Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
3.13.6	Flanged port for slug valve float control, ClaVal CCF-21 or equal	C		
3.14	**Rate of Flow Control Valve and Water Slug Valve**			
3.14.10	Control Valve type: Cat-Val model 40-36 ACGS series or equivalent.	C		
3.15	**Double Wall Waste Fuel Collection Tank**			
3.15.2	Horizontal cylindrical double walled fabricated and certified to ULC-S601	C		
3.16	**Electronic Truck Overfill and Ground Verification and Deadman – Bulk Truck Loading**			
2.19.1	Electronic overfill and ground verification with deadman control units, Scully/Civicon or approved equivalent. The unit shall include:	C		
2.19.1.1	UL/CSA agency approvals for Class 1 Zone 1.	C		
2.19.1.2	Nominal power supply to 115 VAC.	C		
2.19.1.3	Overfill, Deadman and ground verification option.	C		
2.19.1.4	Positive ground indication lamp.	C		
2.19.1.6	Interface junction box and interface cabling to control unit.	C		
3.17	**Heating and Insulation**			
2.20.1	The modules shall be electrically heated. Heaters shall be explosion proof.	C		
2.20.2	Insulation shall be sprayed foam or rigid insulation. Insulation shall be two-inch thick installed on the exterior walls, ceiling and floor of container.	C		
3.19	**Electrical – General**			
2.22.1	Provide a single connection point for a 600V 60 Hz 3 phase 3 wire supply, suitable for the connected load (minimum 100A).	C		
2.22.1	All electrical equipment shall be CSA or equivalent recognized certification authority approved.	C		

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
2.22.1	All wiring shall be copper.	C		
	Disconnect Switches:			
2.22.2	Field mounted disconnect switches for protection of motor and equipment circuits shall be heavy duty, horsepower rated, industrial type, Class 1 zone 1 rated NEMA 7 enclosure (or better), Switches must be capable of being padlocked to the "OFF" position.	C		
	Pushbuttons, Selector Switches and Indicating Lights:			
2.22.4.1	Pushbuttons:On all single row pushbutton stations, the stop button shall be located below or to the right of all other associated buttons, indicating lights and selector switches.	C		
2.22.4.1	Field pushbutton stations shall be NEMA type min class1, zone 1.	C		
2.22.4.2	Indicating Lights:When a single indicating light is used to show the status of motors, the colour shall be WHITE and the light shall be so connected that it is ON when the motor is running or the device is energized.	C		

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-50-117-0002	Sub	01
Date Received	09/04/2014		

Review Grade / Next Submittal Status

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit
- ☑ C4 – No further submission required – Complete ☑
- No further submission required – Cancelled ☐
- No further submission required – Superseded ☐

Next Submittal Status: ☐ Internal Review ☐ Certified Final ☐ Final ☐ As-built

Next Submittal Date:

Package Coordinator: Name, signature and Date: KEN LMAI, [signature], 23/09/2014

REVIEWED ONLY FOR GENERAL CONFORMITY WITH THE SPECIFICATIONS. ACCEPTANCE BY THE ENGINEER DOES NOT WARRANT OR REPRESENT THAT THE INFORMATION CONTAINED ON THE DRAWING/DOCUMENT IS EITHER ACCURATE OR COMPLETE. THE SOLE RESPONSIBILITY FOR CORRECT DESIGN, DETAILS & DIMENSIONS SHALL REMAIN WITH THE PARTY SUBMITTING THE DRAWING/DOCUMENT.

	Fuel Module Test Plan	14-Feb-14		
	Jet Fuel Module			
REF	**Test Description**	**Tools and Materials Required**	**Test Criteria**	**Pass/Fail**
	Tests during assembly			
	Piping Pneumatic tests	Air Compressor, Blanking flanges		
	~~Test 1 after assembly of 1-1/2" piping—vehicle and genset systems.~~			N/A
	Test 2 following assembly of 4" piping - truck loading system.			P
	Piping to be pressurized to 15psi with compressed air. Close air inlet		Pressure must hold for 30 minutes	
	Operational tests after assembly			
	Electrical Tests			
	Energize 120V circuit	120V Genset		P
	Test interior lighting			P
	Check Fire Suppression System control panel		Panel free of alarm, trouble or fault codes	
	Check operation of emergency stop buttons (3)		E-stop relay must disengage	P
3.1.3	**Truck Loading Pump controls**			
	Selector switch OFF, START button pressed		Pump motor relay must not engage	P
	Selector switch HAND, pump selector switch PUMP 1, start button pressed		Pump 1 motor relay must engage	P
	Selector switch HAND, pump selector switch PUMP 2, start button pressed		Pump 2 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 1 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 2 motor relay must engage	P
	Check operation of flow switch - 5 minute shutdown		Pump motor relay must disengage in 5 minutes	P
	Check operation of Scully system and control valve solenoid			P
	Scully system GREEN light		Solenoid valve must open	P
	Scully system RED light		Solenoid valve must close	P
	Deadman switch open		Solenoid valve must close	P
3.8	**Filter Drain Pump controls**			
	Start button pressed - MANUAL STARTER		Pump motor relay must engage	P
	Jog hose reel motor to check rotation		Motors must turn in rewind direction	P
	Energize 600V circuit	600V Genset		
	Check operation of heater		Heater must operate	P
	Jog truck loading pumps to check rotation		Rotation as marked on pump	P
	Jog filter drain pump to check rotation		Rotation as marked on pump	P
	Operational Tests - Commissioning	600V power supply		
		Fuel supply		
		Fuel truck		
	Truck Loading			
3.9	Flow meter		Register turning in correct direction	P
3.7.3	Record flow rate (time meter register) Pump 1 1800 LPM	stopwatch	Run Pump 1 for min. 20 minutes	P
3.7.4	Record suction and discharge pressures 3 PSI, 42 PSI		Check performance against manufacturer's curve	P

3.7.10	Record Motor Current draw	21 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure	44 PSI		Bypass valve must limit pressure to 50psi or less	P
3.7.3	Record flow rate (time meter register) Pump 2	1800 LPM	stopwatch	Run Pump 2 for min. 20 minutes	P
3.7.4	Record suction and discharge pressures	3 psi, 42 psi		Check performance against manufacturer's curve	P
3.7.10	Record Motor Current draw	22 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure	44 PSI		Bypass valve must limit pressure to 50psi or less	P
3.16	Check Scully System	WITH LOADING RACK TESTER		Flow stops on RED light	P
3.16	Check Deadman switch			Flow stops on open switch	P
	Check operation Hose Reel 1			Inspect for leaks	P
	Filter Drain Pump				
3.8	Record Motor Current draw		ammeter	Not to exceed FLA on motor nameplate	

COUPLINGS AND ALIGNMENT CHECKED ON ALL PUMP & MOTOR ASSEMBLIES TIR < .010"

ISOLATING VALVES FOR BYPASS VALVE LOCKED (BOLT & NUT) OPEN.

NOTES: LINE RELIEF VALVE DISCHARGE SHOULD BE PLUMBED TO THE WASTE FUEL TANK TO KEEP THE FLOOR DRY.

SAPPHIRE BOTTLE (FIRE SUPRESSION IN ELECTRICAL ROOM) PRESSURE IS SLIGHTLY LOW. SHOULD BE MONITORED TO ENSURE IT DOES NOT CONTINUE TO DROP.

G. Bartz

SEI INDUSTRIES LTD.
GEORGE BARTZ
APRIL 2, 2014.

H349000 PM00401 Milne Port Diesel Fuel Module Inspection Plan

MILNE PORT

HATCH VENDOR DATA REVIEW
Doc Number: E349000-PM004-00-177-0003 | Sub: 01
Date Received: 09/04/2014
Review Grade
☐ 01 - Proceed to next submission & status
☐ 02 - Proceed with exceptions as noted in next submission & status
☐ 03 - Do not proceed, revise as noted & resubmit
☑ 04 - No further submission required - Complete
☐ No further submission required - Cancelled
☐ No further submission required - Superseded
Next Submission Status
Next Submission Date
Package Coordinator, Name, signature and date: KEN MAI 23/09/14

Objective:	The objective of the inspection is to assess the Milne Port Diesel Module against the requirements of Contract No. H349000 PM00401
Personnel:	The inspections will be conducted by SEI personnel under the direction of George Bartz, Project engineer

Table 1 - Master Inspection List: This table identifies requirements from Contract H349000 to be met.

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
2.1.1	The Fuel Modules housing shall be a 12 m ISO sea shipping container with separate mechanical and electrical rooms, in accordance with SEI Drawing No. PS-D-046 Rev. C and PS-D-1040 Rev. A, approved by Hatch.	C		GEORGE BARTZ
2.1.2	The dispensing module design shall include a Truck Bulk Loading System, a Vehicle Fueling system, a Generator Fueling System and a Lube Oil Dispensing System.	C		
	Truck Bulk Loading			
2.1.3	Accept permissive inputs from truck grounding and overfill and deadman system (Scully).	C		
2.1.3	A port is provided for the addition of an RTD (temperature) probe by others.	C		
2.1.3	Local meter display will provide visual quantity of product transferred	C		
2.1.3	Pump starters shall be equipped with hand/off/auto control	C		
2.1.3	No flow signal will shut down pumps when no product flow is detected for a period of five (5) minutes	C		
2.1.3	Activation of the ESD system will stop all pumps.	C		
	Vehicle Fueling			
2.1.4	A local stop/start will activate the pump	C		
2.1.4	Manual operated fueling nozzle will control the fueling rate and stop fuel transfer	C		
2.1.4	Local meter display will provide visual quantity of product transferred	C		
2.1.4	A port is provided for the addition of an RTD (temperature) probe by others.	C		
2.1.4	Pump starters shall be equipped with hand / off/ auto control	C		
	Generator Fueling			
2.1.5	A local stop/start will activate the pump	C		

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
2.1.5	Local meter display will provide visual quantity of product transferred.	C		
2.1.5	A port is provided for the addition of an RTD (temperature) probe by others.	C		
2.1.7	The design and installation of components shall be as per the process flow diagram (PFD), SEI Drawing No. PS-D-943 Rev. A, approved by Hatch.	C		
2.1.8	The Lube Oil System shall consist of dispensing piping, valves, pump, meter, hose, hose reel and associated equipment.	C		
2.1.9	Truck Loading pump discharge piping shall be complete with a pump bypass equipped with a flow control valve (Cla –Val 50-48 ACGS or equivalent). Isolation valves shall be provided on all pump bypass assemblies.	C		
2.1.10	One strainer complete with isolation valves shall be provided on the module inlet supply line.	C		
2.1.11	Check valves shall be provided on all pump discharge lines.	C		
2.1.13	The Vehicle Fuelling system shall be provided with hose reels, hoses and nozzle assemblies downstream of the meter.	C		
2.1.14	Each vehicle fuelling system and generator fuelling system shall be equipped with a duplex coalescing cartridge filters installed in parallel before the meters complete with isolating valves.	C		
2.1.15	All equipment shall have isolation valves per the Process Flow Diagram, SEI Drawing No. PS-D-943 Rev.A	C		
2.1.16	Pressure relief shall be provided on all systems.	C		
2.1.17	Overfill and grounding verification system with deadman control shall be provided on the truck loading system. (Scully)	C		
	Pressure Gauges			
2.4.1	Size 115 mm, Liquid filled process gauge. 4"	C		
2.4.5	Pressure range: Discharge side of pump – 0-1050 kPa (0-150 psi). 160 psi	C		
2.4.6	Suction side of pump (Compound gauge) – 0-210 kPa (0-30 psi) and 0-30 in. Hg.	C		
2.5.1.7	Flow Indicator - Visi-Flo Flow Indicators Series 1500 or equivalent.	C		
2.6.1.2	Basket Strainer: 304 SS perforated screen	C		
	Truck Bulk Loading Pump			
2.7.1	Centrifugal pump	C		

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
2.7.2	Pump to have external bypass system capable of handling full pump flow. REF. 2.1.9	C		
2.7.7	Mechanical Seal compatible with Arctic Grade Diesel fuel.	C		
2.7.8	Spacer type motor coupling.	C		
2.7.9	Coupling guard – non sparking.	C		
2.7.11	Motor: TEFC explosion proof - Class 1 Zone 1, S.F. 1.15.	C		
2.7.12	Pump type: Gorman Rupp, Goulds or equivalent.	C		
	Vehicle Fuelling Pump			
2.8.5	Mechanical Seal compatible with Arctic Grade Diesel fuel.	C		
2.8.7	Motor: TEFC explosion proof - Class 1 Zone 1, S.F. 1.15.	C		
	Generator Fuelling Pump			
2.10.1	Flow rate: 100 litres per minute.	C		
2.10.2	Pressure requirement: 15 m head.	C		
2.10.5	Mechanical Seal compatible with Arctic Grade Diesel fuel.	C		
2.10.7	Motor: TEFC explosion proof - Class 1 Zone 1, S.F. 1.15.	C		
	Flow Meter (Bulk Truck Loading)			
2.11.1	100 mm (4 inch) Positive displacement meter for Truck Loading System.	C		
2.11.4	Meter register equipped with pulse output.	C		
	Flow Meter (Vehicle Fuelling)			
2.12.1	50mm (2 inch) Positive displacement meter. 1 1/2" METER 226 l/min MAX.	C		
2.12.5	Meter register equipped with pulse output.	C		

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
	Flow Control Valve C/W Deadman Control (Bulk Truck Loading)			
2.14.11	Control Valve type: Cal-Val model 94AF-3 series or equivalent.	C		
2.14.12	Deadman control type: Gammon Deadman Control System or equivalent. INTEGRAL WITH SCULLY	C		
2.15	Bulk Truck Loading Hose and Dry Break Coupling: Truck loading hose: 12 m of 75 mm dia. ExtremeFlex hose by Goodyear or approved equivalent.	C		
2.15.2	API coupler type: OPW 1004-D4-02 or equivalent.	C		
	Vehicle and Equipment Fuelling Hose			
2.16.1	Equipment fuelling hose 10 m of 25 mm dia. ExtremeFlex hose by Goodyear or approved equivalent fitted with hand nozzle dual plane swivel and breakaway assembly.	C		
2.16.2	Nozzle type: OPW 7H or equivalent.	C		
	Hose Reel – Bulk Truck Loading			
2.17.4	Swivel Joint: 75 mm Victaulic.	C		
2.17.6	Rewind Drive – 115 VAC explosion proof electric motor.	C		
2.17.10	Four way roller top wind.	C		
	Hose Reel – Vehicle Fuelling			
2.18.5	Swivel Joint: 25 mm (1 inch) dia. female NPT.	C		
2.18.7	Rewind Drive – 115 VAC explosion proof electric motor.	C		
2.18.11	Four way roller top wind.	C		
	Electronic Truck Overfill and Ground Verification and Deadman – Bulk Truck Loading			
2.19.1	Electronic overfill and ground verification with deadman control units, Scully/Civicon or approved equivalent. The unit shall include:	C		
2.19.1.1	UL/CSA agency approvals for Class 1 Zone 1.	C		
2.19.1.2	Nominal power supply to 115 VAC.	C		

Contract Reference	Requirement	C - Conform	NC - Non Conform	Examiner
2.19.1.3	Overfill, Deadman and ground verification option.	C		
2.19.1.4	Positive ground indication lamp.	C		
2.19.1.6	Interface junction box and interface cabling to control unit.	C		
	Lube Oil System Requirements			
4.20	The module shall be designed to provide a heated location where a standard Intermediate Bulk Container (IBC) can be stored.	C		
4.20	Hose for lubrication oil shall be accessible through access door in dispensing module container	C		
	Heating and Insulation			
2.20.1	The modules shall be electrically heated. Heaters shall be explosion proof.	C		
2.20.2	Insulation shall be sprayed foam or rigid insulation. Insulation shall be two-inch thick installed on the exterior walls, ceiling and floor of container.	C		
	Electrical – General			
2.22.1	Provide a single connection point for a 600V 60 Hz 3 phase 3 wire supply, suitable for the connected load (minimum 100A).	C		
2.22.1	All electrical equipment shall be CSA or equivalent recognized certification authority approved.	C		
2.22.1	All wiring shall be copper.	C		
	Disconnect Switches:			
2.22.2	Field mounted disconnect switches for protection of motor and equipment circuits shall be heavy duty, horsepower rated, industrial type, Class 1 zone 1 rated NEMA 7 enclosure (or better), Switches must be capable of being padlocked to the "OFF" position.	C		
	Pushbuttons, Selector Switches and Indicating Lights:			
2.22.4.1	Pushbuttons:On all single row pushbutton stations, the stop button shall be located below or to the right of all other associated buttons, indicating lights and selector switches.	C		
2.22.4.1	Field pushbutton stations shall be NEMA type min class1, zone 1.	C		
2.22.4.2	Indicating Lights:When a single indicating light is used to show the status of motors, the colour shall be WHITE and the light shall be so connected that it is ON when the motor is running or the device is energized.	C		

HATCH — VENDOR DATA REVIEW

Doc Number: E349000-PM004-50-117-0004 | Sub: 01

Date Received: 09/04/2014

Review Grade

- [ ] C1 – Proceed to next submission & status
- [ ] C2 – Proceed with exceptions as noted (revise) submission & status
- [ ] C3 – Do not proceed, revise as noted & resubmit
- [x] C4 – No further submission required – Complete [x]; No further submission required – Cancelled [ ]; No further submission required – Superseded [ ]

Next Submittal Status: [ ] Internal Review [ ] Certified Final [ ] Final [ ] As-Built

Next Submittal Date:

Package Coordinator: Name, signature and date: KENWRAI [signature] 23/09/2014

[illegible]

REF	Test Description	Tools and Materials Required	Test Criteria	Pass/Fail
	Fuel Module Test Plan	14-Feb-14		
	Milne Port Diesel Fuel Module			
REF	Test Description	Tools and Materials Required	Test Criteria	Pass/Fail
	Tests during assembly			
	Piping Pneumatic tests	Air Compressor, Blanking flanges		
	Test 1 after assembly of 1-1/2" piping - vehicle and genset systems.			P
	Test 2 following assembly of 4" piping - truck loading system.			P
	Piping to be pressurized to 15psi with compressed air. Close air inlet		Pressure must hold for 30 minutes	
	Operational tests after assembly			
	Electrical Tests			
	Energize 120V circuit	120V Genset		P
	Test interior lighting			P
	Check Fire Suppression System control panel		Panel free of alarm, trouble or fault codes	P
	Check operation of emergency stop buttons (3)		E-stop relay must disengage	P
2.1.3	**Truck Loading Pump controls**			
	Selector switch OFF, START button pressed		Pump motor relay must not engage	P
	Selector switch HAND, pump selector switch PUMP 1, start button pressed		Pump 1 motor relay must engage	P
	Selector switch HAND, pump selector switch PUMP 2, start button pressed		Pump 2 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 1 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 2 motor relay must engage	P
	Check operation of flow switch - 5 minute shutdown		Pump motor relay must disengage in 5 minutes	P
	Check operation of Scully system and control valve solenoid			P
	Scully system GREEN light		Solenoid valve must open	P
	Scully system RED light		Solenoid valve must close	P
	Deadman switch open		Solenoid valve must close	P
2.1.4	**Vehicle Fueling Pump controls**			
	Selector switch OFF, START button pressed		Pump motor relay must not engage	P
	Selector switch HAND, pump selector switch PUMP 1, start button pressed		Pump 1 motor relay must engage	P
	Selector switch HAND, pump selector switch PUMP 2, start button pressed		Pump 2 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 1 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 2 motor relay must engage	P
	Check operation of flow switch - 5 minute shutdown		Pump motor relay must disengage in 5 minutes	P
2.1.5	**Generator Pump controls**			
	Selector switch OFF, START button pressed		Pump motor relay must not engage	P
	Selector switch HAND, pump selector switch PUMP 1, start button pressed		Pump 1 motor relay must engage	P
	Selector switch HAND, pump selector switch PUMP 2, start button pressed		Pump 2 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 1 motor relay must engage	P
	Selector switch AUTO, start button pressed		Pump 2 motor relay must engage	P
	Check operation of flow switch - 5 minute shutdown		Pump motor relay must disengage in 5 minutes	P
	Jog hose reel motors to check rotation		Motors must turn in rewind direction	P
	Jog Lube Pump to check rotation		Rotation as marked on pump	P
	Energize 600V circuit	600V Genset		

	Check operation of heater		Heater must operate	P
	Jog truck loading pumps to check rotation		Rotation as marked on pump	P
	Jog vehicle fueling pumps to check rotation		Rotation as marked on pump	P
	Jog genset pumps to check rotation		Rotation as marked on pump	P
	Operational Tests - Commissioning	600V power supply		
		Fuel supply		
		Fuel truck		
	Truck Loading			
2.11	Flow meter		Register turning in correct direction	P
2.7.3	Record flow rate (time meter register) Pump 1 1600 LPM	stopwatch	Run Pump 1 for min. 20 minutes	P
2.7.4	Record suction and discharge pressures 9 psi, 42 psi		Check performance against manufacturer's curve	P
2.7.10	Record Motor Current draw 24 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 44 psi		Bypass valve must limit pressure to 50psi or less	P
2.7.3	Record flow rate (time meter register) Pump 2 1700 LPM	stopwatch	Run Pump 2 for min. 20 minutes	P
2.7.4	Record suction and discharge pressures 9psi, 40 psi		Check performance against manufacturer's curve	P
2.7.10	Record Motor Current draw 23.5 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 44 psi		Bypass valve must limit pressure to 50psi or less	P
2.19	Check Scully System WITH LOADING RACK TESTER		Flow stops on RED light	P
2.19	Check Deadman switch		Flow stops on open switch	P
	Check operation Hose Reel 1		Inspect for leaks	P
	Vehicle Fueling	Vehicle or container to fill		
2.12	Flow meter		Register turning in correct direction	P
2.8.1	Record flow rate (time meter register) Pump 1 93 LPM	stopwatch	Run Pump 1 for min. 20 minutes	P
2.8.2	Record suction and discharge pressures 10 psi, 30 psi		Check performace against manufacturer's curve	P
2.8.6	Record Motor Current draw 2.5 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 30 psi		Relief valve must limit pressure to 30 psi or less	P
2.8.1	Record flow rate (time meter register) Pump 2 93 LPM	stopwatch	Run Pump 2 for min. 20 minutes	P
2.8.2	Record suction and discharge pressures 13psi, 30 psi		Check performance against manufacturer's curve	P
2.8.6	Record Motor Current draw 2.4 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 30 psi		Relief valve must limit pressure to 30 psi or less	P
	Check operation Hose Reel 2		Inspect for leaks	P
	Check nozzle shutoff, Hose Reel 2	5 gallon container	Test shutoff per OPW instructions	P
	Check operation Hose Reel 3		Inspect for leaks	P
	Check nozzle shutoff, Hose Reel 3	5 gallon container	Test shutoff per OPW instructions	P
	Check operation Hose Reel 4		Inspect for leaks	P
	Check nozzle shutoff, Hose Reel 4	5 gallon container	Test shutoff per OPW instructions	P
	Generator Pump	Tank or container to fill		
2.12	Flow meter		Register turning in correct direction	—
2.10.1	Record flow rate (time meter register) Pump 1	stopwatch	Run Pump 1 for min. 20 minutes	—
2.10.2	Record suction and discharge pressures 6 psi, 23 psi		Check performance against manufacturer's curve	P
2.10.6	Record Motor Current draw 2.5 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 23 psi		Relief valve must limit pressure to 30 psi or less	P

2.10.1	Record flow rate (time meter register) Pump 2	stopwatch	Run Pump 2 for min. 20 minutes	—
2.10.2	Record suction and discharge pressures 6 PSI, 23 PSI		Check performance against manufacturer's curve	P
2.10.6	Record Motor Current draw 2.5 A	ammeter	Not to exceed FLA on motor nameplate	P
	Close isolation valve, record shutoff pressure 23 PSI		Relief valve must limit pressure to 30 psi or less	P
4.20	Test lube oil pump - run for at least 10 minutes	IBC of lube oil	Oil is dispensed per preset meter	P

COUPLINGS AND ALIGNMENT CHECKED ON ALL PUMP & MOTOR ASSEMBLIES.
TIR < .010"

ISOLATING VALVES FOR BYPASS VALVE LOCKED (BOLT & NUT) OPEN

GENSET PUMPS RUN DEADHEAD ONLY - NO CONNECTION

G. Bartz
GEORGE BARTZ
SEI INDUSTRIES LTD.
APRIL 1, 2014

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVED
B	AS-BUILT	JC	17 APRIL 2014	GB

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-50-042-0004-001	Sub	03
Date Received	26/09/2014		

Review Grade

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit
- ☑ C4 - No further submission required - Complete
- ☐ No further submission required - Cancelled
- ☐ No further submission required - Superseded

Next Submittal Status

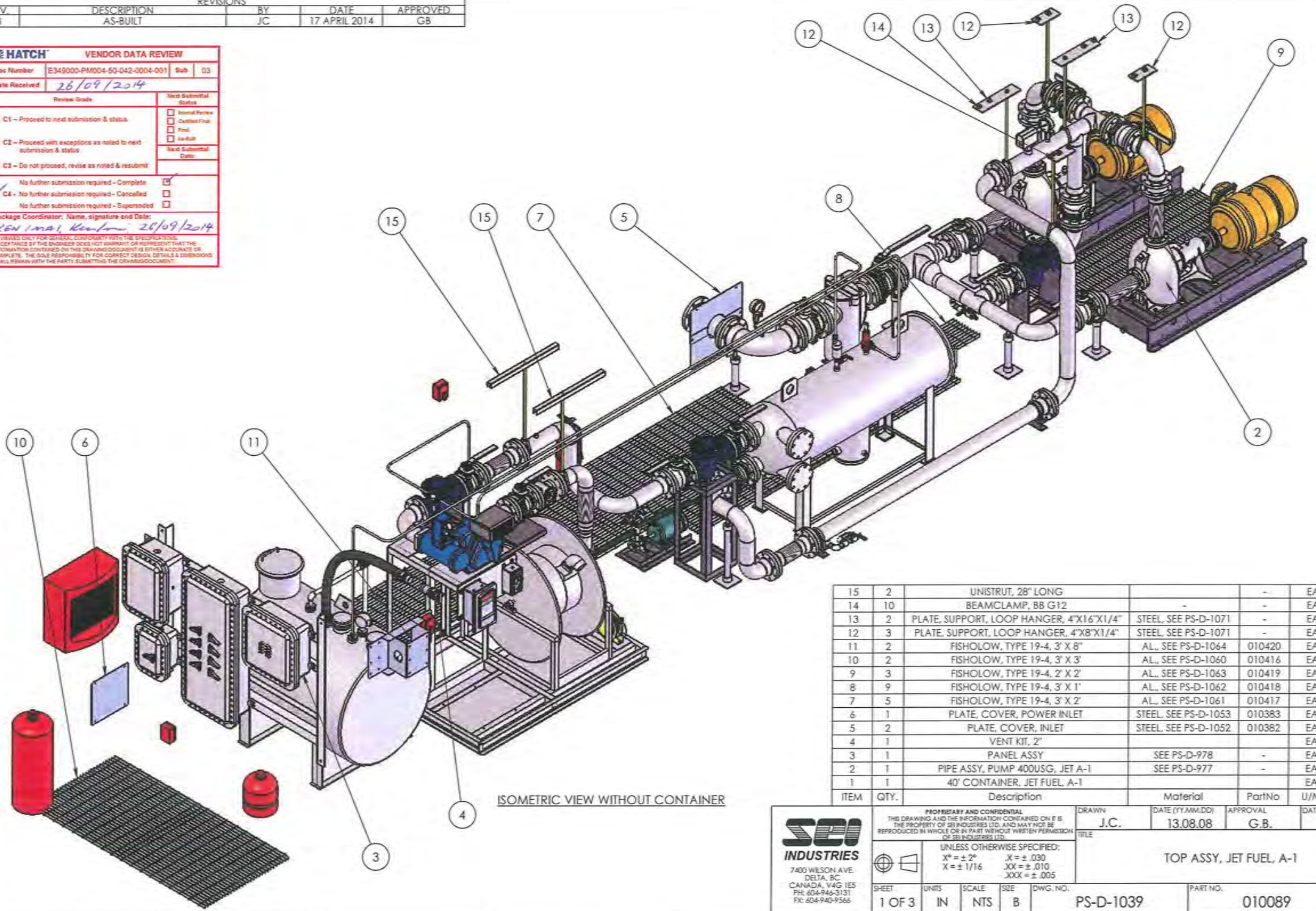
- ☐ Internal Review
- ☐ Certified Final
- ☐ Final
- ☐ As-Built

Next Submittal Date:

Package Coordinator: Name, signature and Date:

KEN IMAI, Ken Imai 26/09/2014

REVIEWED ONLY FOR GENERAL CONFORMITY WITH THE SPECIFICATIONS. ACCEPTANCE BY THE ENGINEER DOES NOT WARRANT OR REPRESENT THAT THE INFORMATION CONTAINED ON THIS DRAWING/DOCUMENT IS EITHER ACCURATE OR COMPLETE. THE SOLE RESPONSIBILITY FOR CORRECT DESIGN, DETAILS & DIMENSIONS SHALL REMAIN WITH THE PARTY SUBMITTING THE DRAWING/DOCUMENT.



ISOMETRIC VIEW WITHOUT CONTAINER

ITEM	QTY.	Description	Material	PartNo	U/M	T.QTY
15	2	UNISTRUT, 28" LONG		-	EA	2
14	10	BEAMCLAMP, BB G12	-	-	EA	10
13	2	PLATE, SUPPORT, LOOP HANGER, 4"X16"X1/4"	STEEL, SEE PS-D-1071	-	EA	2
12	3	PLATE, SUPPORT, LOOP HANGER, 4"X8"X1/4"	STEEL, SEE PS-D-1071	-	EA	3
11	2	FISHOLOW, TYPE 19-4, 3' X 8"	AL., SEE PS-D-1064	010420	EA	2
10	2	FISHOLOW, TYPE 19-4, 3' X 3'	AL., SEE PS-D-1060	010416	EA	2
9	3	FISHOLOW, TYPE 19-4, 2' X 2'	AL., SEE PS-D-1063	010419	EA	3
8	9	FISHOLOW, TYPE 19-4, 3' X 1'	AL., SEE PS-D-1062	010418	EA	9
7	5	FISHOLOW, TYPE 19-4, 3' X 2'	AL., SEE PS-D-1061	010417	EA	5
6	1	PLATE, COVER, POWER INLET	STEEL, SEE PS-D-1053	010383	EA	1
5	2	PLATE, COVER, INLET	STEEL, SEE PS-D-1052	010382	EA	2
4	1	VENT KIT, 2"			EA	1
3	1	PANEL ASSY	SEE PS-D-978	-	EA	1
2	1	PIPE ASSY, PUMP 400USG, JET A-1	SEE PS-D-977	-	EA	1
1	1	40' CONTAINER, JET FUEL, A-1			EA	1

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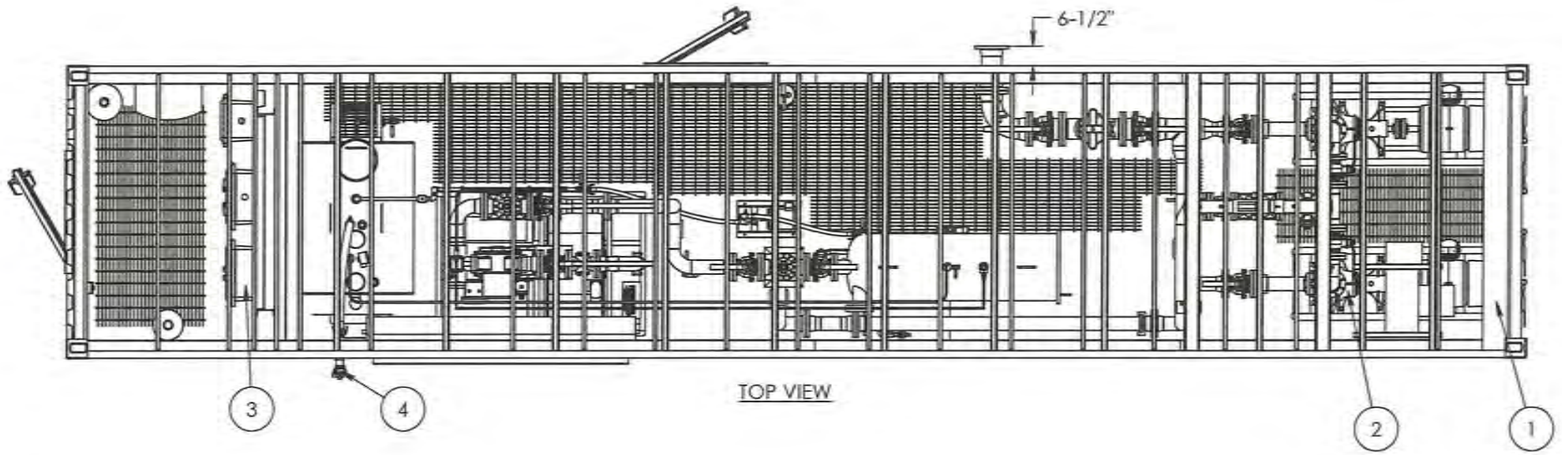
X = ± 1/16 .XX = ± .010
.XXX = ± .005

DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.08.08	G.B.	13.08.08

TITLE: TOP ASSY, JET FUEL, A-1

SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
1 OF 3	IN	NTS	B	PS-D-1039	010089	B

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVED
A	-	-	-	-



TOP VIEW

HATCH — VENDOR DATA REVIEW

Doc Number	E349000-PM004-50-042-0004-002 Sub 02
Date Received	26/09/2014

Review Grade

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit
- ☑ C4 - No further submission required - Complete
- ☐ No further submission required - Cancelled
- ☐ No further submission required - Superseded

Next Submittal Status

- ☐ Internal Review
- ☐ Certified Final
- ☐ Final
- ☐ As-Built

Next Submittal Date:

Package Coordinator: Name, signature and Date:
KEN INAI, Kenner, 26/09/2014

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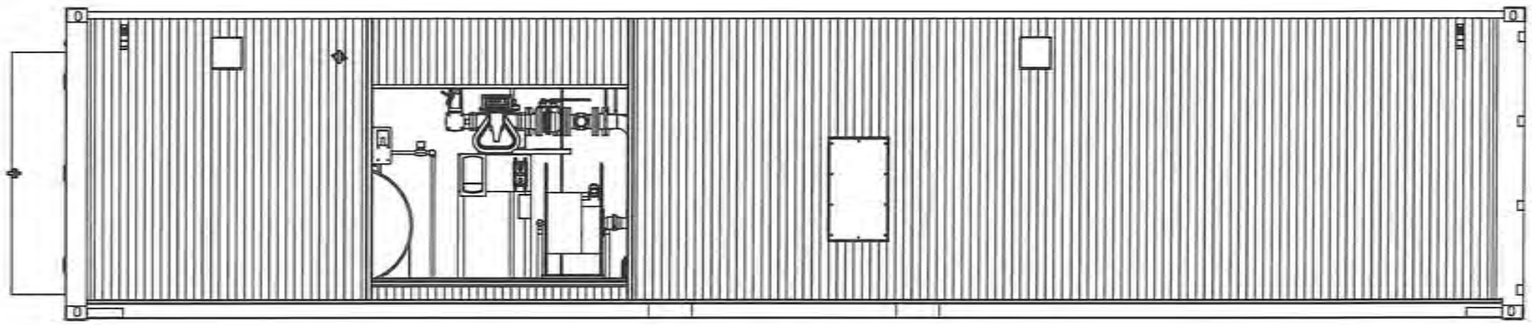
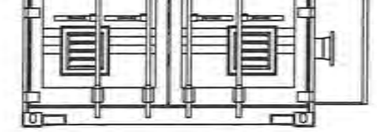
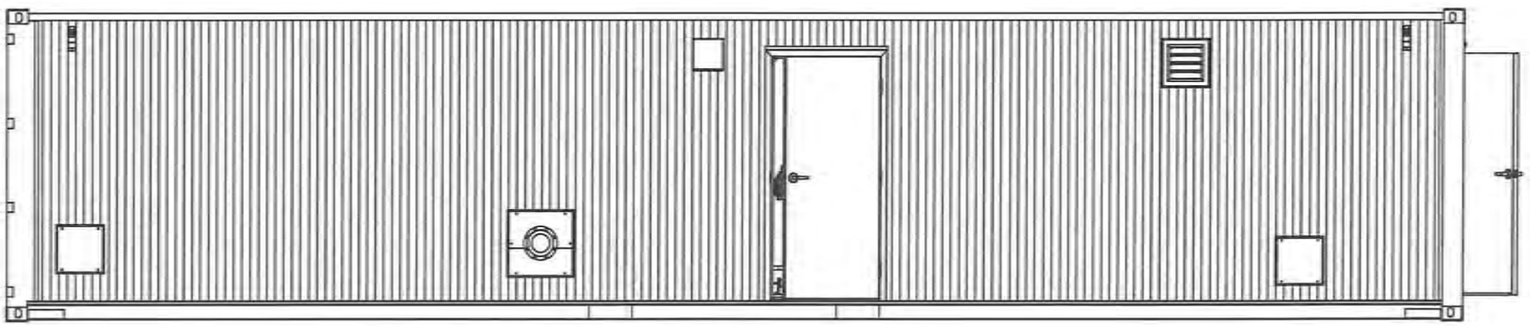


FRONT VIEW



RIGHT VIEW



BACK VIEW

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.XXX = ± .005

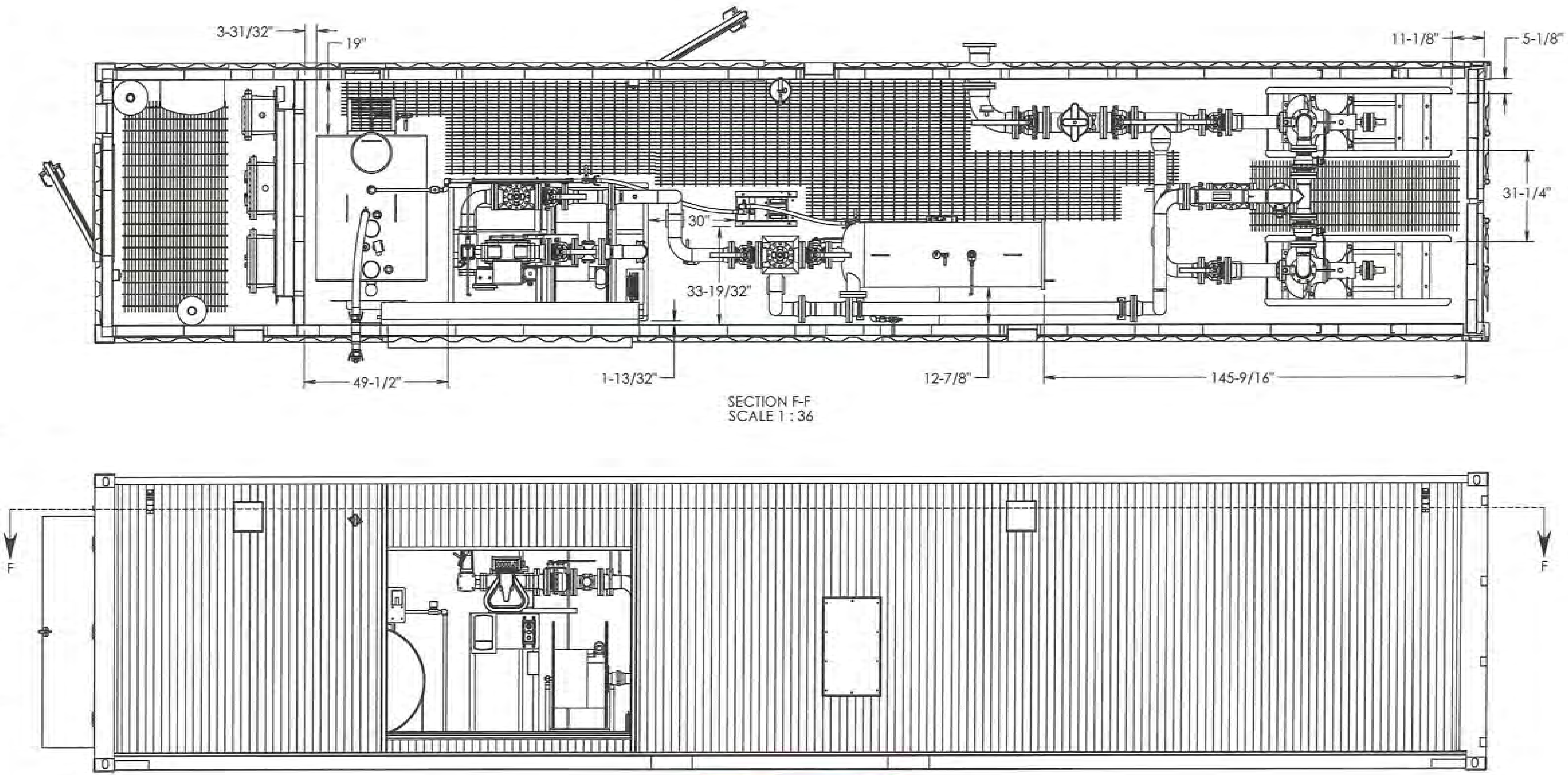
DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.08.08	G.B.	13.08.08

TITLE: TOP ASSY, JET FUEL, A-1

SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
2 OF 3	IN	NTS	B	PS-D-1039	010089	B

REV.	DESCRIPTION	BY	DATE	APPROVED
A	-	-	-	-

REVISIONS



HATCH VENDOR DATA REVIEW

Date Reviewed: 28/07/2014

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KEN IMAI, 28/07/14

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X = ± 1/16   .XX = ± .010
.XXX = ± .005

DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.10.03	G.B.	13.10.03

TITLE: JET A-1 FLOOR PLAN

SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
3 OF 3	IN	NTS	B	PS-D-1039	010089	B

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVED
B	AS-BUILT	JC	17 APRIL 2014	GB

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-50-042-0008-001 Sub: 03
Date Received	26/09/2014

Review Grade — Next Submittal Status:
- C1 – Proceed to next submission & status — ☐ Internal/Review ☐ Contractual ☐ Final ☐ As-Built
- C2 – Proceed with exceptions as noted to next submission & status
- C3 – Do not proceed; revise as noted & resubmit — Next Submittal Date:
- ☑ No further submission required - Complete
- C4 – No further submission required - Cancelled ☐
- No further submission required - Superseded ☐

Package Coordinator: Name, signature and Date: KEN INGL Kenton 26/09/14

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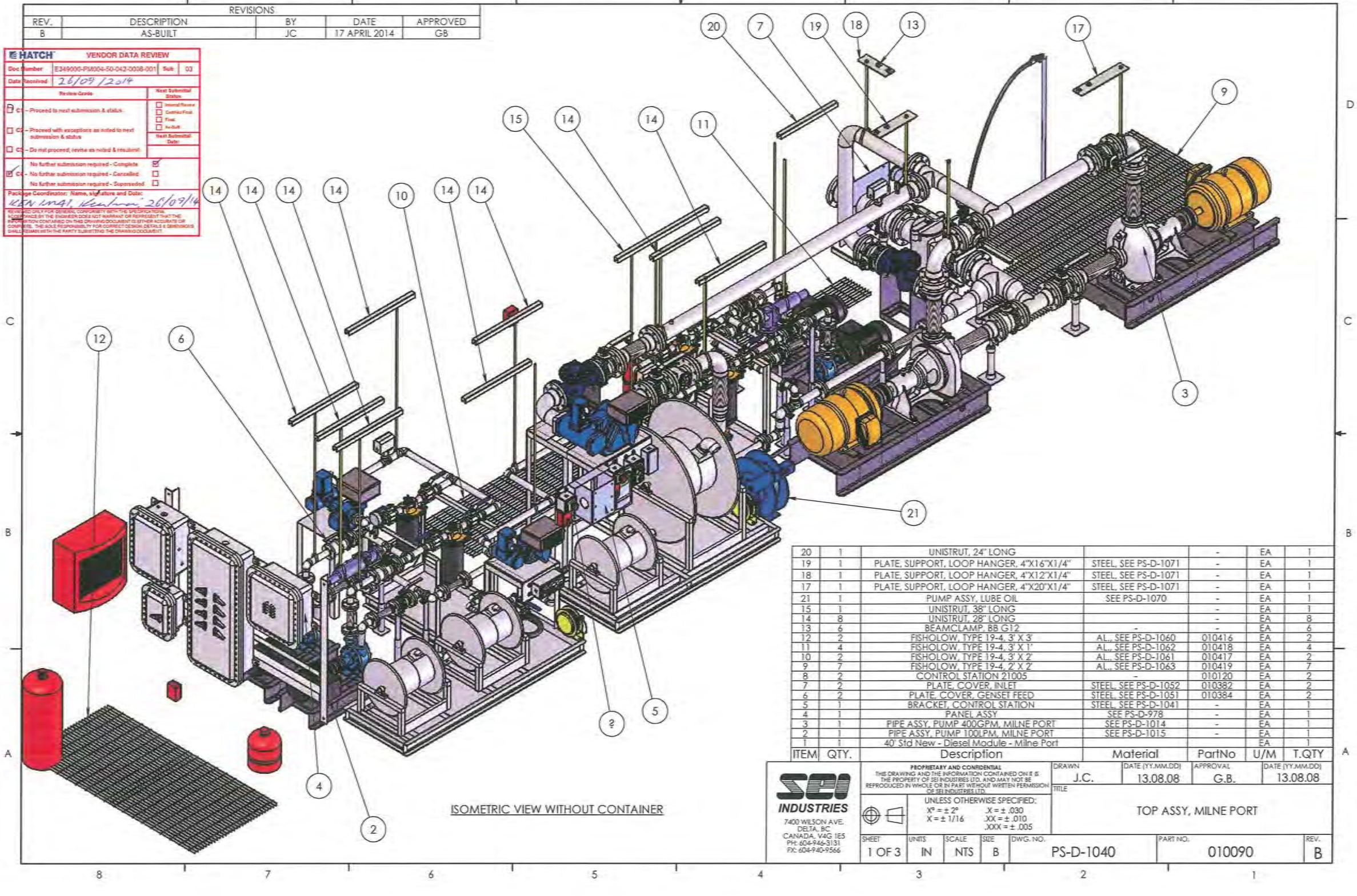

ISOMETRIC VIEW WITHOUT CONTAINER

ITEM	QTY.	Description	Material	PartNo	U/M	T.QTY
20	1	UNISTRUT, 24" LONG		-	EA	1
19	1	PLATE, SUPPORT, LOOP HANGER, 4"X16"X1/4"	STEEL, SEE PS-D-1071	-	EA	1
18	1	PLATE, SUPPORT, LOOP HANGER, 4"X12"X1/4"	STEEL, SEE PS-D-1071	-	EA	1
17	1	PLATE, SUPPORT, LOOP HANGER, 4"X20"X1/4"	STEEL, SEE PS-D-1071	-	EA	1
21	1	PUMP ASSY, LUBE OIL	SEE PS-D-1070	-	EA	1
15	1	UNISTRUT, 38" LONG		-	EA	1
14	8	UNISTRUT, 28" LONG		-	EA	8
13	6	BEAMCLAMP, BB G12	-	-	EA	6
12	2	FISHOLOW, TYPE 19-4, 3' X 3'	AL., SEE PS-D-1060	010416	EA	2
11	4	FISHOLOW, TYPE 19-4, 3' X 1'	AL., SEE PS-D-1062	010418	EA	4
10	2	FISHOLOW, TYPE 19-4, 3' X 2'	AL., SEE PS-D-1061	010417	EA	2
9	7	FISHOLOW, TYPE 19-4, 2' X 2'	AL., SEE PS-D-1063	010419	EA	7
8	2	CONTROL STATION 21005	-	010120	EA	2
7	2	PLATE, COVER, INLET	STEEL, SEE PS-D-1052	010382	EA	2
6	2	PLATE, COVER, GENSET FEED	STEEL, SEE PS-D-1051	010384	EA	2
5	1	BRACKET, CONTROL STATION	STEEL, SEE PS-D-1041	-	EA	1
4	1	PANEL ASSY	SEE PS-D-978	-	EA	1
3	1	PIPE ASSY, PUMP 400GPM, MILNE PORT	SEE PS-D-1014	-	EA	1
2	1	PIPE ASSY, PUMP 100LPM, MILNE PORT	SEE PS-D-1015	-	EA	1
1	1	40' Std New - Diesel Module - Milne Port			EA	1

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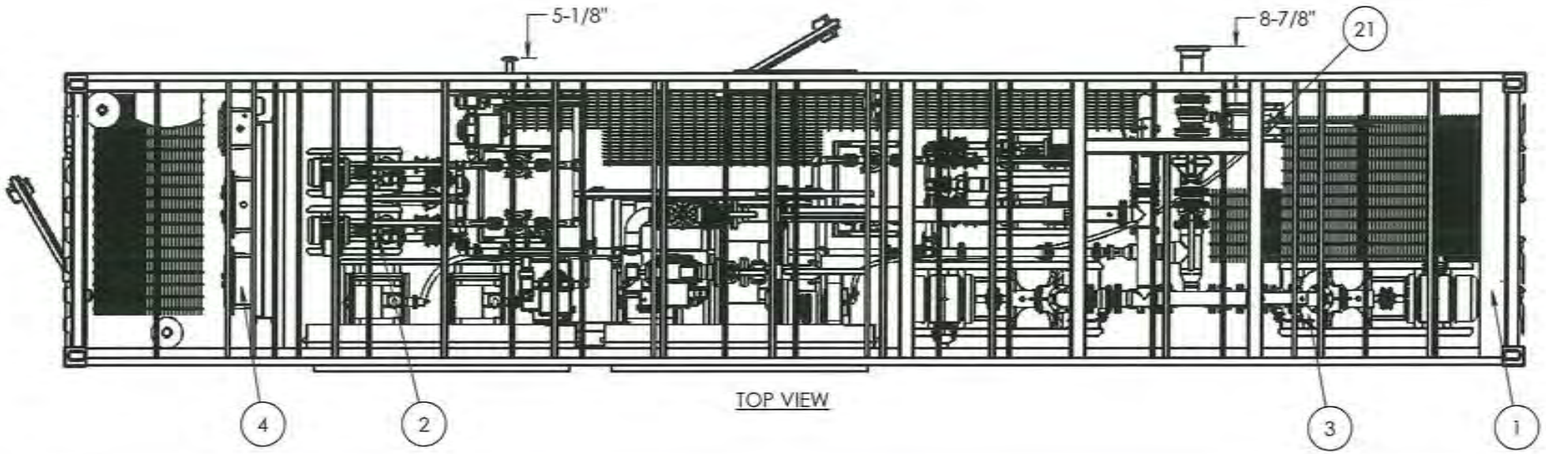
DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.08.08	G.B.	13.08.08

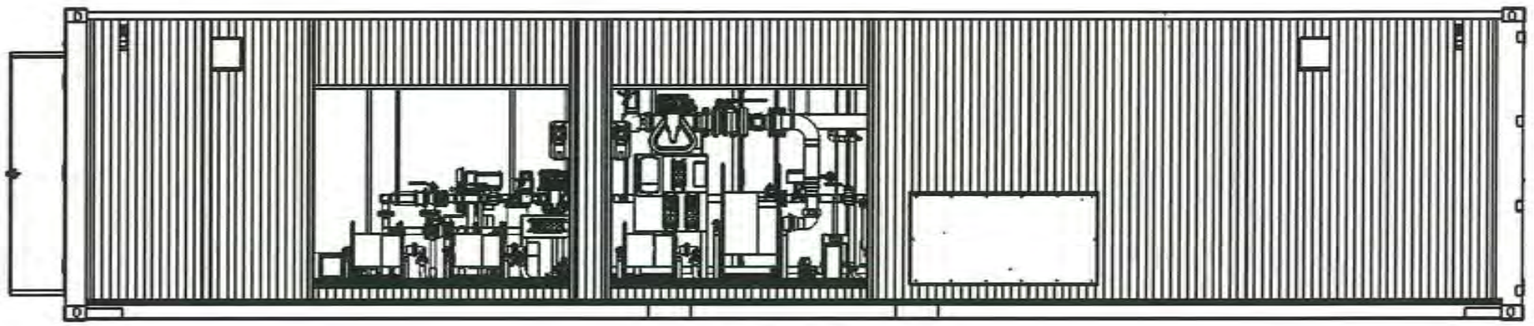
TITLE: TOP ASSY, MILNE PORT

SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
1 OF 3	IN	NTS	B	PS-D-1040	010090	B

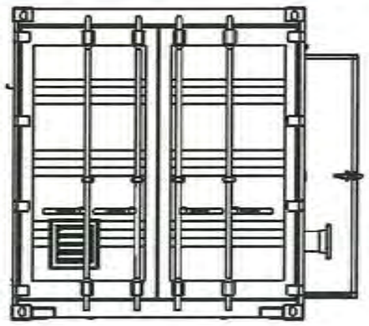
REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVED
A	-	-	-	-



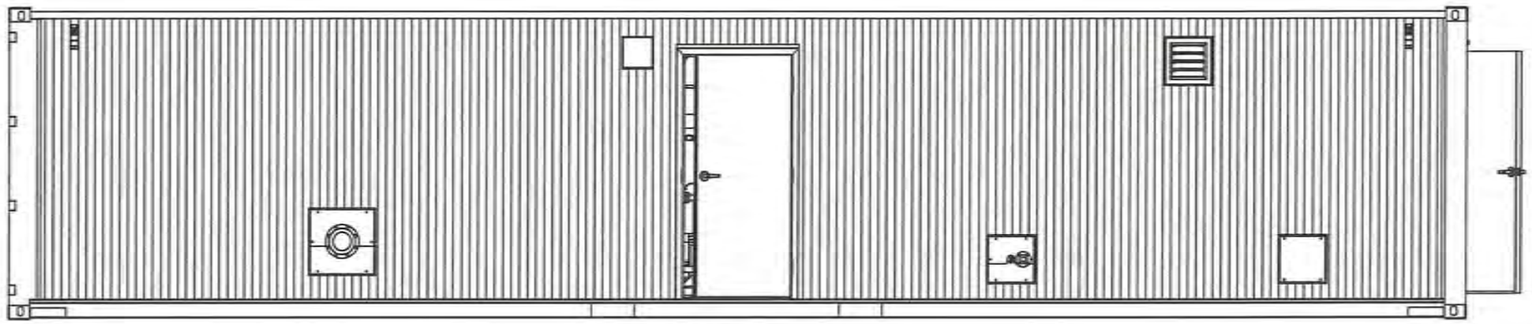
TOP VIEW



FORNT VIEW



RIGHT VIEW



BACK VIEW

HATCH — VENDOR DATA REVIEW

Doc Number	E349000-PM004-50-042-0008-002 Sub 02
Date Received	26/09/2014

Review Grade	Next Submittal Status
☐ C1 – Proceed to next submission & status	☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built
☐ C2 – Proceed with exceptions as noted to next submission & status	Next Submittal Date:
☐ C3 – Do not proceed, revise as noted & resubmit	
No further submission required - Complete	☑
☑ C4 - No further submission required - Cancelled	☐
No further submission required - Superseded	☐

Package Coordinator: Name, signature and Date:
KENIMAL, Kenimal 26/09/2014

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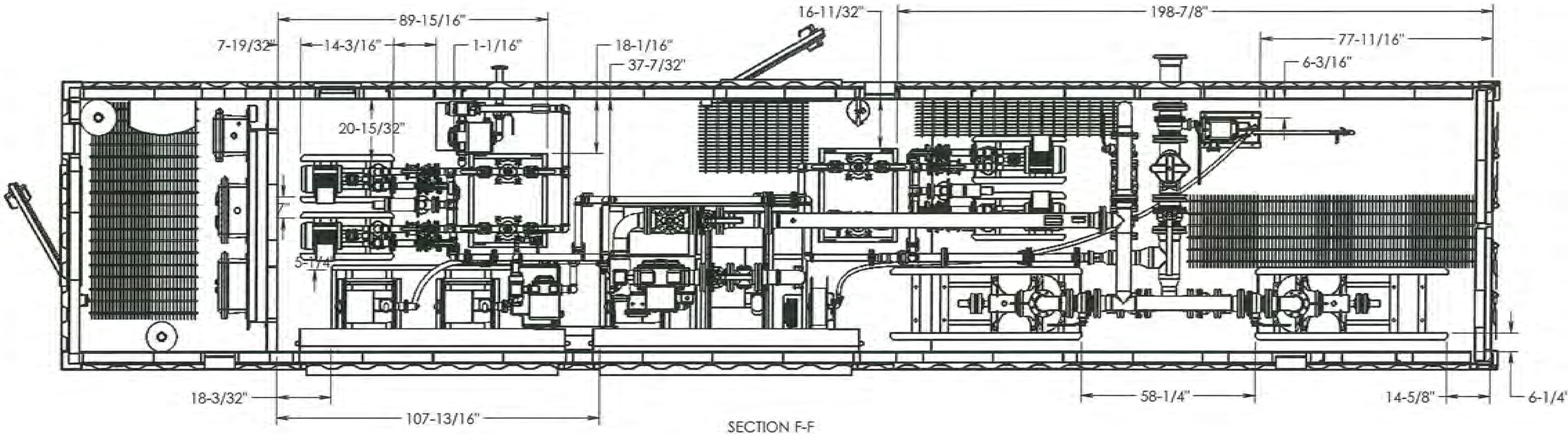
DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.08.08	G.B.	13.08.08

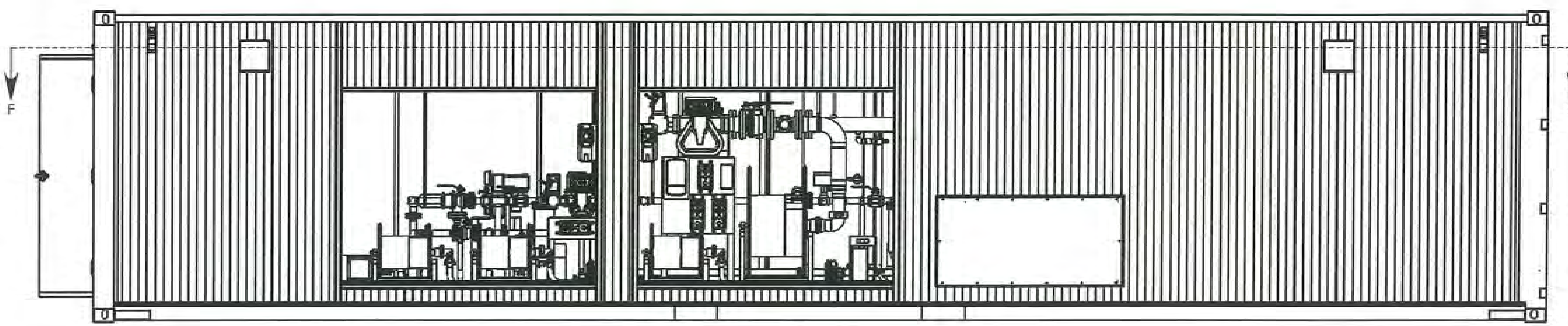
TITLE: TOP ASSY, MILNE PORT

SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
2 OF 3	IN	NTS	B	PS-D-1040	010090	B

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVED
A	-	-	-	-



SECTION F-F
SCALE 1 : 36



HATCH VENDOR DATA REVIEW

Date Received: 26/09/2014

C4 - No further submission required - Complete ☑

Package Coordinator: Name, signature and Date: KEN [illegible] 26/09/14

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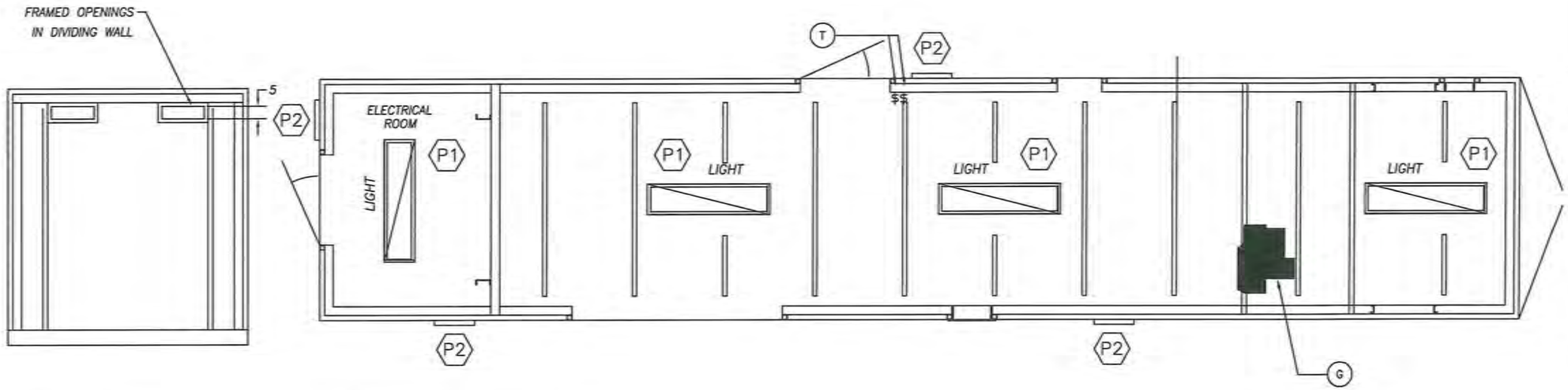
.XXX = ± .005

DRAWN	DATE (YY.MM.DD)	APPROVAL	DATE (YY.MM.DD)
J.C.	13.10.03	G.B.	13.10.03

TITLE: MILNE PORT FLOOR PLAN

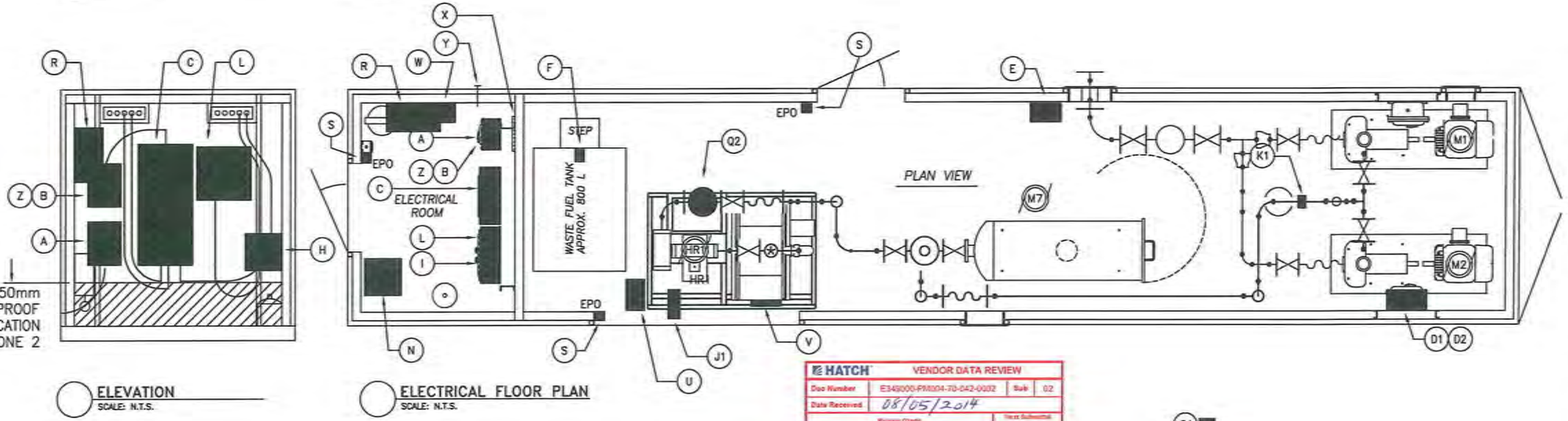
SHEET	UNITS	SCALE	SIZE	DWG. NO.	PART NO.	REV.
3 OF 3	IN	NTS	B	PS-D-1040	010090	B

REV	REVISION DESCRIPTION	BY	DATE	APPV
1	RELEASED	B.C.	9SEP'13	G.B.
2	AS-BUILT	G.B.	10APR'14	G.B.



ELEVATION
SCALE: N.T.S.

ELECTRICAL CEILING PLAN
SCALE: N.T.S.



ELEVATION
SCALE: N.T.S.

ELECTRICAL FLOOR PLAN
SCALE: N.T.S.

HATCH VENDOR DATA REVIEW

Doc Number	E340000-PM004-70-042-0002	Sub	02
Date Received	08/05/2014		

Review Grade — Next Submittal Status: Internal Review / Contract Issue / Final / As-Built

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit

Next Submittal Date:

- No further submission required - Complete ☑
- ☑ C4 - No further submission required - Cancelled ☐
- No further submission required - Superseded ☐

Package Coordinator: Name, signature and Date:
KENIMAI, Kenfrac 22/09/2014

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ITEM	QTY	DESCRIPTION	MATERIAL	PART_NO.	U/M	E.QTY

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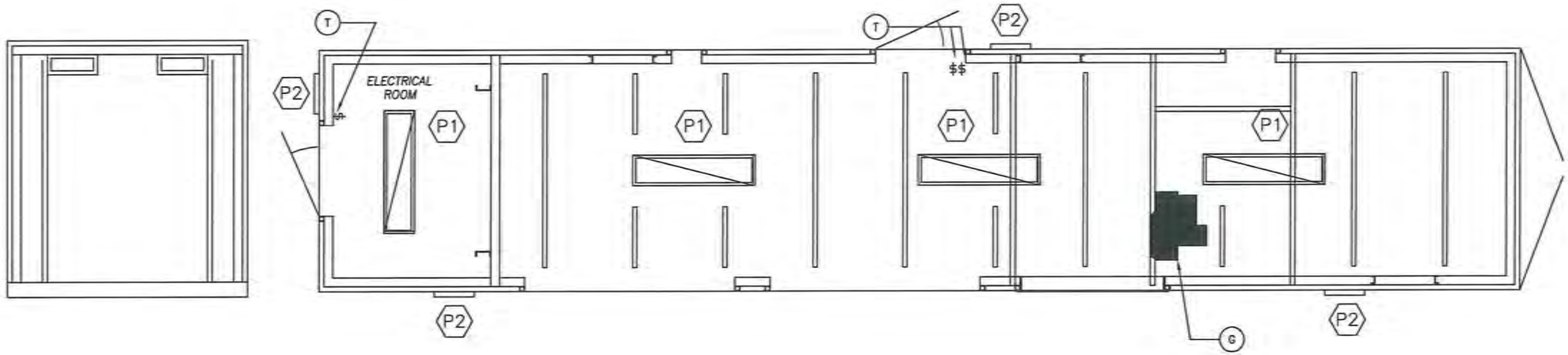
DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
W.C.	13/08/02	B.I.C.	13/08/02

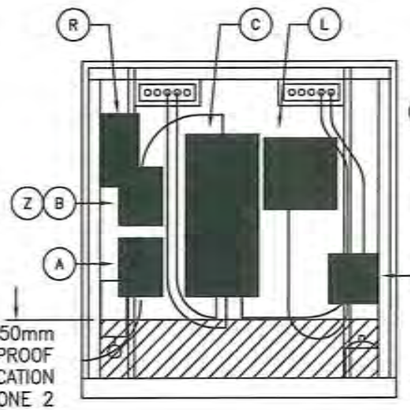
TITLE: JET A-1 MODULE
GENERAL ARRANGEMENT ELECTRICAL

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
2/5	IN	NTS		PS-D-1097	4871-JM-E2.1	2

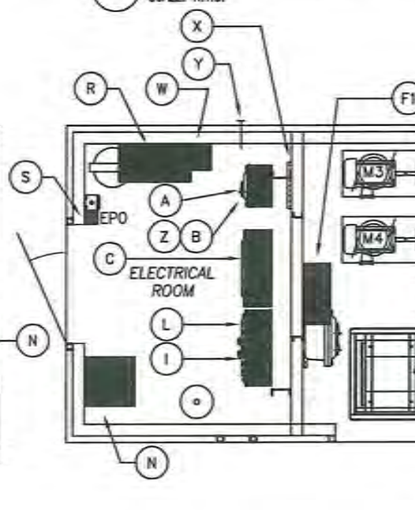
REV	REVISION DESCRIPTION	BY	DATE	APPV
2	AS-BUILT	G.B.	29APR'14	G.B.



ELEVATION
SCALE: N.T.S.



ELECTRICAL CEILING PLAN
SCALE: N.T.S.



ELEVATION
SCALE: N.T.S.

ELECTRICAL FLOOR PLAN
SCALE: N.T.S.

Q1

HATCH — VENDOR DATA REVIEW

Doc Number	E349000-PM004-70-042-0004 Sub 02
Date Received	18/09/05/2014

Review Grade / Next Submittal Status

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit

Next Submittal Status: ☐ Internal Review ☐ Confirm Final ☐ Final ☐ As-Built

Next Submittal Date:

- ☐ No further submission required - Complete
- ☑ C4 - No further submission required - Cancelled
- ☐ No further submission required - Superseded

Package Coordinator: Name, signature and Date:
KEN HALL Kenhall 22/09/14

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ITEM	QTY	DESCRIPTION	MATERIAL	PART_NO.	U/M	T.QTY
–	–	–	–	–	–	–

DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
W.C.	13/08/02	B.I.C.	13/08/02

UNLESS OTHERWISE SPECIFIED
X" = ± 2" .X = ± .030
X = ± 1/16 .XX = ± .010
.XXX = ± .005

TITLE: DIEDEL MODULE – MILNE PORT
GENERAL ARRANGEMENT ELECTRICAL

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
2/6	IN	NTS		PS-D-1096	4871-MP-E2.1	2

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REV	REVISION DESCRIPTION	BY	DATE	APPV
1	RELEASED	G.B.	2AUG'13	
2	AS-BUILT	G.B.	7FEB'14	

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-70-082-0001	Sub	02
Date Received	08/05/2014		

Review Grade

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- ☑ No further submission required - Complete
- ☐ No further submission required - Superseded

Next Submittal Status: ☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built

Next Submittal Date:

Package Coordinator: Name, signature and Date:
KEN LIMA, Ken Lima, 22/09/2014

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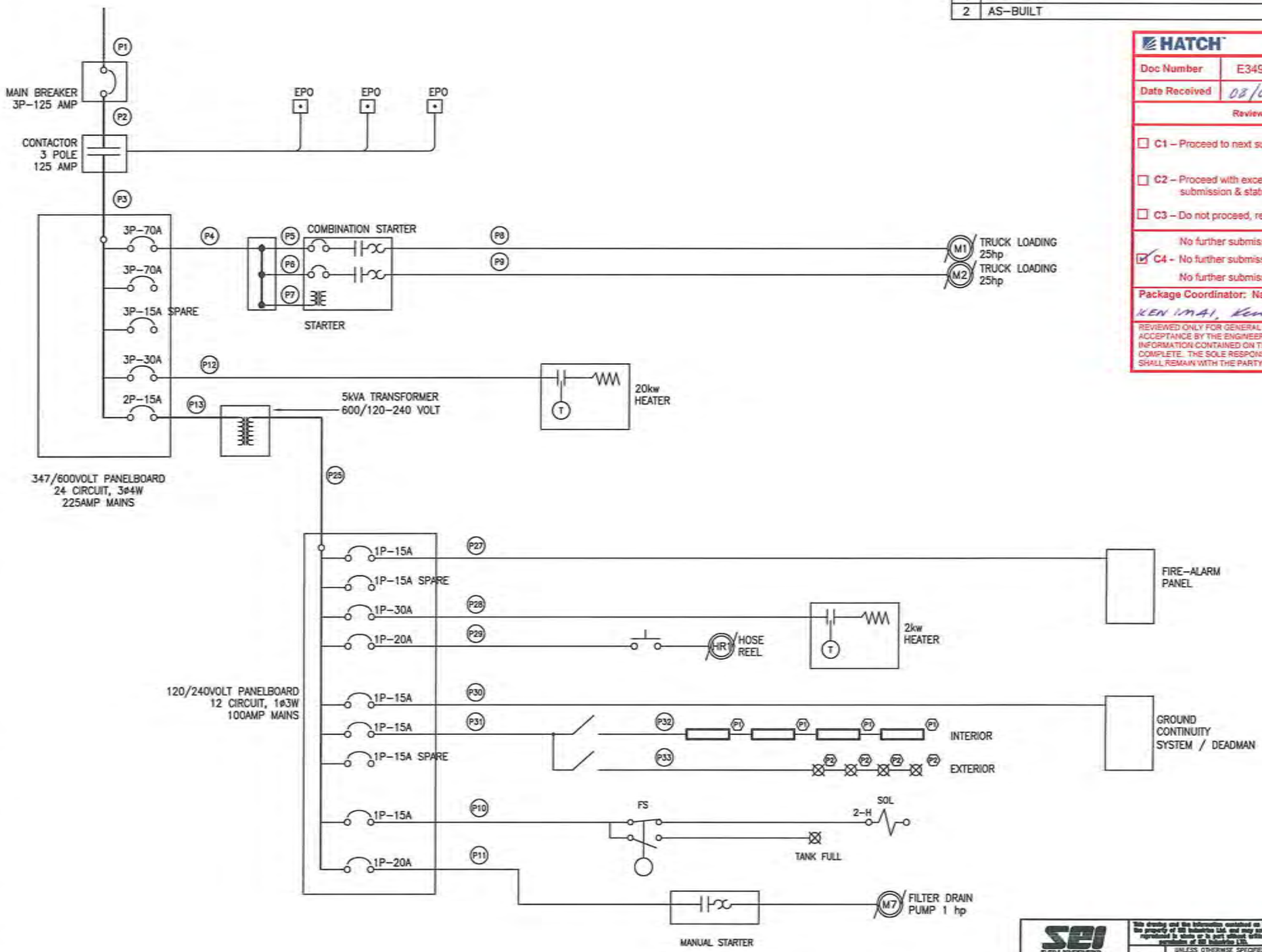

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FAX (604) 940-9566

DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
W.C.	13/08/02	B.I.C.	13/08/02

UNLESS OTHERWISE SPECIFIED
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X = ± 1/16 .XX = ± .010
.XXX = ± .005

TITLE: JET A–1 MODULE
ELECTRICAL ONE–LINE DIAGRAM

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
3/5	IN	NTS.		PS–D–1097	4871–JM–3.1	2

REV	REVISION DESCRIPTION	BY	DATE	APPV
2	AS-BUILT	G.B.	29APR'14	G.B.

MAIN BREAKER
3P-125 AMP

CONTACTOR
3 POLE
125 AMP

FA
SHUT DOWN
RELAY

EPO EPO EPO EPO

3P-70A
3P-70A
COMBINATION STARTER
M1 TRUCK LOADING 25hp
M2 TRUCK LOADING 25hp

3P-15A
3P-15A
COMBINATION STARTER
M3 DISPENSING PUMP 1.5hp
M4 DISPENSING PUMP 1.5hp

3P-15A
COMBINATION STARTER
M5 GENSET FUEL PUMP 1.5hp
M6 GENSET FUEL PUMP 1.5hp

3P-15A
COMBINATION STARTER
M5 LUBE OIL PUMP 0.5hp

3P-30A
20kw HEATER

2P-15A
5kVA TRANSFORMER
600/120-240 VOLT

347/600VOLT PANELBOARD
24 CIRCUIT, 3ø4W
225AMP MAINS

1P-15A
1P-15A
1P-30A
1P-20A
1P-20A
1P-20A
1P-15A
1P-15A SPARE
1P-15A SPARE
1P-15A SPARE
1P-15A SPARE

120/240VOLT PANELBOARD
12 CIRCUIT, 1ø3W
100AMP MAINS

DEADMAN CONTROL & GROUND CONTINUITY SYSTEM

2kw HEATER

HR1 HR2 HR3 HR4

FIRE-ALARM PANEL

INTERIOR

EXTERIOR

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-70-082-0002	Sub	02
Date Received	08/05/2014		

Review Grade

- ☐ C1 – Proceed to next submission & status
- ☐ C2 – Proceed with exceptions as noted to next submission & status
- ☐ C3 – Do not proceed, revise as noted & resubmit
- ☐ No further submission required - Complete
- ☑ C4 - No further submission required - Cancelled
- ☐ No further submission required - Superseded

Next Submittal Status: ☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built

Next Submittal Date:

Package Coordinator: Name, signature and Date:
KEN IMAI, Kenlma. 22/09/2014

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SEI INDUSTRIES
7400 WILSON AVE.
DELTA, B.C., CANADA V4G 1E5
PHONE: (604) 946-3131
FAX (604) 940-9566

UNLESS OTHERWISE SPECIFIED
X" = ± 2" .X = ± .030
X = ± 1/16 .XX = ± .010
.XXX = ± .005

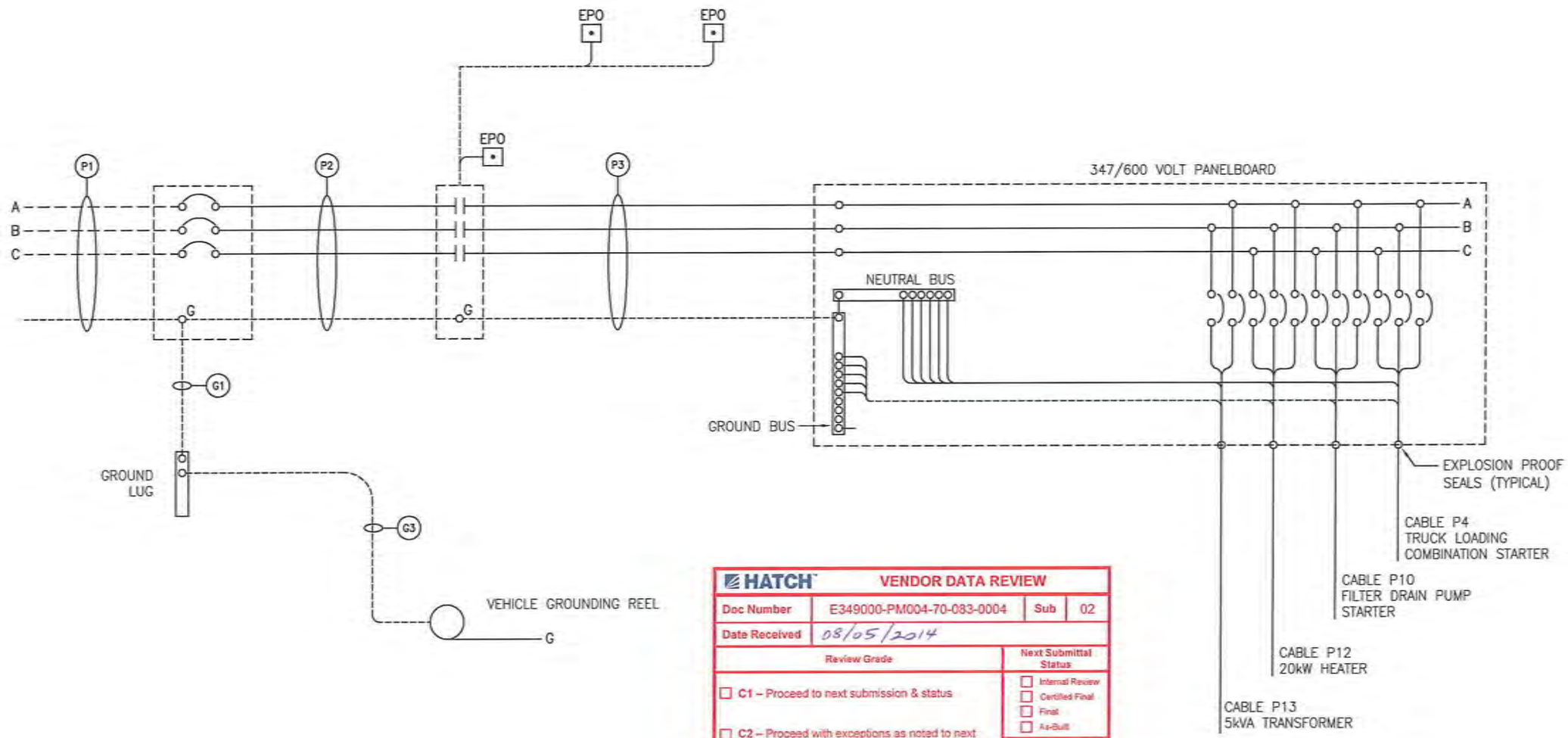
ITEM	QTY	DESCRIPTION	MATERIAL	PART_NO.	U/M	T.QTY
–	–	–	–	–	–	–

DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
W.C.	13/08/02	B.I.C.	13/08/02

TITLE
DIESEL MODULE – MILNE PORT
ELECTRICAL ONE-LINE DIAGRAM

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
3/6	IN	NTS		PS-D-1096	4871-MP-E3.1	2

REV	REVISION DESCRIPTION	BY	DATE	APPV
1	RELEASED	G.B.	2AUG'13	
2	AS-BUILT	G.B.	7FEB'14	GB



HATCH — **VENDOR DATA REVIEW**

Doc Number	E349000-PM004-70-083-0004	Sub	02
Date Received	08/05/2014		

Review Grade	Next Submittal Status
☐ C1 – Proceed to next submission & status	☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built
☐ C2 – Proceed with exceptions as noted to next submission & status	Next Submittal Date:
☐ C3 – Do not proceed, revise as noted & resubmit	
No further submission required - Complete ☑	
☑ C4 - No further submission required - Cancelled ☐	
No further submission required - Superseded ☐	

Package Coordinator: Name, signature and Date:
KEN IMAI, Ken Imai, 22/09/2014

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DELTA, B.C., CANADA V4G 1E5
PHONE: (604) 946-3121
FAX (604) 940-9565

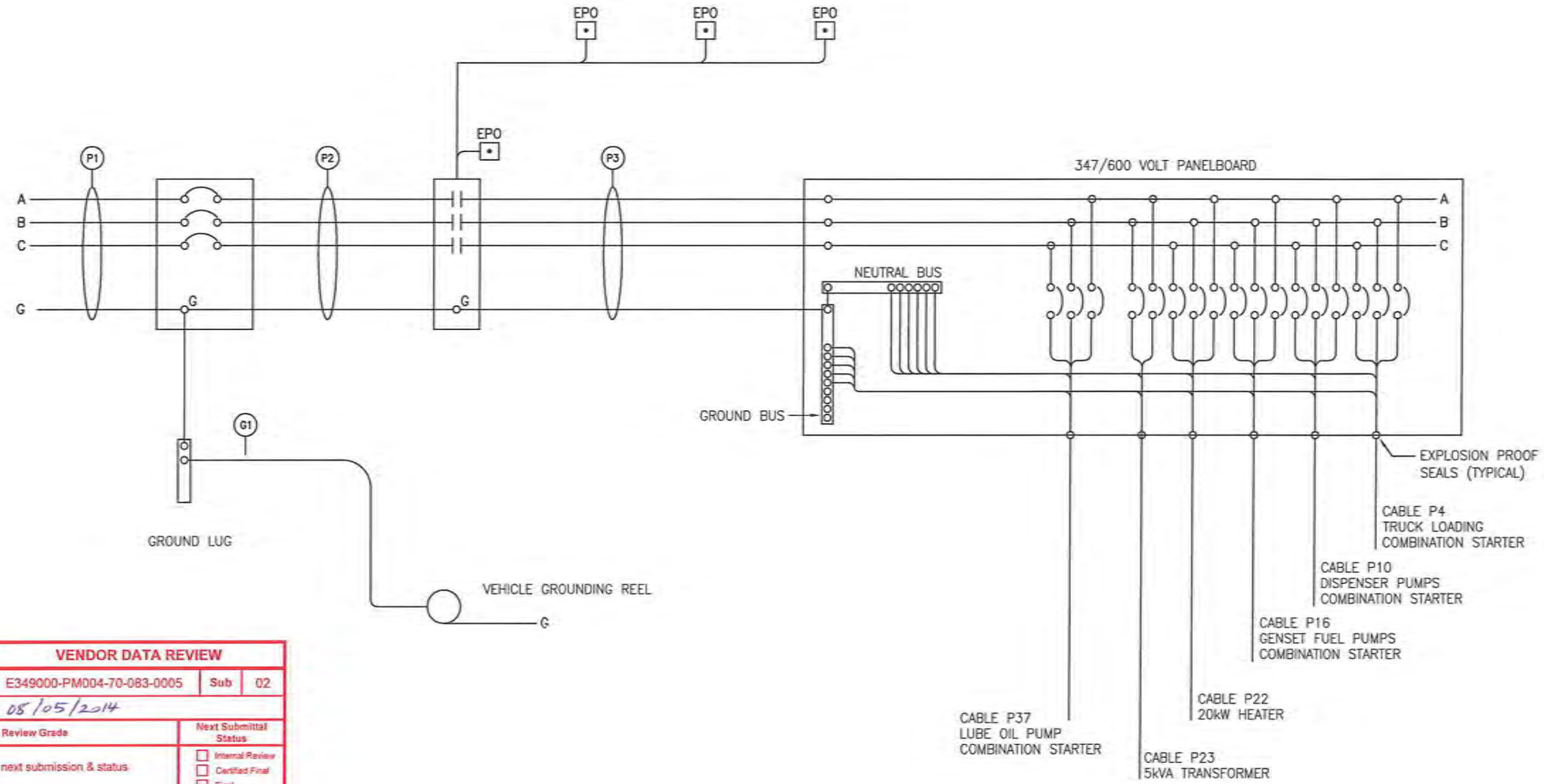
UNLESS OTHERWISE SPECIFIED
X" = ± 1" X = ± .030
X = ± 1/16 .XX = ± .010
.XXX = ± .005

DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
W.C.	13/08/02	B.I.C.	13/08/02

TITLE: JET A-1 MODULE
ELECTRICAL 600V THREE-LINE DIAGRAM

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
4/5	IN	NTS		PS-D-1097	4871-JM-E3.2	2

REV	REVISION DESCRIPTION	BY	DATE	APPV
2	AS–BUILT	G.B.	29APR'14	G.B.



HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM004-70-083-0005	Sub	02
Date Received	08/05/2014		

Review Grade	Next Submittal Status
☐ C1 – Proceed to next submission & status	☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built
☐ C2 – Proceed with exceptions as noted to next submission & status	Next Submittal Date:
☐ C3 – Do not proceed, revise as noted & resubmit	
No further submission required - Complete ☑	
☑ C4 - No further submission required - Cancelled ☐	
No further submission required - Superseded ☐	

Package Coordinator: Name, signature and Date:
KEN IMAI, Kenimai, 22/09/2014

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ITEM	QTY	DESCRIPTION	MATERIAL	PART_NO.	U/M	T.QTY
–	–	–	–	–	–	–

SEI INDUSTRIES
7400 WILSON AVE.
DELTA, B.C., CANADA V4G 1E5
PHONE: (604) 946–3131
FAX (604) 940–9566

	DRAWN	DATE (YY/MM/DD)	APPROVAL	DATE (YY/MM/DD)
	W.C.	13/08/02	B.I.C.	13/08/02

UNLESS OTHERWISE SPECIFIED
X" = ± 2" .X = ± .050
X = ± 1/16 .XX = ± .010
.XXX = ± .005

TITLE: DIESEL MODULE – MILNE PORT
ELECTRICAL 600V THREE–LINE DIAGRAM

SHEET	UNITS	SCALE	SIZE	DRAWING No.	PART NO.	REV.
4/6	IN	NTS		PS–D–1096	4871–MP–E3.2	1

Appendix H

Mobile Oil Water Separator (OWS)

T. E349000-PM005-00-118-0001Sub01 Portable Oil Water Separator (OWS) Operation and Maintenance Manual ***[121 pages]***

newterra
smart technology. sustainable solutions.

1325 California Avenue • P.O. Box 1517 • Brockville, ON • K6V 7N6 • T: 800.420.4056 • F: 613.345.7615

HATCH VENDOR DATA REVIEW

Doc Number	E349000-PM005-00-118-0001	Sub	01
Date Received	13/09/2013		

Review Grade / Next Submittal Status

- C1 – Proceed to next submission & status
- C2 – Proceed with exceptions as noted to next submission & status
- C3 – Do not proceed, revise as noted & resubmit
- C4 – No further submission required - Cancelled
- No further submission required - Complete ☑
- No further submission required - Superseded

Next Submittal Date:

Package Coordinator: Name, signature and Date:
KENIMAL, Kenimal 16/09/2013

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PROCESS TREATMENT SYSTEM

MARY RIVER PROJECT
PM005 PORTABLE OIL WATER SEPARATOR (OWS)

PROJECT # 102140

Site:

SOLD - USED RTS151 - BAFFINLAND 150GPM WTS

Prepared For:

Baffinland Iron Mines Corporation
2275 Upper Middle Road East # 300
Oakville, Ontario

Operation and Maintenance Manual

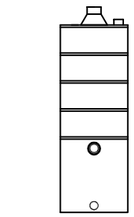
Prepared by:
newterra

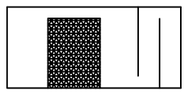
VALVES AND PIPING

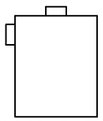
NO NC

BALL VALVE -
GATE VALVE -
GLOBE VALVE -
NEEDLE VALVE -
SLIDE VALVE -
SOLENOID VALVE -
BUTTERFLY VALVE -
SWING CHECK VALVE -
WAFER CHECK VALVE -
SPRING CHECK VALVE -
WYE STRAINER -
SAMPLE PORT -
PRESSURE RELIEF VALVE -
VACUUM RELIEF VALVE -
CAMLOCK CONNECTION -
FERNCO CONNECTION - FERNCO
FLEXIBLE CONNECTION -
FLANGED CONNECTION -
REDUCER -
UNION -
ADSORBENT FILTER - A DRAIN
COALESCING FILTER - DRAIN
PARTICULATE FILTER - DRAIN
FILTER, SILENCER -
PRESSURE REGULATOR -
REGULATOR W/ FILTER -

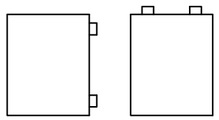
EQUIPMENT

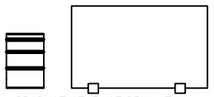

AIR STRIPPER

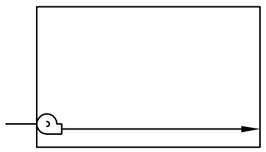

OIL/WATER SEPARATOR


VAPOR/LIQUID, SEAL FLUID SEPARATOR

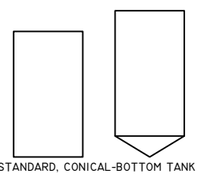
BAG FILTER


CARBON VESSEL


PRODUCT STORAGE DRUM, TANK


OXIDIZER


CHEMICAL DRUM


STANDARD, CONICAL-BOTTOM TANK

EQUIPMENT

CENTRIFUGAL PUMP -
PROGRESSIVE-CAVITY PUMP -
CHEMICAL-INJECTION PUMP -
CENTRIFUGAL, REGENERATIVE BLOWER -
POSITIVE-DISPLACEMENT BLOWER -
ROTARY-CLAW BLOWER -
LIQUID-RING PUMP -
ROTARY-VANE COMPRESSOR -
RECIPROCATING COMPRESSOR -
HEAT EXCHANGER -
PASSIVE COOLING FINS -

EQUIPMENT

AS - AIR STRIPPER
BLD - BUILDING, TRAILER OR SKID
FLT - FILTER VESSEL
LPC - LIQUID-PHASE CARBON VESSEL
MFD - MANIFOLD
OWS - OIL/WATER SEPARATOR
OX - OXIDIZER
PST - PRODUCT STORAGE TANK
SOS - SEAL OIL SEPARATOR
SWS - SEAL WATER SEPARATOR
TNK - TANK
VLS - VAPOR/LIQUID SEPARATOR
VPC - VAPOR-PHASE CARBON VESSEL

FLOW MEASUREMENT

AVERAGING PITOT TUBE - RANGE PDI 101 H L
VENTURI - RANGE PDI 101 H L
ROTOMETER - RANGE FI 101
WATER FLOW METER - FQI 101

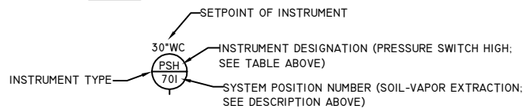
INSTRUMENT DESIGNATION

	INPUT	1ST MODIFIER	2ND MODIFIER	3RD MODIFIER	OUTPUT	1ST MODIFIER	
A			ALARM				A
B						BLOWER	B
C	CYCLE					COMPRESSOR	C
D		DIFFERENTIAL				AIR DRYER	D
E							E
F	FLOW					FAN	F
G	GAS (LEL)		GAUGE				G
H				HIGH	HAND	HEATER	H
I	CURRENT		INDICATOR				I
J							J
K							K
L	LEVEL			LOW			L
M					MOTORIZED		M
N							N
O							O
P	PRESSURE				PNEUMATIC	PUMP	P
Q		QUANTITY					Q
R							R
S	SPEED		SWITCH		SOLENOID		S
T	TEMPERATURE		TRANSMITTER				T
U							U
V						VALVE	V
W							W
X							X
Y							Y
Z	POSITION						Z

INSTRUMENT IDENTIFICATION

- INDICATING INSTRUMENT
- DIGITAL INPUT TO CONTROL PANEL
- DIGITAL INPUT CAUSING ALARM
- ** DIGITAL INPUT CAUSING SYSTEM SHUTDOWN ALARM
- ANALOG INPUT TO CONTROL PANEL
- ANALOG OUTPUT FROM CONTROL PANEL

EXAMPLE



SYSTEM POSITION DESIGNATION

100 - VACUUM INLET MANIFOLD
300 - INLET HEAT EXCHANGER
400 - VAPOR/LIQUID SEPARATOR
500 - VAPOR/LIQUID SEPARATOR - 2
700 - SOIL-VAPOR EXTRACTION
1000 - LIQUID-RING PUMP
1300 - SVE HEAT EXCHANGER
1600 - VAPOR-PHASE CARBON
1900 - OXIDIZER
2200 - AIR SPARGE
2500 - SPARGE HEAT EXCHANGER
2800 - SPARGE OUTLET MANIFOLD
3100 - AIR COMPRESSOR
3400 - COMPRESSED-AIR OUTLET MANIFOLD
3700 - PNEUMATIC WELL PUMPS
4000 - SUBMERSIBLE WELL PUMPS
4300 - SURFACE-MOUNT WELL PUMPS
4600 - GROUNDWATER INLET MANIFOLD
4900 - OIL/WATER SEPARATOR
5200 - PRODUCT STORAGE TANK
5500 - INLET TANK
5800 - UPSTREAM BAG FILTER
6100 - CHEMICAL INJECTION
6400 - AIR STRIPPER
6700 - PRE-CARBON BAG FILTER
7000 - LIQUID-PHASE CARBON
7100 - PRE-MEDIA BAG FILTER
7200 - ACTIVATED ALUMINA
7300 - DISCHARGE TANK
7400 - POST-TREATMENT BAG FILTER
7600 - REINJECTION
7900 - BUILDING,TRAILER OR SKID
8200 - CONTROL PANEL
8500 - ELECTRICAL PARTS
9900 - EXTRAS

PIPING DETAILS:
- WATER FLOW METERS: PROVIDE 10 DIA. OF STRAIGHT PIPE BEFORE AND 5 DIA. OF STRAIGHT PIPE AFTER METERS. ENSURE THAT THROTTLING VALVES ARE NOT DIRECTLY IN LINE WITH METERS.
- AIR FLOW METERS: PROVIDE 8 DIA. OF STRAIGHT PIPE BEFORE AND 3 DIA. OF STRAIGHT PIPE AFTER METERS, IF POSSIBLE. AVOID TEES AND ELBOWS BEFORE AND AFTER METERS.
- MATERIALS OF VALVES AND FITTINGS TO BE THE SAME AS THE DESCRIPTION AT THE LINE. IF THERE IS A TRANSITION FROM PVC TO STEEL, THE VALVE SHOULD BE BRASS.
- THERE ARE NO SPECIAL PIPING REQUIREMENTS OTHER THAN WHAT IS EXPLAINED ON THE DIAGRAM.
- WHEN PVC HOSE IS SPECIFIED, ALWAYS USE VACUUM HOSE; USE GREEN HOSE FOR PRESSURES LESS THAN 60PSI; USE TANK TRUCK HOSE FOR PRESSURES BETWEEN 60PSI AND 150PSI.
- PVC PIPE MAY BE SUBSTITUTED WITH EQUAL-SIZED PVC HOSE WHERE A FLEXIBLE CONNECTION IS PREFERRED.

B	2013-08-06	DAM	FOR PRODUCTION

DWG. NO: 102140-01 (PAGE 2 OF 2)
TITLE: PROCESS & INSTRUMENTATION DRWG LEGEND
CUSTOMER: MARY RIVER PROJECT BAFFINLAND

INLET HOSE ASSEMBLY TO WTS
BUILDING SUPPLIED WITH SYSTEM

3" X 50' HOSE

3" FNPT INLET

1" FNPT DRAIN

2" FNPT DRAIN

LSH 4001

P 4001

INLET PUMP

NOTES FOR OUTPUT:
FLOWRATE & PRESSURE = 150GPM @ 30TDH
HORSEPOWER = 1.5
VOLTAGE & PHASE = 230V, 1PH
FULL-LOAD AMPS = 18

VENT TO OUTSIDE

2" PVC

OIL/WATER SEPARATOR
OWS-4901

BRASS

LSH 4901

LSHH 4901 **

3" GALV. ST

3" BRASS

1" PVC

BRASS

2" BRASS

2" PVC

NOTES FOR OIL/WATER SEPARATOR:
COALESCING MEDIA SIZE = HQPAC
STAND HEIGHT = 24"
IMMERSION HEATER = NO
SKIMMER MATERIAL = 3" PVC
USE PVC STRAIN-RELIEFS WHERE BALL FLOATS ENTER TANK

LSHH 7901 **

BUILDING SUMP SWITCH

2" GALV

POTENTIALLY HAZARDOUS
CLASS I DIV 2 AREA

0-60PSI PI 4901

BRASS

3" PVC

3" SST FLEX

P 4901

3" SST FLEX

NOTES FOR OUTPUT:
FLOWRATE & PRESSURE = 150GPM @ 43PSI.
HORSEPOWER = 7.5
VOLTAGE & PHASE = 208V, 3PH
FULL-LOAD AMPS = 25.3

40 PSIG PSH 6701

0-60PSI PI 6701

0-60PSI PI 6702

FILTER FLT-6701

FT 7001

FQI 7001

40 PSIG PSH 7001

ANTI-SIPHON CHECK VALVE ABOVE TOP OF VESSEL

0-60PSI PI 7004

3" HOSE

LIQUID PHASE CARBON LPC-7003

0-60PSI PI 7003

LIQUID PHASE CARBON LPC-7002

0-60PSI PI 7002

LIQUID PHASE CLAY LPC-7001

0-60PSI PI 7001

2" FNPT DISCHARGE

2" X 5' TANK TRUCK HOSE

3" FNPT DISCHARGE

3" X 50' HOSE

DISCHARGE HOSE ASSEMBLY FROM WTS
BUILDING SUPPLIED WITH SYSTEM

PRODUCT DISCHARGE

2" X 4' PVC STACK

VENT

LSHH 5201 **

PRODUCT STORAGE TANK
PST-5201

BUILDING EQUIPMENT AND CONTROL PANEL

BORDER DEFINES THE LIMITS OF THE ENCLOSURE

CONTROL PANEL

TO BE LOCATED ON BUILDING. PANEL TO BE A MINIMUM OF 36" FROM ANY HAZARDOUS PROCESS EQUIPMENT, AND A MINIMUM OF 36" ABOVE GRADE.

TSL 7901 · TSL 7902 · TSH 7901 · TSH 7902
H 7901 · H 7902 · H 7903 · F 7901 · F 7902
LSHH 7901 ** · KILL 7901 **

WIRING TO BE CLASS I DIVISION 2, AS PER THE CEC.

IS INPUT WIRING TO BE WIRED FOR INDOORS, ACCORDING CEC FOR HAZARDOUS LOCATIONS.

PIPING DETAILS:
- WATER FLOW METERS: PROVIDE 10 DIA. OF STRAIGHT PIPE BEFORE AND 5 DIA. OF STRAIGHT PIPE AFTER METERS. ENSURE THAT THROTTLING VALVES ARE NOT DIRECTLY IN LINE WITH METERS.
- AIR FLOW METERS: PROVIDE 8 DIA. OF STRAIGHT PIPE BEFORE AND 3 DIA. OF STRAIGHT PIPE AFTER METERS, IF POSSIBLE. AVOID TEES AND ELBOWS BEFORE AND AFTER METERS.
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- PVC PIPE MAY BE SUBSTITUTED WITH EQUAL-SIZED PVC HOSE WHERE A FLEXIBLE CONNECTION IS PREFERRED.

C	2013-08-20	DM	AS BUILT
B	2013-08-06	DAM	FOR PRODUCTION

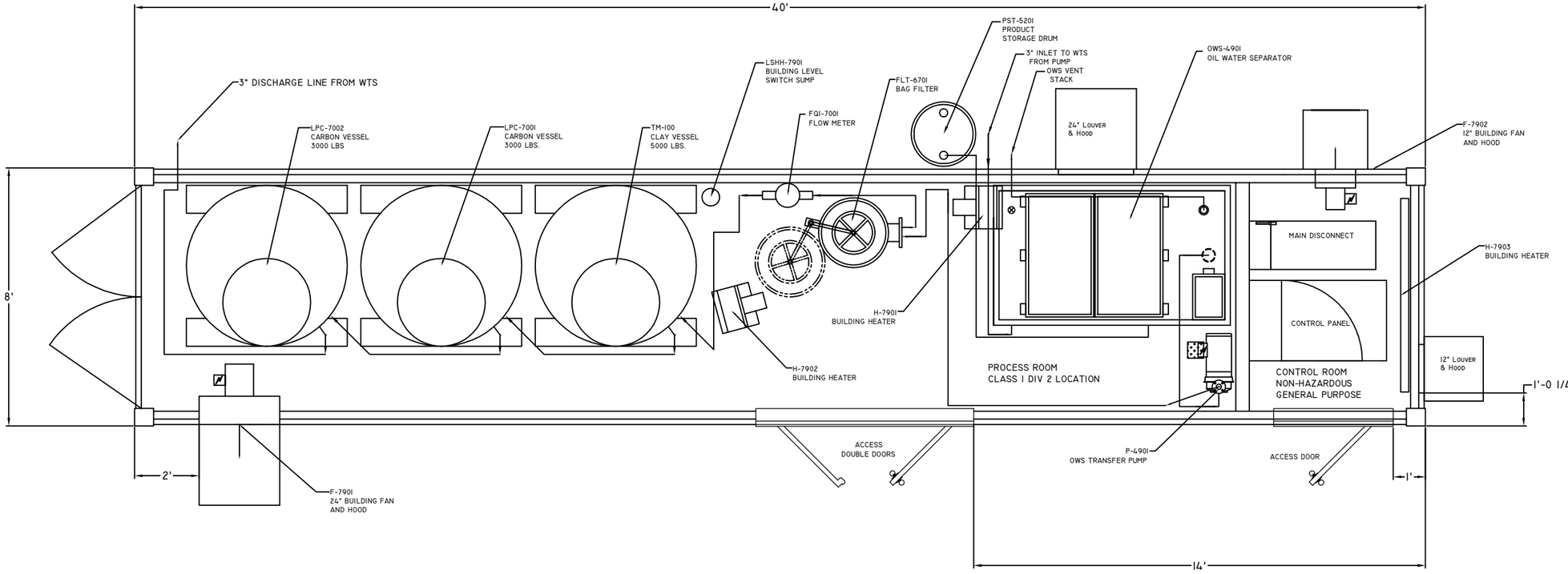
DWG. NO: 102140-01 (PAGE 1 OF 2)

TITLE: PROCESS & INSTRUMENTATION DRAWING

CUSTOMER: MARY RIVER PROJECT
BAFFINLAND

newterra LTD.

SCALE BAR, EACH BLOCK IS 12" LONG



PLEASE NOTE; THIS BUILDING IS SHIPPING ON A BOAT AND MUST NOT BE MORE THE 96" IN WIDTH. THIS INCLUDES ALL EQUIPMENT AND CONNECTIONS THAT PROTRUDE THROUGH THE ENCLOSURE.

**** CIVIL CONSTRUCTION NOTES ****

- BUILDING TO BE PAINTED WITH HEMPATEX HI BUILD 46410, BLUE. HEMPEL COLOUR CODE 33930
- DOOR COLOUR TO BE THE SAME AS BUILDING.
- FLOOR TO BE GATOR GUARDED
- PROVIDE WOOD LIP AROUND PERIMETER TO ALLOW SUMP SWITCH TO TRIP.
- INSTALL GRATING BETWEEN BUILDING FANS AND OUTSIDE LOUVERS.
- THERMAL INSULATION ON WALLS AND CEILING

****MECH./ELECT. ASS'Y NOTES ****

- MAXIMUM WIDTH FOR SHIPPING IS 96". THIS INCLUDES ALL CONNECTIONS THAT PROTRUDE THROUGH THE SIDES OF THE ENCLOSURE.
- PLUG AND SEAL (WITH WASHERS) ANY HOLES IN THE FLOOR TO CONTAIN WATER SPILLS.
- LOCATE COOLING THERMOSTAT IN THE WARMEST LOCATION AT CEILING LEVEL.
- LOCATE HEATING THERMOSTAT AT FLOOR LEVEL.

***** COMMISSIONING NOTES *****

- NEWTERRA RECOMMENDS PAD BE AT LEAST 12" LARGER THAN ENCLOSURE IN ALL DIRECTIONS. LOCAL CODES MAY REQUIRE ALTERNATE DIMENSIONS.
- BUILDINGS NEED TO BE SHIMMED ON SITE TO ALLOW DOORS TO OPEN FREELY. PLEASE HAVE SHIMMING MATERIAL READY DURING BUILDING INSTALLATION.
- FOR BUILDINGS IN COLD WEATHER CLIMATES, WHERE THE BUILDING IS ELEVATED, A SKIRT MUST BE BUILT AROUND THE BASE TO PREVENT THE FLOOR FROM FREEZING.
- FAN AND LOUVER HOODS NEED TO BE INSTALLED ON SITE. CANNOT SHIP WITH HOODS ATTACHED.

***** DIMENSION INFORMATION *****

DESCRIPTION	DIM (L X W X H)	WEIGHT
40' CONTAINER	8' X 42' X 9.5'	?????

FLOW DIRECTION
ELECTRICAL CONNECTION
FLOW INTO THE PAGE
FLOW OUT OF THE PAGE
THIS AREA REPRESENTS SERVICE SPACE REQUIRED

LEVEL	DATE:	BY	REVISION:
F	2013-08-20	DM	AS BUILT FOR 102140
F2	2013-08-07	DM	PRODUCTION RELEASE FOR 102140

DWG. NO: 102140 - 02
TITLE: SYSTEM LAYOUT
CUSTOMER: BAFFINLAND MARY RIVER PROJECT
newterra LTD.

Project As-Built Document

27-Aug-13

RTS151 **WTS, 150gpm, OWS-24, Carbo**

Customer: newterra ltd.

System SIte Specifications

Elevation:	0	ft
Max Temp	0	deg F
Min Temp:	0	deg F
Noise Target:		
Gas Required:		
Water Required:		
Telephone Reqd:		
Building:		

System Electrical Specifications

Voltage:	208V/120V-3ph		
Main Disconnect	100amp		
Panel Approval:	MET1604(CL	Class	CL1DIV2
System Approval:		Class	CL1DIV2
Panel Type:	PLC-DL06		
Telemetry:			
Autodialer:			
EMonitor:		Server:	

System SVE (First Blower)

0 @ 0

Blower Disch Temp:	0	deg F
Inlet Legs:	0	
Disch Press:	0	in wc
Water Flowrate:	0	gpm
Heat xchg Disch:	0	deg F

System SVE (Second Blower)

0 @ 0

Blower Disch Temp:	0	deg F
Inlet Legs:	0	
Disch Press:	0	in wc
Water Flowrate:	0	gpm
Heat xchg Disch:	0	deg F

Air Sparge

0 @ 0 psi

Sparge Disch Temp:	0	deg F
Disch Legs:	0	
Heat xchg Disch:	0	deg F

Other Specifications

Other Inlet Liquid Flow:	0	gpm		
Disch Flow:	150	gpm	@	40 psi
AirTreatment:	None			
Water_Treatment:	Carbon			
Stripper Airflow:	0	cfm		
Stripper Dsn Flow:	0	gpm		
OWS_Dsn_Flow:	150	gpm		

Contaminants

Other Information May be Presented Below

Connection Info:

Shipping Information

Parts

Module Code: 0

Insulation, Foil Back Foam, 1", R, Thinsulate, 4x8	Part:	10636
	Qty:	34
	Mfg:	
	Mfg Part:	356075
Lumber, Spruce, Dry, 2" x 4" x 10'	Part:	10912
818011	Qty:	96
	Mfg:	
	Mfg Part:	818011
Lumber, Plywood, Spr, STD, 4 x 8 x 3/8"	Part:	14463
620295	Qty:	34
	Mfg:	
	Mfg Part:	620295
Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	2
	Mfg:	Johnson Controls
	Mfg Part:	
Breaker, Techna, JTEC4892C40	Part:	17700
240V 40 AMP 2P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
	Mfg Part:	JTEC4892C40
Combination Starter, SQT LUCC32FU	Part:	19434
TeSysU 1 Phase Control Unit 8-32A	Qty:	1
110/120VAC coil	Mfg:	Telemecanique
	Mfg Part:	SQT LUCC32FU
Wire, Stranded, T90, #1 AWG, Black	Part:	25152
	Qty:	10
	Mfg:	
	Mfg Part:	T901BLK

FLT-6701

Filter, Bag, Dewatering, Assembly, Four (4)	Part:	RC036
	Qty:	1
	Mfg:	
---	Mfg Part:	---

PI-6701

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	8
	Mfg:	
---	Mfg Part:	P16K2-FG-60

PSH-6701

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Rental Components

Module Code: 2

RCHOSE DISCH.

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	50
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-

RCHOSE-INLET

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	50
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-

Submersible Pump

Module Code: 4000

LSH-4001

Switch, Level, Mech Float, Wide Angle, N.O., Red	Part:	M1108
Tilt Float Level Switch 90deg, w 40' cable	Qty:	1
13A, SPST, N/O	Mfg:	Warrick Controls
---	Mfg Part:	GR20W4000

P-4001

Pump, Sump, Goulds, 160GPM @ 40'	Part:	RC073
WS2038BHF, 200V, 3 Ph, 2 HP, w/o switch	Qty:	1
3" Type F Camlock Fitting	Mfg:	Goulds
---	Mfg Part:	

Oil/Water Separator

Module Code: 4900

LSHH-4901

Switch, Level, Mech Float, Narrow Angle, N.C., YEL	Part:	19279
N/C, Yellow float	Qty:	1
	Mfg:	
---	Mfg Part:	PY2CW4000

OWS-4901

Media, Coalescing, HD Q-PAC	Part:	13959
0.25" spacing, 132 sqft/cuft	Qty:	24
	Mfg:	
---	Mfg Part:	HD Q-PAC
Oil Water Separator, OWS-24, Stainless	Part:	16263
24 cubic feet of packing, 304SS	Qty:	1
Note: Build up price from Price Sheet	Mfg:	Maple Leaf Environmental Equipment
To be removed from RTS-148, SVE, WTS returning fron Veron,TX. Purchased used equipment, 50430 Jerry Wood #2 project.	Mfg Part:	
Strain Relief, Connector, PVC, 1/2"	Part:	16884
TSRC10	Qty:	2
	Mfg:	
None	Mfg Part:	TSRC10
Oil Water Separator, Assembly, OWS-24	Part:	17535
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Switch, Level, Mech Float, Wide Angle, N.O., Red	Part:	m1108
Tilt Float Level Switch 90deg, w 40' cable	Qty:	1
13A, SPST, N/O	Mfg:	Warrick Controls
None	Mfg Part:	GR20W4000
Valve, Ball, Brass, 2", 150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve, Ball, Brass, 2", 150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve, Ball, Brass, 1", 150#	Part:	p1067
NPT, Teflon seats, 600 PSI WOG	Qty:	3
	Mfg:	Kitz
None	Mfg Part:	601-1
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	3
	Mfg:	
---	Mfg Part:	601-3

P-4901

Valve, Gate, Brass, 3"	Part:	10167
	Qty:	1
	Mfg:	
None	Mfg Part:	514T10
Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	Part:	16203
SS, brass internals, Glyc. Filled, bottom mount	Qty:	1
	Mfg:	Indumart
None	Mfg Part:	
Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	1
	Mfg:	
---	Mfg Part:	835-030SR
Pump, Piping, Centrifugal, 3" x 3", 170gpm	Part:	17316
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Pump, Suction, Goulds, SSH Series, 4SH2K52C0	Part:	21028
7.5hp, 3ph, 208-230/460V, TEFC	Qty:	1
C Impeller	Mfg:	Goulds
---	Mfg Part:	---
Hose, Braided, SS, 3", MNPT fittings, 12" long	Part:	21971
5680K2	Qty:	2
304SS	Mfg:	
None	Mfg Part:	5680K2
Strainer, Wye, Brass, 3"	Part:	M1523
threaded	Qty:	1
	Mfg:	
None	Mfg Part:	145T10
Valve, Check, Swing, Brass, 3"	Part:	M1524
	Qty:	1
	Mfg:	
None	Mfg Part:	521T10
Valve, Check, Swing, Brass, 3"	Part:	M1524
	Qty:	1
	Mfg:	
None	Mfg Part:	521T10
Union, Galv, 3"	Part:	M1530
	Qty:	2
	Mfg:	
None	Mfg Part:	3GLU
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
-	Mfg Part:	601-3

Product Storage Tank

Module Code: 5200

LSHH-5201

Switch, Level, Almeg, Vertical, ATB3-48B	Part:	12351
1/4NPT	Qty:	1
	Mfg:	Almeg
---	Mfg Part:	ATB3-48B
Reducer, Bushing, Galv, 2" x 1/2"	Part:	P1021
Hex	Qty:	1
	Mfg:	
---	Mfg Part:	2X12GZB
Union, Galv, 2"	Part:	P1093
	Qty:	1
	Mfg:	
---	Mfg Part:	2GZU

PST-5201

Tee, Galv, 2"	Part:	10136
1	Qty:	1
	Mfg:	
---	Mfg Part:	2GZT
Drum, Black, Steel, 45 gal, 2 hole lid, bottom 2" port	Part:	M1137
including palletization	Qty:	1
	Mfg:	
---	Mfg Part:	SOH00733
Elbow, 90deg, Galv, 2"	Part:	P1058
	Qty:	4
	Mfg:	
---	Mfg Part:	2GZE9
Valve, Ball, Brass, 2", 150#	Part:	P1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
---	Mfg Part:	601-2
Nipple, Galv, 2" x Short	Part:	P1192
	Qty:	5
	Mfg:	
---	Mfg Part:	2xSHGZN

Bag Filter

Module Code: 5800

FLT-5801

O-Ring, Buna-N, 8-3/8" OD, 3/16" Thick	Part:	21619
A70 Hardness	Qty:	25
* Fits most Filter Innovation EB112 series	Mfg:	
---	Mfg Part:	369 BUNA
Filter, Bag, Dewatering, Assembly, Four (4)	Part:	RC033
	Qty:	1
	Mfg:	
---	Mfg Part:	---

FLT-5802

Reducer, Bushing, Galv, 3" x 2"	Part:	10019
Hex	Qty:	4
	Mfg:	
---	Mfg Part:	3X2GZB
Tee, Galv, 2"	Part:	10136
1	Qty:	2
	Mfg:	
---	Mfg Part:	2GZT
Nipple, Galv, 2" x Close	Part:	10222
	Qty:	14
	Mfg:	
---	Mfg Part:	2XCLGZN
Tee, Galv, 3"	Part:	10302
	Qty:	2
	Mfg:	
---	Mfg Part:	3GZT
Valve, Ball, Brass, 1/2", 150#	Part:	10538
NPT, Teflon seats, 600 PSI WOG	Qty:	2
	Mfg:	
---	Mfg Part:	601-1/2
Nipple, Galv, 1/2" x Close	Part:	10619
	Qty:	2
	Mfg:	
---	Mfg Part:	12CLGZN
Skid, 2ft x 4ft	Part:	15152
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
---	Mfg Part:	
Sample Port Assembly, 1/4"	Part:	18682
	Qty:	2
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Filter, Bag, Housing, #2, Carbon Steel	Part:	19117
SS Basket, CS legs	Qty:	2
	Mfg:	
---	Mfg Part:	

Reducer, Bushing, Galv, 2" x 1/2"	Part:	P1021
Hex	Qty:	2
	Mfg:	
---	Mfg Part:	2X12GZB
Valve, Ball, Brass, 2", 150#	Part:	P1065
NPT, Teflon seats, 600 PSI WOG	Qty:	4
	Mfg:	Kitz
---	Mfg Part:	601-2
Union, Galv, 2"	Part:	P1093
	Qty:	4
	Mfg:	
---	Mfg Part:	2GZU

PI-5801

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	12
	Mfg:	
---	Mfg Part:	P16K2-FG-60

PSH-5801

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Bag Filter

Module Code: 6700

FLT-6701

Nipple, Galv, 3" x Close	Part:	11220
	Qty:	6
	Mfg:	
---	Mfg Part:	3CLGZN
Flange, Companion, Galv, 6"	Part:	12572
threaded	Qty:	2
	Mfg:	
---	Mfg Part:	6GZCIF / 12.0905
Valve, Butterfly, Wafer, Ductile Iron, 6"	Part:	15019
316SS disc & stern, BUNA, 10 position lever	Qty:	2
	Mfg:	
---	Mfg Part:	CIWB-SBL 6" CO
Reducer, Bushing, Galv, 6" x 3"	Part:	19681
Hex	Qty:	2
	Mfg:	
---	Mfg Part:	
Tee, PVC 40, 3", SxSxS, 401-030G	Part:	22578
	Qty:	2
	Mfg:	
---	Mfg Part:	
Elbow, 90deg, PVC 40, 3", SxS, 406-030G	Part:	22619
	Qty:	8
	Mfg:	
---	Mfg Part:	406-030G
Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	1
	Mfg:	
Pricing from Steve Hughes, Aug. 7th,2013 e-mail	Mfg Part:	Qo8L100RB9
V6427-A, Muilti-Bag Filter Housing - 7 Bag Model - 304 Stainless		
Vessel A - Inlet and Outlet are on the right hand side of the unit when looking at the label.		
Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	2
	Mfg:	
4155-1490-B, O-rings for V6427-A Bag Filter Housing	Mfg Part:	Qo8L100RB9
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
---	Mfg Part:	601-3
Elbow, 90deg, Galv, 3"	Part:	P1220
	Qty:	1
	Mfg:	
---	Mfg Part:	3GZE9

FT-6701

Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	4
	Mfg:	
---	Mfg Part:	835-030SR

PSH-6701

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Liquid Phase Carbon

Module Code: 7000

7000

Nipple, Galv, 3" x Close	Part:	11220
	Qty:	2
	Mfg:	
---	Mfg Part:	3CLGZN
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
---	Mfg Part:	601-3
Adapter, PVC 80, Female, 3", SxT, 835-030G	Part:	P1153
	Qty:	2
	Mfg:	
---	Mfg Part:	835-030

FQI,FT-7001

Meter, Water, 2", US Gal, w/ pulse, Turbine, DLJ	Part:	15499
Flange	Qty:	1
	Mfg:	Daniel L. Jerman Co.
---	Mfg Part:	DLJ200TC

LPC-7001

Reducer, Bushing, Galv, 3" x 2"	Part:	10019
Hex	Qty:	5
	Mfg:	
---	Mfg Part:	3X2GZB
Tee, Galv, 3"	Part:	10302
	Qty:	5
	Mfg:	
---	Mfg Part:	3GZT
Nipple, Galv, 3" x Short (3")	Part:	10445
	Qty:	4
	Mfg:	
---	Mfg Part:	3SHGZN
Camlock Fitting, Aluminum, 3", Part "F"	Part:	10541
Male Adapter x Male Thread Cam Lock Fitting	Qty:	6
	Mfg:	Bayco Industries
-	Mfg Part:	BAL-300F
Camlock Fitting, Aluminum, 3", Part "C"	Part:	10542
Female Adapter x Hose Shank Cam Lock Fitting	Qty:	6
	Mfg:	Bayco Industries
-	Mfg Part:	BAL-300C
Hose, Suction, PVC, Green, 3", J300	Part:	12043
TigerFlex, 65psi@70F, 40psi@100F	Qty:	30
PVC,150F, (min 100ft order)	Mfg:	Kuriyama
-	Mfg Part:	J300
Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	6
	Mfg:	
---	Mfg Part:	835-030SR

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	3
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Sample Port Assembly, 1/4"	Part:	18682
	Qty:	3
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Valve, Check, Spring, Brass, 2"	Part:	M1529
	Qty:	1
	Mfg:	
---	Mfg Part:	2BPUCV
Clamp, Hose, SS, 3", HAS48	Part:	P1044
	Qty:	12
	Mfg:	
None	Mfg Part:	HAS48
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	4
	Mfg:	
---	Mfg Part:	601-3
Reducer, Bushing, Galv, 2" x 1/4"	Part:	P1219
Hex	Qty:	5
	Mfg:	
---	Mfg Part:	2x14GZB

PI-7001

Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	Part:	16203
SS, brass internals, Glyc. Filled, bottom mount	Qty:	2
	Mfg:	Indumart
---	Mfg Part:	

PI-7004

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	1
	Mfg:	
---	Mfg Part:	P16K2-FG-60

PSH-7001

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Building, Trailer or Skid

Module Code: 7900

7900

Door, Single, 36", Steel slab/no brick moulding, No sill ext	Part:	10822
1103A,wooden frame,open out,RH	Qty:	1
to be pre drilled for passage and deadbolt	Mfg:	
-	Mfg Part:	1103-Dalmen
Lock, Passage, 107188, Taymor	Part:	10908
107188	Qty:	1
	Mfg:	
None	Mfg Part:	
Lock, Deadbolt, 289648, Taymor, 1 cyl, S/S	Part:	10909
keyed alike #289648	Qty:	1
	Mfg:	
None	Mfg Part:	
Container, Painting, 40ft exterior/interior	Part:	12063
	Qty:	1
	Mfg:	
Building exterior, to be painted our standard white finish.	Mfg Part:	
Container, Shipping, Tilt load	Part:	13593
	Qty:	1
	Mfg:	
---	Mfg Part:	
Container, 8' x 40' x High Cube	Part:	15512
	Qty:	1
	Mfg:	
---	Mfg Part:	
Container, Modification	Part:	15513
As per specification below or drawing provided.	Qty:	1
	Mfg:	
---	Mfg Part:	
Door, Assembly, 72", Double	Part:	19012
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Door, Assembly, 36", Single	Part:	19014
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-

Access Cover

Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	3
	Mfg:	
As per attached drawing. For 36"x36" Carbon Access Cover	Mfg Part:	---

F-7901

Fan, Building, 24", 1/3hp, 1625rpm, 120/230V, 1ph, XPF	Part:	10329
SD24-XPF, OSHA Guard,Turnout Box	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	SD24-XPF-OSHA

Fan Shutter Assembly,KD,24",KDS24-SS - Use 23082	Part:	10330
	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	KD24-SS
Fan, Hood, White,24",HFPW-24	Part:	M1411
	Qty:	2
	Mfg:	Canarm
---	Mfg Part:	HFPW-24

F-7903

Fan, Shutter, Backdraft damper, 12"x12"	Part:	23080
Non-Motorized	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	SR3212X12
Hood, 15"	Part:	23989
Fits 12" Fan & Louver	Qty:	2
	Mfg:	
---	Mfg Part:	
Fan, Building, 12", 1/4hp, 1750rpm, 120V, 1ph, TEFC	Part:	M1072
CSA Approved, S12-E1	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	SD120311

H-7901

Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	2
	Mfg:	Johnson Controls
-	Mfg Part:	-

H-7903

Heater, Baseboard, Ouellet, 1.5kW, OFM1508	Part:	22314
208V, 66" long	Qty:	1
	Mfg:	Ouellet
---	Mfg Part:	OFM1508

TSH-7903

Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	
Switch, Temperature, Probe, WEL 14A-602R	Part:	15653
Bulb, Well for Temperature Switch, Brass	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	WEL 14A-602R
Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	1
	Mfg:	Johnson Controls
-	Mfg Part:	-

TSL-7903

Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	

Switch, Temperature, Probe, WEL 14A-602R	Part:	15653
Bulb, Well for Temperature Switch, Brass	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	WEL 14A-602R
Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	1
	Mfg:	Johnson Controls
-	Mfg Part:	-

Main Control Panel

Module Code: 8200

8200

Contactor, SQD LC1D32G7	Part:	10520
32A, 10/10/20/25HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D32G7
Disconnect, 3ph, D324N	Part:	11163
200A, UL,240V,Nema 1,fusible disconnect	Qty:	1
	Mfg:	Square D
---	Mfg Part:	SQD D324N
Contactor, SQD LC1D09G7	Part:	12547
9A, 2/2/5/7.5HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D09G7
Contactor, SQD LC1D50AG7	Part:	12548
50A, 15/15/40/40HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D50G7
Modem, Antenna, Airlink GPRS, N-Female	Part:	13723
120-110-2107	Qty:	1
MAX-BMLPVDB800/1900 Antenna & MAX-MTPM-800 Hardwar	Mfg:	
---	Mfg Part:	120-110-2107
PLC, EA1-S3ML	Part:	17233
C-more micro graphic user interface	Qty:	1
	Mfg:	Automation Direct
---	Mfg Part:	EA1-S3ML
PLC, DV-1000CBL	Part:	17234
2m Cable RJ12 to RJ12	Qty:	1
C-more Micro to DL05/06/205	Mfg:	Automation Direct
---	Mfg Part:	DV-1000CBL
Breaker, Techna, JTEC4892C30	Part:	17543
480/277V 30 AMP 2P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4892C30
Breaker, Techna, JTEC4893C06	Part:	17709
480/277V 6 AMP 3P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C06
Breaker, Techna, JTEC4893C40	Part:	17717
240V 40 AMP 3P C Trip Cuve	Qty:	2
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C40
Breaker, Techna, JTEC4893C50	Part:	17718
240V 50 AMP 3P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C50

Breaker, Techna, JTEC4891C15	Part:	18359
240V 15A, 1P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4891C15
Motor Saver, 460 w/Diagnostic 3ph	Part:	18396
Finger Safe, DIN Rail Mountable	Qty:	1
	Mfg:	Symcom
---	Mfg Part:	460
Combination Starter, SQT LUB12	Part:	19264
TeSysU Power Base 12A	Qty:	1
3HP@208/240, 7.5HP@480, 10HP@600	Mfg:	Telemecanique
---	Mfg Part:	SQT LUB12
Combination Starter, SQT LUA1C20	Part:	19269
TeSysU Aux Contact Module	Qty:	2
1NO Ready 1NO Fault	Mfg:	Telemecanique
---	Mfg Part:	LUA1C20
Combination Starter, SQT LU9SP0	Part:	19270
TeSysU UL508 Type E Phase Barrier	Qty:	2
	Mfg:	Telemecanique
---	Mfg Part:	SQT LU9SP0
Combination Starter, SQT LUB32	Part:	19273
TeSysU Power Base 32A	Qty:	1
10HP@208/240, 20HP@480, 25HP@600	Mfg:	Telemecanique
---	Mfg Part:	SQT LUB 32
Combination Starter, SQT LUCA32FU	Part:	19274
TeSysU Standard Control Unit 8-32A	Qty:	1
110/120VAC coil	Mfg:	Telemecanique
---	Mfg Part:	SQT LUCA32FU
Combination Starter, SQT LUCC12FU	Part:	19456
TeSysU 1 Phase Control Unit 3-12	Qty:	1
110/120VAC coil	Mfg:	Telemecanique
---	Mfg Part:	LUCC12FU
Transformer, Hammond, HAT Q005YEKF	Part:	19999
208V to 240V,5KVA,UL/CSA,3R.1ph	Qty:	1
	Mfg:	Hammond Power Solutions
---	Mfg Part:	HAT Q005BECF
Modem, Cable, RF, N-Male to SMA-Male, 15' Length	Part:	20569
GW195-180-SM-NM	Qty:	1
Use with Raven XE	Mfg:	
---	Mfg Part:	GW195-180-SM-N
Relay, SQT RXM4AB1F7	Part:	21887
Miniature Relay 4PDT 120 V AC	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXM4AB1F
Relay, SQT RXM4AB1BD	Part:	21888
Miniature Relay 4PDT 24 V DC	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXM4AB1B

Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Modem, Bracket, Mounting, Airlink Raven XE	Part:	22143
100-170-1015	Qty:	1
Use with Raven XE	Mfg:	
---	Mfg Part:	100-170-1015
Modem, Airlink Raven, XE V2228E-SA w/AC Pwr Adapter, Sprint	Part:	22170
V2228E-SA	Qty:	1
Requires mounting bracket MLE# 22143	Mfg:	Airlink_Communications
---	Mfg Part:	V2221E-SA
Fuse, GLD GDL3	Part:	E1187
3A 250V Time Delay	Qty:	1
Miniature 1/4"x1-1/4"	Mfg:	Ferraz Shawmut
---	Mfg Part:	GLD GDL3
Fuse, GLD TR125R	Part:	E1206
125A 240V Time Delay	Qty:	3
Class R	Mfg:	Ferraz Shawmut
---	Mfg Part:	GLD TR125R

Panel

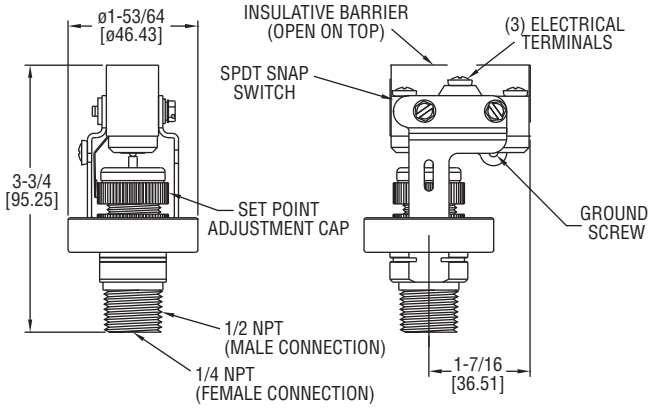
Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	1
	Mfg:	
Use and modify the old RTS070 PLC Control panel and Disconnect in the rental tent.	Mfg Part:	---

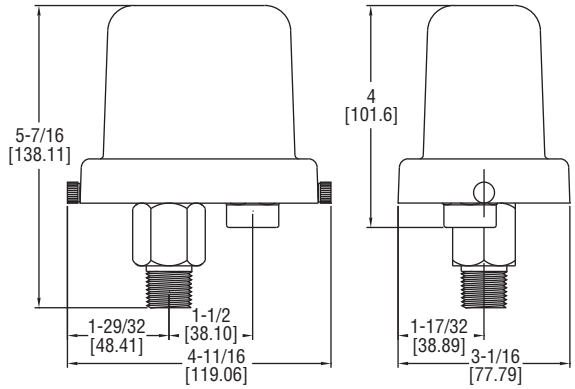
Series A1F Compact OEM Pressure Switch

Specifications - Installation and Operating Instructions

A1F

A1F with A-447





The Series A1F Compact OEM Pressure Switch is ideal for panel mounting wherever a high-quality, economical open-case or weatherproof control is required.

INSTALLATION

1. Location: Select a location where the temperature limits of -40 to 180°F (-40 to 82°C) will not be exceeded. Locate the switch as close as possible to the pressure source. Long lengths of piping will not affect accuracy of the actuation point but will slightly add to response time.

2. Mounting and Processing Connection: Avoid mounting surfaces with excess vibration which could cause false actuation when pressure is near setpoint. The switch should be mounted within 20° of vertical for proper operation. Mount the switch by connecting it to the process piping using either 1/4″ NPT female or 1/2″ male connection. Pipe joint compound or TFE thread tape should be used to prevent leakage.

3. Electrical Connections: The SPDT snap switch includes normally open, normally closed and common connections. The common and normally open contacts will close and the common and normally closed contacts will open when pressure increases to the setpoint. The actions will reverse when pressure decreases below the setpoint minus the deadband. A green grounding screw is provided on the switch bracket. All wiring should be in accordance with local codes.

SETPOINT ADJUSTMENT

1. Determine the setpoint pressure. The approximate actuation point can be set by turning the adjustment cap up or down, aligning the top of the O-ring, located above the cap, with the appropriate scale graduation.
2. Connect tubing or piping from the pressure port on bottom of switch to one leg of a tee. Connect the second leg to a pressure test gage of known accuracy and in an appropriate range. The third leg should be connected to a controllable source of pressure.
3. Connect a volt/ohm meter or other circuit tester to the snap action terminals to indicate when switching occurs.
4. Slowly apply pressure to the system and note the pressure at which switching occurs.
5. Operate the switch through several cycles to confirm proper actuation point.
6. Remove test apparatus and attach switch to pressure source and control circuit wiring. Place switch in service.

SPECIFICATIONS

Service: Compatible liquids and gases.
Wetted Materials:
Pressure Chamber: 316 SS.
Diaphragm: Fluorocarbon.
Temperature Limit: -40 to 175°F (-40 to 80°C).
Pressure Limits: 750 psig (51 bar).
Enclosure Rating: No rating for open construction. Installed properly within an optional A-447 enclosure meets NEMA 4X standards.
Switch Type: SPDT snap switch.
Electrical Rating: 15A @ 120/240/480 VAC, 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC.
Electrical Connection: Screw terminals.
Process Connection: 1/4″ female NPT and 1/2″ male NPT.
Mounting Orientation: Within 20° of vertical.
Set Point Adjustment: Knurled screw cap with indicating scale.
Deadband: Fixed, See deadband chart.
Weight: 10.5 oz (297 g).

DWYER INSTRUMENTS, INC.
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Phone: 219/879-8000 www.dwyer-inst.com
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Example of how to order:

A1F	-	O	-	SS	-	1	-	4
1		2		3		4		5

1. Diaphragm Designation:
F - Fluorocarbon

2. Enclosure Designation:
O - Open Construction No Enclosure

3. Housing Material Designation:
SS - 316SS

4. Switch Designation:
1 - SPDT Snap Action Switch

5. Operating Pressure Range Designation:
1 - 2 to 15 psig
2 - 4 to 75 psig
3 - 8 to 225 psig
4 - 16 to 450 psig

Series A1F Deadband Chart-psig (bar)

Range	Deadband at Minimum Range	Deadband at Maximum Range
2 to 15 (0.14 to 1.03)	2 (0.14)	3 (0.21)
4 to 75 (0.28 to 5.17)	4 (0.27)	15 (1.0)
8 to 225 (0.55 to 15.5)	8 (0.55)	25 (1.7)
16 to 450 (1.1 to 31.0)	15 (1.0)	50 (3.5)

MAINTENANCE

Upon final installation of the Series A1F Compact OEM Pressure Switch, no routine maintenance is required. A periodic check of the system calibration is recommended. The Series A1F is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

Printed in U.S.A. 7/08 FR# 89-440838-10 Rev.2

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Series M
Mechanical Tilt Float Level Switch

- Non-Mercury Switch
- Sealed Cable
- Impact & Corrosion Resistant ABS Shell
- N.O., N.C., SPDT Contacts
- Various Cable Lengths
- Color Coded Body

Designed for level control and alarm applications in difficult liquids such as sewage and waste water. Series M mechanical tilt floats are ideal for applications where the presence of mercury is a concern. Series M Switches have impact resistant ABS shell and neoprene jacketed cable.

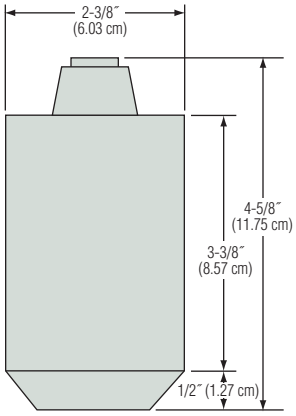
Specifications

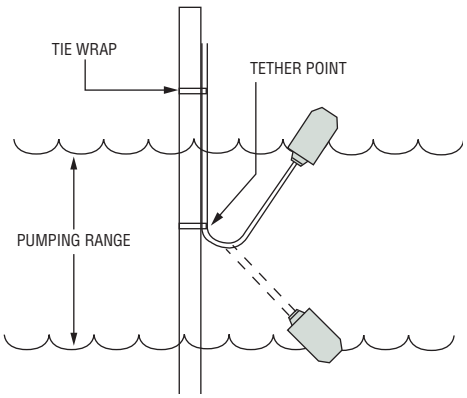
Cord	2 or 3 conductor 16 AWG wire SJOW Oil Resistant CPE
Contact Rating	13 amp @ 120/240 VAC 1/2 hp
Contact Design	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)
Temperature Rating	
Dry	32°F to 194°F (0°C to 90°C)
Water Resistant	32°F to 140°F (0°C to 60°C)
Overall Weight	1.0 lbs. (not including weight)
Tether Method	Tie-wrap nylon, weight: 2.5 lbs.
Approvals	U.L. Recognized, CSA Cert.

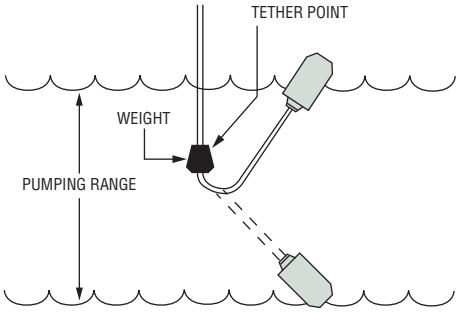
Applications

- Level Control
- Alarms
- Sewage Lift Systems
- Slurries
- Drainage Sumps
- Wastewater Treatment
- Holding Tanks

Dimensions







How to Order

Use the **Bold** characters from the chart below to construct a product code.

M XXX XX X

Series
M

Contact Configuration
BLU – SPST, Normally Open, narrow angle[1]
YEL – SPST, Normally Closed, narrow angle[1]
RED – SPST, Normally Open, wide angle[2]
WHI – SPST, Normally Closed, wide angle[2]
GRE – SPDT, Form C, wide angle[2]

Length
40 – 40 feet (12.19 m)

Tether Method
T – Tie
W – Weight

Tether Method	Part Number
Tie Wrap	**7762360**
Weight	**7762381**

Notes:
1. Narrow angle pumping range approximately 2 in. to 8 in.
2. Wide angle pumping range approximately 5 in. to 18 in.

OIL WATER SEPARATORS – OWS SERIES

Application:

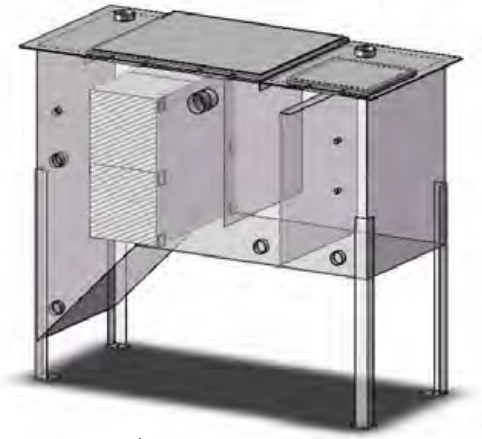
newterra Oil Water Separators are designed to remove oil from a liquid phase inlet stream. As the oil/water mixture is passed through the coalescing oil/water separator, larger oil droplets migrate to the surface to be collected and skimmed off. The media collects the smaller droplets until they are large and buoyant enough to float to the surface.

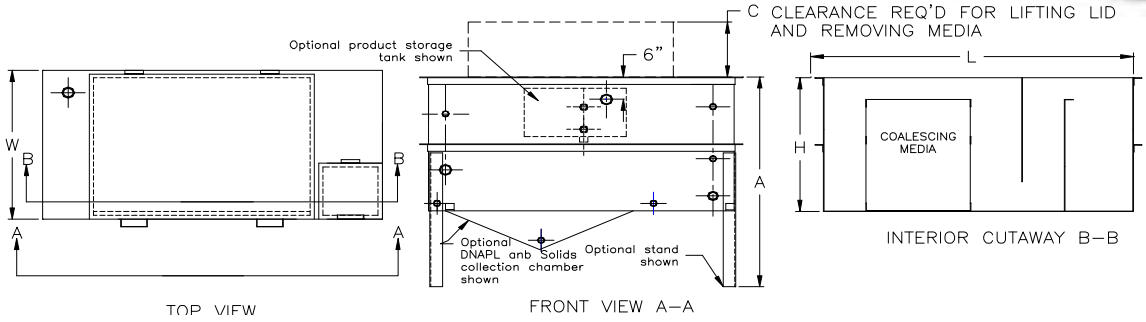
Construction:

The standard OWS Series are fabricated from carbon steel. For corrosion resistance, the interior is epoxy coated and the exterior is painted. Optional stainless steel construction is also available. A large lid allows access to the coalescing media and oil skimmer while a small lid allows access to the pump-out tank.

Standard Features:

- Standard finish: Interior is epoxy coated. Exterior is painted **newterra** blue over zinc primer (except stainless steel option)
- Sacrificial anode to prevent corrosion of tank.
- 11 AWG carbon steel construction
- Sludge containment section
- Adjustable oil skimmer
- Water underflow/overflow weir design
- Easy removal of coalescing media for cleaning
- High Alarm Level Coupling and Pump High/Low Level Coupling in the pump-out chamber





Dimension Chart:

Part Number	Width "W"	Standard Height "H"	Standard Overall Length	Length with Extended Pump-out	Height with Elevated Pump-out "A"	Overhead Clearance "C"	Standard Pump-out Volume	Extended Pump-out Volume	Elevated Pump-out Volume	Product Tank Volume
OWS-2	16"	30"	64"	76"	n/a	14"	23 Gal	41 Gal	n/a	8.1 Gal
OWS-4	28"	30"	64"	76"	n/a	26"	46 Gal	81 Gal	n/a	8.1 Gal
OWS-8	28"	30"	76"	88"	n/a	26"	46 Gal	81 Gal	n/a	8.1 Gal
OWS-12	40"	30"	76"	88"	n/a	38"	70 Gal	122 Gal	n/a	8.1 Gal
OWS-18	40"	30"	88"	n/a	60"	24"	70 Gal	n/a	130 Gal	12.2 Gal
OWS-24	52"	30"	88"	n/a	60"	24"	93 Gal	n/a	173 Gal	12.2 Gal
OWS-36	52"	42"	88"	n/a	72"	24"	133 Gal	n/a	212 Gal	17.8 Gal
OWS-45	64"	42"	88"	n/a	72"	24"	166 Gal	n/a	265 Gal	17.8 Gal
OWS-72	100"	42"	88"	n/a	72"	24"	266 Gal	n/a	425 Gal	17.8 Gal

newterra
smart technology. sustainable solutions.™

OIL WATER SEPARATORS – OWS SERIES

Specification Chart:

Part Number	HQ PAC		½" Packing		¾" Packing		1 ¼" Packing		Slant Plate	
	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)
OWS-2	9.7	27.0	5.0	14.1	3.5	9.8	2.3	6.3	0.9	2.5
OWS-4	19.3	54.0	10.1	28.2	7.0	19.7	4.5	12.7	1.8	4.9
OWS-8	38.6	108.1	20.2	56.5	14.0	39.3	*9.1*	*25.4*	*3.5*	*9.8*
OWS-12	57.9	162.1	30.3	84.7	21.1	59.0	13.6	38.1	5.3	14.7
OWS-18	86.9	243.2	45.4	127.1	31.6	88.4	20.4	57.1	7.9	22.1
OWS-24	115.8	324.2	60.5	169.5	42.1	117.9	27.2	76.1	10.5	29.5
OWS-36	159.2	445.8	68.1	190.7	47.4	132.6	30.6	85.7	11.8	33.2
OWS-45	199.0	557.3	85.1	238.4	59.2	165.8	38.2	107.1	14.8	41.5
OWS-72	318.5	891.7	136.2	381.4	94.7	265.3	61.2	171.3	23.7	66.3

Rated US GPM (Based on 25 micron particles at 65 deg F and design safety factor of 1.25)
Larger spaced packing will not plug as quickly as closely spaced packing allowing longer intervals between maintenance requirements. The coalescing slant plate should be used in applications with heavy sludge loads because it does not foul quickly.

Options Table:

Option	Description
Stand	The separator will be elevated above ground to assist in gravity discharge or to provide room underneath the separator for blowers and pumps. This replaces the standard foot mounts. The maximum stand height for 8' clearance is 36" for OWS-18 and OWS-24 and 24" for OWS-36 and larger.
Oversize Pump-out (Extended)	OWS-2, OWS-4, OWS-8 and OWS-12 only. The final section of the separator can be oversized to allow a greater water pump-out volume. For the OWS-2, OWS-4, OWS-8 and OWS-12 the oversized pump-out will be an extended length of the final section of the separator.
Oversize Pump-out (Elevated)	OWS-18, OWS-24, OWS-36 and OWS-45 only. The final section of the separator can be oversized to allow a greater water pump-out volume. For the OWS-18, OWS-24, OWS-36 and OWS-45 the separator will be raised on a stand and the final section will extend to the ground to give the oversized volume.
Top Inlet	A top mounted option is available to allow for pre-separation of air and liquid at the inlet to the separator.
Product Storage Tank	A tank may be mounted on the front of the separator to collect the oil from the skimmer. The volume of the product storage tank is: OWS-2, OWS-4, OWS-8 and OWS-12: 8.1 US Gal OWS-18, OWS-24 12.2 US Gal OWS-36, OWS-45 17.8 US Gal
Telerette Basket	A telerette basket may be added to allow for a high surface area polishing media for final hydrocarbon removal.
Oversize Inlet and Outlet	The inlet and outlet couplings may be increased by one size to allow for higher flow through the separator.
Stainless Steel	Each separator can be purchased with Stainless Steel construction instead of the standard Carbon Steel.
Main Tank Low Coupling	Additional couplings may be added to allow for the installation of a low level switch in the main separator tank. NOTE: This option covers only the cost of installing the coupling, the switches must be purchased separately.
Main Tank High High Coupling	Additional couplings may be added to allow for the installation of a high high level switch in the main separator tank. NOTE: This option covers only the cost of installing the coupling, the switches must be purchased separately.
Custom Size	A custom sized separator can be designed to meet specific project needs.
Media	Custom media available for contaminants other than oil/BTEX such as chlorinated solvents and other DNAPL products.
DNAPL Separation	The separator can be supplied with a DNAPL sump to capture heavy fluids and solids and allow collection below the media of the oil water separator.

Sample Ordering Format:

OWS-4 with ½" Packing
SG: 0.9
Temp: 65 deg F
Minimum Micron Size: 25
Design Safety Factor: 1.25
Options:
Oversize Pumpout (Extended)
Product Storage Tank
Stand: 24"

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ATB 3 and ATS3 Series Spec Sheet
Level Switch - Small Size - Heavy Duty

The ATB3 is designed for high or low level alarm or switch point applications in rugged situations similar to oil tank reservoirs or industry vessels that require a more robust level switch. Notice the larger brass one piece machined hex to get a wrench on - this model also has an optional brass set screw locking collar in place of the clip.

Internal reed switch selection is the same Almeg quality standard but we've beefed up the external part as well as fully encapsulated the reed switch to maintain a complete moisture free environment. The leads are wire wrapped (not clipped) soldered and heat shrink sealed to the reed switch before encapsulating.

The TRUE closed cell Buna float will not swell or take on moisture - even if cut or drilled. It is designed like a tight bee hive or honey comb construction.

100% of our controls are tested before shipping.

The ATB3 is available in a single order or OEM applications.

DLJ Epoxy Coated Cast Iron Turbine Meters

200T, 250T, 300T, 400T, 600T, 800T

Description

Operation DLJ Turbine Meters are horizontal Woltman type water meters designed for installation where occasional low and moderate to high sustained flows are demanded. Water flow drives a vertical impeller in direct proportion to the quantity of water passing through the meter. Impeller revolutions are transferred to the register assembly through a reduction gear and magnetic drive.

Compliance The DLJ Turbine Meters comply with AWWA C701 and ISO 4064 Class B standards.

Installation The meter must be installed in a clean pipeline, free of any foreign materials. Install the meter with direction of flow as indicated by the arrow cast into the meter body. You can install the meter vertically or horizontally and the registers are fully revolvable for ease of reading. It is recommended to strain the incoming water to prevent foreign debris damage and to reduce the effects of water turbulence.

Application The DLJ Cold Water Turbine Meters are for use only with cold water up to 120 degrees F (50 degrees C)

Construction The meter consists of a fully epoxy coated cast iron main case with the flow direction cast into it and a removable measuring element for easy maintenance.

	Specifications					
Characteristics	**DLJ 200T 2"**	**DLJ 250T 2 1/2"**	**DLJ 300T 3"**	**DLJ 400T 4"**	**DLJ 600T 6"**	**DLJ 800T 8"**
Flow Rating (gpm)	325	395	495	1250	2500	3450
Continuous Flow (gpm)	250	300	375	1000	2000	2800
Low Flow (gpm)	4	5	6	9	32	38
Maximum Pressure (psi)	175	175	175	175	175	175
Maximum Temperature (°F)	120	120	120	120	120	120
Sweep Hand Registers (Gallons)	10/100	10/100	10/100	10/100	10/100	10/100
Register Capacity (Millions of Gallons)	1000	1000	1000	1000	1000	1000

DLJ Epoxy Coated Cast Iron Turbine Meters

200T, 250T, 300T, 400T, 600T, 800T

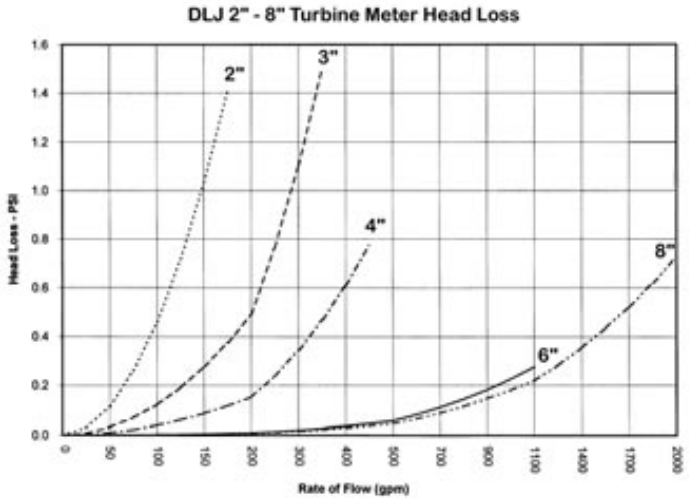
Direct Read Register The register is contained in a hermetically sealed nylon casing with a 5mm tempered glass lens. The totalizer wheels are large and easy to read and the sweep hands are offset on seperate 10 gallon and 100 gallon register wheels. The large black spinning trickle indicator is excellent for leak detection. Each register clearly show's it's applicable meter size.

Pulse Output The DLJ line is available with a dry contact reed switch pulse output. This requires external DC power, 4 watts, 30VDC maximum. Contact closure is 1 pulse per **100** gallons on the 2 - 3" Turbines and 1 pulse per **1000** gallons on the 4 - 8" Turbines

Magnetic Drive The magnetic drive design eliminates all miscouplings associated with conventional right angle drives. Excess torque is eliminated in the encased undergear assembly, ensuring constant magnet coupling.

Maintenance The register/measuring assembly is easily removable and replaceable if needed, and doesn't require taking the meter off line.

Connections The DLJ Turbine Meters are available with standard Class 150lb ANSI flanges (4 bolt in 2, 2 1/2" and 3", 8 bolt in 4, 6 and 8"). Companion Flange sets in Cast Iron or PVC and Uni-Flanges are available for ease of connection.



	Specifications					
Characteristics	**DLJ 200T 2"**	**DLJ 250T 2 1/2"**	**DLJ 300T 3"**	**DLJ 400T 4"**	**DLJ 600T 6"**	**DLJ 800T 8"**
Length (Inches)	12	7.75	8.75	9.75	11.6	13.6
Weight (Pounds)	32	29	35	40	92	141
Crated Weight (Pounds)	43	40	47	50	110	150

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DLJ Meter

www.watermeters.com

Stacking Shipping Containers on Land for an Off-Axis Detector

J. Cooper, J. Kilmer, B. Wands
Fermi National Accelerator Laboratory, Batavia, IL 60510

(May 29, 2003)

Introduction

Fig. 1 shows a typical International Standards Organization (ISO) Series 1 shipping container.

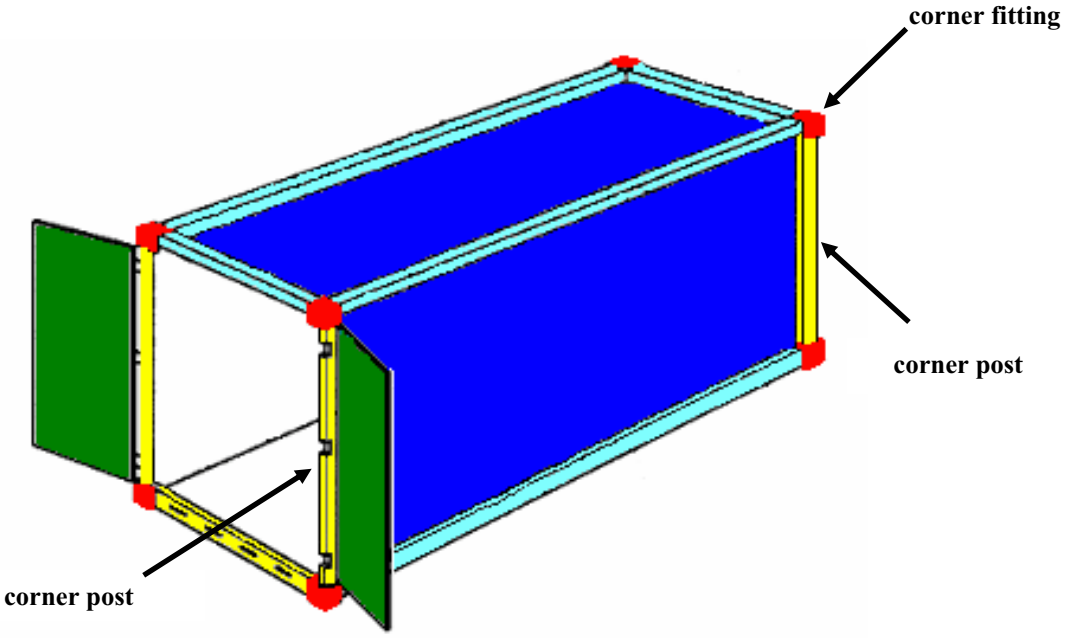


Figure 1. ISO Series 1 Shipping Container

These containers are designed to make vertical contact with each other through discrete corner fittings; when stacked, all vertical force is transferred through these fittings, in turn loading the corner posts, and not the walls, of the container. The number of containers which can be stacked on each other is determined by the strength of the corner posts.

ISO Standard 1496[(1)] states that the corner posts of ISO Series 1 containers should be tested to a load of 86,400 kg (190,480 lbs). This is the load applied to the posts of the bottom container in an 8-on-1 stack of 24,000 kg (gross weight) containers,

multiplied by a factor of 1.8. This extra factor is used to take into account "conditions aboard ship and the relative eccentricities between superimposed containers."[1] The "conditions aboard ship" were derived from a 1964 study of maximum acceleration values under the worst sea and wind conditions.[2]

Calculating the safe stacking height for loaded containers *on land* requires some understanding of the corner posts, their material properties, possible failure modes, and what constitutes an adequate factor of safety.

Corner Post Geometry and Compressive Load-Bearing Capacity

Corner post steels typically correspond to the specification ASTM A-572, with a yield stress of 47,000 psi, and an ultimate stress of 70,000 psi. This is a low alloy columbium or vanadium steel commonly used for high-strength steel weldments, such as bridges. The load-bearing characteristics of corners posts are complex, because in a walled container the posts receive substantial lateral stability, and compressive cross sectional area, from the participation of the walls and doors.

The corner post can fail in two ways: The first is collapse, or buckling. This occurs in a slender column when the compressive load reaches a critical load P_{cr} which is so large that the column can no longer recover from small lateral displacements along its length. The result is sudden and catastrophic loss of stiffness, and gross deformation of the column and its attached material.

A second type of failure can occur if the compressive load P_{comp} exceeds the value S_yA, where S_y is the yield stress of the material, and A is the cross sectional area of the post. Even a column which is stable against buckling failure can fail from compressive yielding. Failures of this type are rare for columns, since the yielding will tend to produce larger cross sectional area through plastic deformation, and eventually become self-limiting. This self-limit may not be reached before even a very short column becomes unstable, however, resulting in a type of collapse that is characterized by large amounts of plastic deformation.

The most likely failure mode, given the substantial lateral constraint offered by the walls, is probably a combination of collapse and gross yielding, a type of failure referred to as elastic/plastic collapse.

The calculation of collapse (buckling) loads for long, slender steel columns uses the Euler equation:

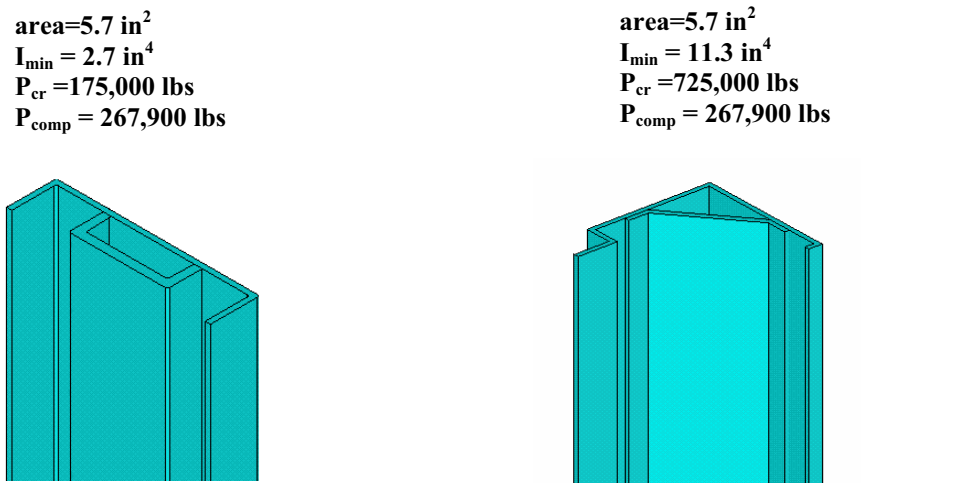
$$P_{cr} = k\pi^2 EI/L^2$$

where P_{cr} = critical (collapse) load
E = modulus of elasticity of steel = 30e6 psi
I = minimum moment of inertia of section
L = length of column
k = factor for end rotational restraint (theoretical range from 1-4)

For the corner posts, the degree of end rotational restraint is difficult to quantify. The top, bottom, and side rails will serve to provide substantial restraint, and even the corner fitting contact of the loading container above a corner post will tend to limit rotation. Therefore, a k factor of 2 is chosen for calculating the estimates of collapse load.[3] This is less than the complete rotational restraint (k = 4), but greater than free rotation (k = 1).

In addition to resisting collapse, the corner post must also work at a compressive stress that is below the yield of the material. Corner posts will yield at a stress of 47,000 psi. Therefore, the minimum cross sectional area for resisting the corner post loads is A = 190,840/47,000 = 4.05 in^2.

While the minimum performance of a corner post is standardized via ISO, the actual geometry of the post is not. Manufacturers have explored many different designs for many different types of containers, all of which will pass the ISO test load of 86,400 kg or 190,840 pounds. Figure 2 shows the most common corner post cross-sections at the door and walled ends of a Series 1 container. These posts are made of 6mm thick pressed steel shapes welded together along the length of the post. In the case of the door end post, a piece of hot rolled channel 113 x 40 x 10 mm is welded to the 6mm plate. Both posts in Figure 2 have adequate cross sectional area from the standpoint of compressive stress. However, the Door End post (a), has a collapse load which is less than the load required by the ISO standard, and therefore must rely on interaction with the walls and doors of the container to produce the necessary load-bearing capacity.



(a) Corner Post at Door End

(b) Corner Post at Walled End

Figure 2. Corner Post Cross Sections -- Properties and Load Capacities without Wall/Door Participation

The effect of participation of the walls and doors is illustrated in Fig. 3 The profile of Fig. 2(a) has been used with a 3-inch wide strip of adjacent container sidewall (3.6 mm thick) and a 2-inch wide strip of door panel (2 mm thick), to form a column of considerably higher strength than the profile of Fig. 2(a) alone. The cross section shown, with walls, has a critical load of approximately 252,000 lbs, which is well above the 175,000 lbs of the corner post alone, and well above the 190,480 lbs required by the ISO Standard.

These calculations show that the door is an important part of the load path under stacking, providing additional cross-sectional area for compression and stability. The door also acts as a sheer wall, preventing the parallelogram deformation of the end referred to as "racking" or "sidesway." For these reasons, in commercial practice, the doors on a container within a stack are presumably never opened. This is not a constraint on the way the containers are used in commerce, since only one container at a time is loaded or unloaded at terminals, with stacking occurring only during transit.

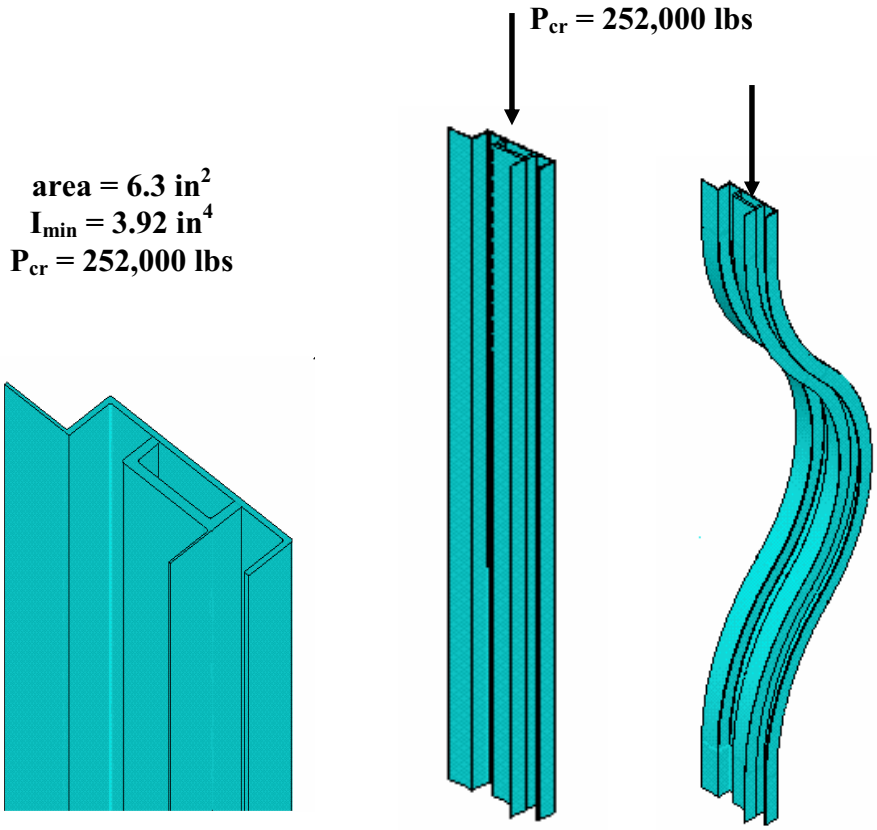


Figure 3. Corner Post from Fig. 2(a) showing increase in buckling strength due to participation of wall

Corner Fittings

The corner fittings shown in Figure 1 are an integral part of the load-bearing column in the container. ISO 1161-1984(E)[4] states "Corner fittings for Series 1 freight containers shall be capable of withstanding the loads calculated in accordance with the requirements of ISO 1496/1 for Series 1 containers." This means that the bottom corner fitting of the bottom container in a stack must withstand the weight of the containers stacked above it, plus the weight of the bottom container itself. The maximum load which a single corner fitting must take is then

$$P_{tot} = 190{,}480 + (52{,}800/4) = 203{,}680 \text{ lbs}$$

A typical corner fitting is shown in Fig. 4.. The cross sectional area of this fitting is shown in Fig. 5. The total cross sectional area available for compression is 10.15 in^2. This results in an average compressive stress under maximum load of 20,067 psi.

Corner fittings are typically cast and machined from A-216 steel, which has a minimum specified yield stress of 40,000 psi. Therefore, under maximum load, a corner fitting of the cross section shown below operates with a safety factor on yield of nearly 2.0

Figure 4. Corner Fitting

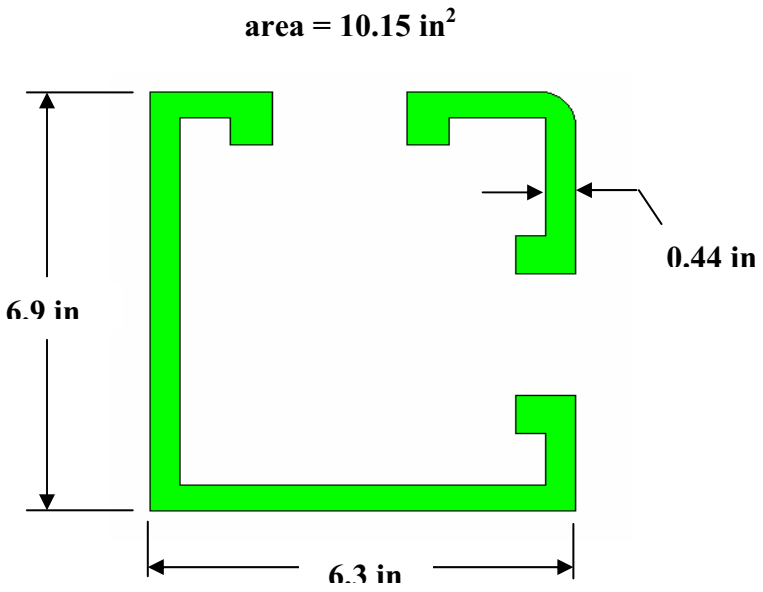


Figure 5. Fitting Cross Section

Safety Factor for Stacking Containers on Land

A safety factor for the corner posts in the bottom container of a stack can be defined as

$$SF = F_{cp\text{-}fail}/F_{cp\text{-}act}$$

where SF = safety factor
$F_{cp\text{-}act}$ = actual operating load on corner post
$F_{cp\text{-}fail}$ = failure load of corner post

The ISO Standard, however, does not define a force $F_{cp\text{-}fail}$; rather, it specifies the load that each corner post must withstand *without* failure. In this sense, the specified load is a *proof* load, F_{cp_proof}, which is simply a load which each corner post must be shown capable of resisting. For the purposes of calculating a safety factor, the specified test load can be thought of as an absolute lower limit on the failure load. Any safety factor calculated with $F_{cp\text{-}fail} = F_{cp\_proof}$ will be smaller than the actual safety factor, since F_{cp_proof} is always smaller than $F_{cp\text{-}fail}$.

Using the expression above, the safety factor of an 8-on-1 stack of containers on land is at least 1.8 . Safety factors in engineering commonly range from 1.25 to 2.0 or greater, depending on the amount of confidence the designer has in material performance and load characterization. The AISC Steel Construction Code[5], for example, uses a safety factor of 2 for column loading; however, conservative design in civil structures is necessary because there is typically no load-testing of the parts; they are designed, manufactured, and set in place with only the calculation and fabrication standards serving as proof of merit. Aircraft design, however, uses safety factors closer to 1.25, due to the great penalties incurred by excess weight. The extremely rigorous materials and testing programs common in the aviation industry justify these smaller safety factors.

Because the corner posts of all containers are known to have been tested to the load stipulated by ISO 1496 with no failures occurring at a load that is less than the test load, a safety factor of about 1.5 is adequate for a stack of containers on land. Table I shows the safety factor on the corner post loading of the bottom container in a stack, for stacks of various heights. This table is based on the application of the equation for safety factor, with $F_{cp\text{-}fail} = F_{cp\text{-}proof}$ = 190,480 lbs, and containers of 52,910 lbs gross weight:

Table I. Safety Factors on Land for Various Stack Heights on Land with Container Corner Post Capacity of 190,480 lbs (86,400 kg)

Number of Containers Stacked on One	Total Height of Stack	Safety Factor on Corner Post Loading
8	**9**	**1.80**
9	**10**	**1.60**
10	**11**	**1.44**
11	**12**	**1.31**

The table shows that we can stack 9-on-1 on land, and maintain a safety factor of greater than 1.5.

Possible Modifications

For a final detector design, good engineering practice would require that the corner posts of several containers be loaded to failure to more precisely determine F_{cp_fail}, from which more accurate stacking safety factors could be calculated. Some advantage might be taken of the fact that while $F_{cp\text{-}fail}$ is not known, it is certainly higher than 190,480 lbs (86,400 kg). If the measured failure load is just 4% higher than the test (proof) load, the safety factor on a 10-on-1 stack becomes 1.5, and stacking to that height becomes defensible.

Some vendors advertise containers with a higher capacity[(6)] than the ISO Series 1 standard, and advantage could be taken of the greater payload, as well as the higher post strength, in configuring the detector array. The typical higher post rating quoted is 214,290 lbs (97,400 kg), allowing exactly 9 on 1 stacking of 52,910 lb (24,000 kg) containers at sea and therefore allowing 10 on 1 on land with a safety factor of (9/8)*(1.44) = 1.62.

Similarly, if the Off-Axis detector density is small enough that our standard gross weight container is less than 52,910 lbs (24,000 kg), then even higher stacks could be supported. Table II shows the stack heights possible when the higher strength containers are used. A container volume of 33.2 m^3 is assumed with a tare weight of 2,250 kg and four different detector gross weights of 22,150 kg, 24,000 kg, 26,000 kg and 30,480 kg. The 30,480 kg number is the vendor quoted maximum gross weight for the higher strength containers. Comparing Tables I and II shows that the higher strength posts lead to the same height stacks as the lower strength posts for containers of density 0.75 gm/cc vs. 0.66 gm/cc.

Table II. Stack Heights on Land forVarious Detector Densities with Container Corner Post Capacity of 214,290 lbs (97,400 kg)

Number of Containers Stacked on One	**Total Height of Stack (m)**	**Safety Factor on Corner Post Loading**			
		with payload density = **0.60 g/cc** (22,150 kg gross)	with payload density = **0.66 g/cc** (24,000 kg gross)	with payload density = **0.75 g/cc** (27,150 kg gross)	with payload density = **0.85 g/cc** (30,480 kg gross)
8 on 1	23.3	**2.20**	**2.03**	**1.80**	**1.60**
9 on 1	25.9	**1.95**	**1.80**	**1.59**	**1.42**
10 on 1	28.5	**1.76**	**1.62**	**1.43**	**1.28**
11 on 1	31.1	**1.60**	**1.48**	**1.30**	**1.16**

Conclusion

Stacking ISO containers 10 high on land is reasonable, and stacks as high as 12 may be possible depending on the type of container purchased and on the loading of the container with Off-Axis detector elements. For a final detector design, good engineering practice would require that the corner posts of the selected containers be loaded to failure to more accurately determine the safety factor of the stacked array.

References

1. ISO 1496-1:1990 *Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes*

2. ISO/TR 15070:1996(E) *Series 1 freight containers – Rationale for structural test criteria*

3. "Commentary on the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", Section 1.8, American Institute of Steel Construction, 1978

4. ISO 1161-1984(E) *Series 1 freight containers – Corner fittings – Specification*

5. "Commentary on the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", Section 1.5.1.3, American Institute of Steel Construction, 1978

6. We have several specification documents from container vendors that stipulate a higher load capacity, but no details on just how this is accomplished by any container manufacturer via changes in the post configuration. We suspect that these vendors may just be taking advantage of a specification requiring a higher measured failure load as discussed in the preceding paragraph. After all, our post calculations for Figures 2(b) and Figure 3 indicate that these "standard" posts should easily pass a failure load test at 214,290 lbs vs. the original ISO test at 190,480 lbs.

STANDARD FANS

Efficient • Low Maintenance • Easy Installation

Canarm's Standard Fans follow a tradition of quality in design, materials and construction.

Features

- Available in 8" to 36" sizes.
- Single, two and variable speed models are available.
- All fans use a totally enclosed, ball bearing motor with thermal overload protection.
- The motor mount is manufactured with heavy welded rods and has a powder coated finish.
- The fan blades are well-balanced, heavy gauge aluminum.
- The rugged steel welded box housing has a durable powder coated finish.
- Aluminum louver shutters are supported by long life nylon bushings (30" and 36" have PVC louvers).
- All fans are shipped completely assembled.

General Information

Canarm's Standard Fans follow a tradition of quality in design, materials and construction. All our Standard Fans are developed to be efficient and economically priced. All variable speed Standard Fans use an energy efficient variable speed, dual voltage motor and blade combination.

To determine the proper Canarm Fan for your applications, use the following formula.

Number of cubic feet in room / Number of minutes per air change = Required C.F.M. Capacity

*****Example*****

A general office, (see chart) which requires an air change every ten minutes, would require the following fan capacity. If office is 100' x 40' x 10' = 40,000 cubic feet

40,000 cubic feet / 10 minutes per air change = 4000 Required C.F.M.

From the "Performance Data" section on the back of this page, you would select a fan that is rated at 4000 C.F.M. at 1/8" S.P. (Static Pressure)

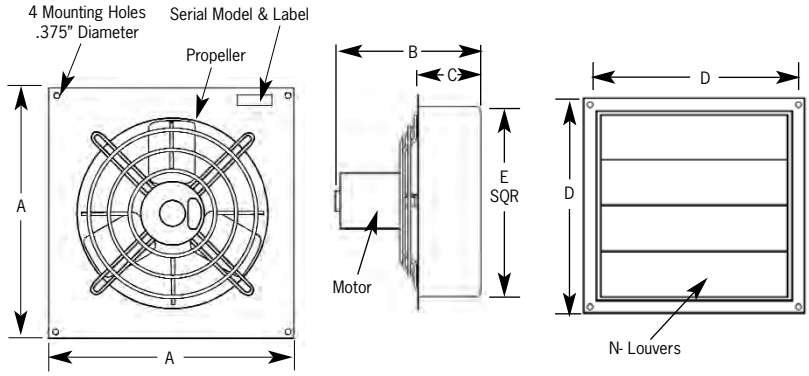
Fan Selection Chart

Application	Minutes per Air Change	Application	Minutes per Air Change	Application	Minutes per Air Change
Assembly Hall	7	Department Store	6	Plating Room	3
Auditorium	10	Dry Cleaning	5	Pressing Room	1
Bakery	3	Engine Room	6	Projection Booth	2
Barber Shop	6	Forge Room	3	Restaurant	6
Basement	8	Foundry	4	School	7
Battery Room	4	Garage	5	Summer Cooling	1
Boiler Room	1	General Office	10	Store	8
Bowling Alley	5	Gymnasium	8	Tavern	3
Church	15	Hospital	8	Toilet	3
Cocktail Bar	3	Kitchen	2	Transformer Room	1
Corridor	10	Laundry	2	Warehouse	12
Dairy	4	Locker Room	3	Welding Shop	2
		Machine Shop	8		

STANDARD FANS

Fan Dimensions

Fan Auto	A	B	C	D (c/c)	E	N
8"	13 1/4"	10"	4"	12"	10 3/4"	2
10"	15 1/4"	10"	4"	14"	12 3/4"	2
12"	17 1/4"	14"	6"	16"	14 3/4"	3
14"	19 1/4"	14"	6"	18"	16 3/4"	3
16"	21 1/4"	14"	6"	20"	18 3/4"	4
18"	23 1/4"	15"	6"	22"	20 3/4"	4
20"	25 1/4"	16"	6"	24"	22 3/4"	5
24"	29 1/4"	16"	6"	28"	26 3/4"	5
30"	35 1/4"	19"	6"	34"	32 3/4"	16
36"	41 1/4"	16"	6"	40"	38 3/4"	20



Performance Data & Specifications

Model Number	Fan Size	Motor HP	Operation Speed	Fan RPM	Current Load Amps @ 115V	Current Load Amps @230V	Input Watts	Airflow Capacity - CFM 0" S.P.	Airflow Capacity - CFM .10" S.P.	Airflow Capacity - CFM .125" S.P.	Airflow Capacity - CFM .25" S.P.	CFM Watts	Sound Level Decibel (A)	Framing Dimensions	Shipping Weight Lbs.
S8-B2	8"	1/20	Two	High 1550 Low 1300	0.95 0.45	– –	109	360 300	270 150	230 110	0 0	2.5	48 43	11" x 11"	12
S10-B2	10"	1/20	Two	High 1550 Low 1300	1.2 0.7	– –	125	690 580	590 460	570 390	0 0	4.72	56 50	13" x 13"	13
S12-E1	12"	1/4	Single	1750	3.5	–	245	1,640	1,540	1,510	1,390	6.00	63	15" x 15"	28
S12-E2			Two	High 1760 Low 1180	3.4 2.3	– –	230 132	1,650 1,090	1,550 950	1,520 930	1,390 –	6.74 7.31	64 50		32
SD12-EV			Variable	Max 1625 Min 600	2.2	1.1	205	1,650 560	1,540 440	1,510 420	1,390 –	7.50	60 –		32
S14-E1	14"	1/4	Single	1740	3.6	–	257	2,170	2,070	2,030	1,860	8.05	67	17" x 17"	30
S14-E2			Two	High 1740 Low 1170	3.8 2.2	– –	253 137	2,180 1,350	2,080 1,190	2,060 1,160	1,890 –	8.22 8.69	65 53		34
S16-E1	16"	1/4	Single	1740	3.7	–	274	2,370	2,270	2,210	2,060	8.28	68	19" x 19"	33
S16-E2			Two	High 1740 Low 1170	3.7 2.3	– –	270 152	2,380 1,640	2,280 1,490	2,230 1,430	2,070 –	8.44 9.80	69 55		36
SD16-EV			Variable	Max 1625 Min 450	2.6	1.3	248	2,370 610	2,270 580	2,210 570	2,063 –	9.15	63 –		36
S18-F1	18"	1/3	Single	1700	4.8	–	448	3,200	3,090	3,040	2,920	6.89	73	21" x 21"	37
S18-F2			Two	High 1700 Low 1140	5.7 3.1	– –	446 250	3,200 2,100	3,090 1,890	3,040 1,820	2,920 –	6.93 7.56	74 64		43
SD18-FV			Variable	Max 1625 Min 390	3..7	1.9	378	3,150 700	3,050 650	2,980 630	2,860 –	8.07	74 –		45
S20-F1	20"	1/3	Single	1735	4.8	–	322	3,420	3,220	3,170	2,920	10.00	77	23" x 23"	41
S20-F2			Two	High 1745 Low 1165	4.3 2.6	– –	315 190	3,440 2,300	3,240 2,000	3,180 1,950	2,930 –	10.20 10.52	77 67		45
SD24-F1	24"	1/3	Single	1075	4.3	–	370	5,000	4,500	4,300	3,600	12.80	70	27" x 27"	46
SD24-GV		1/2	Variable	Max 1100 Min 310	4.2	2.1	290	5,050 800	4,940 710	4,810 650	4,400 –	13.2	72 –		56
SD30-G1D	30"	1/2	Single	1075	4.6	2.3	600	8,000	7,000	6,000	5,000	11.5	82	33" x 33"	72
SD36-G1D	36"	1/2	Single	850	6.0	3.0	660	12,000	11,000	10,500	9,500	13.0	72	39" x 39"	88

NOTE: RPM Min (Minimum) is determined when louvers are opened one inch

Note: Wind has a significant effect on exhaust fans. A 10 mph wind creates a 0.05" pressure against the fan. A 20 mph wind creates 0.20" pressure and 30 mph a 0.45" pressure. These pressures are in addition to the static pressure in the building. Wind blocks or hoods should be included in all designs where fans will be subjected to winds above 10 mph.

Warranty

- 1 year on all components

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Code No. LIT-1927010
Issued February 1, 2009

A19 Series

Remote Bulb Control

Description

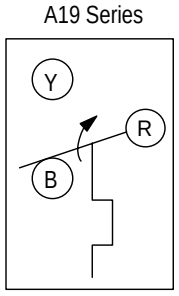
The A19 Series are single-stage temperature controls that incorporate environmentally friendly liquid-filled sensing elements.

Features

- wide temperature ranges available
- constant differential throughout the entire range
- compact enclosure
- fixed or adjustable differential available
- variety of sensing element styles
- unaffected by cross-ambient conditions

Applications

The A19 is suitable for temperature control in heating, ventilating, air conditioning, and refrigeration.



A19 Series
Terminal Arrangement for SPDT

A19ABC-24

Selection Charts

A19 Series Remote Bulb Control[1]

Code Number	Switch Action	Range °F (°C)	Diff F° (C°)	Bulb and Capillary	Bulb Well No. (order separately)	Range Adjuster	Max. Bulb Temp. °F (°C)
Adjustable Differential (Wide Range)							
A19ABA-40C [2]	SPST Open Low	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver Slot	140 (60)
A19ABC-4C	SPDT	50 to 130 (10 to 55)	3 1/2 to 14 (1.9 to 8)	3/8 in. x 5 in., 8 ft. Cap.	WEL14A-603R	Knob	170 (77)
A19ABC-24C [3]	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 8 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-36C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 20 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-37C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ABC-74C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential							
A19AAF-12C	SPDT	25 to 225 (-4 to 107)	3 1/2 (1.9)	3/8 in. x 3 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	275 (135)
Fixed Differential (Case Compensated)							
A19AAC-4C	SPDT	0 to 80 (-18 to 27)	5 (2.8)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAD-12C	SPST Open Low	-30 to 50 (-34 to 10)	2 1/2 (1.4)	3/8 in. x 4 in., 7 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential (Close)							
A19AAD-5C [4]	SPST Open Low	30 to 50 (-1 to 10) (**Bulk Milk Cooler**)	2 1/2 (1.4)	3/8 in. x 2 5/8 in., 6 ft. Cap.	WEL16A-601R	Screwdriver slot	190 (88)
A19AAF-20C	SPDT	-30 to 100 (-34 to 38)	2 1/2 (1.4)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAF-21C	SPDT	40 to 90 (4 to 32)	1 1/2 (0.8)	3/8 in. x 5 3/4 in., 6 ft. Cap.	WEL14A-603R	Screwdriver slot	140 (60)
Manual Reset							
A19ACA-14C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 6 ft .Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ACA-15C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ADB-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 3 1/2 in. 6 ft. Cap.	WEL14A-602R	Knob	290 (143)
A19ADN-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 4 in. 6 ft. Cap.	WEL14A-602R	Screwdriver slot	290 (143)

1. Specify the control model code number, packing nut code number (if required), and bulb well code number (if required).
2. Replaces White-Rodgers 1609-101
3. Replaces White-Rodgers 1609-12, -13; Ranco 010-1408, -1409, - 1410, -1490, 060-110; Honeywell L6018C-1006, L6021A-1005, T675A-1011, -1508, -1516, -1821, T4301A-1008, T6031A-1011, T6031A-1029
4. Case-Compensated

Remote Bulb Control (Continued)

Selection Charts (Continued)

Replacement Parts

Code Number	Description
CVR28A-617R	Concealed adjustment cover
CVR28A-618R	Visible scale cover
KNB20A-602R	Replacement Knob Kit

Accessories

A packing nut is available for closed tank application.
Specify the part number **FTG13A-600R**.

Bulb wells (WEL14A Series) are available for liquid immersion applications.
Refer to the selection chart or to *Bulb Wells Catalog Page, LIT-1922135*.

Technical Specifications

Electrical Ratings

Motor Ratings VAC	120	208	240
Wide Range – Adjustable Differential			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
Fixed Differential and Close Differential			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Case Compensated – Fixed Differential A19AAC-4			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
A19AAD-12			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Manual Reset			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A	16.0	9.2	8.0
Pilot Duty – 125 VA, 24 to 600 VAC			

1. SPST and N.O. contact of SPDT control;
   SPDT N.C. contact- 16 amps 120 to 277 VAC

Features

The 460's universal range from 190-480VAC, 50/60 Hz provides the versatility needed to handle global applications.

Four adjustment pots provide versatility for a variety of applications.

Diagnostic LEDs indicate trip status and provide simple troubleshooting.

Microcontroller-based circuitry provides better accuracy and higher reliability than analog designs.

Single-phase conditions are detected regardless of regenerated voltages.

Transient protection meets IEEE and IEC standards and permits operation under tough conditions.

MotorSaver® THREE-PHASE ELECTRIC MOTOR PROTECTOR

Model 460

Three-Phase Voltage Monitor

•

Engineered Protection

•

Microcontroller Based

The **Model 460** is designed to protect 3-phase motors from damaging power conditions. The 460's wide operating range combined with UL and CE compliance enables quick access to domestic and global markets.

A unique microcontroller-based voltage and phase-sensing circuit constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for a specified amount of time (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

The Model 460 automatically senses whether it is connected to a 190-240V, 60Hz system, a 440-480V, 60Hz system, or a 380-416V, 50Hz system. An adjustment is provided to set the nominal line voltage from 190-240 or 380-480VAC. Other adjustments include a 1-30 second trip delay, 1-500 second restart delay, and 2-8% voltage unbalance trip point.

Protects 3-Phase Motors from:

- Loss of any phase
- Low voltage
- High voltage
- Voltage unbalance
- Phase reversal
- Rapid cycling

Additional Features:

- Compact design
- UL and cUL listed
- CE compliant
- Finger-safe terminals
- 5-year warranty
- Made in USA
- Standard surface or DIN rail mountable
- Standard 1-500 sec. variable restart delay
- Standard 2-8% variable voltage unbalance
- Standard 1-30 sec. variable trip delay
- One 10 amp general purpose Form C relay
- Optional manual reset

SymCom Inc
Motor Protection & Controls Since 1974

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www.symcominc.com • email: sales@symcominc.com

10/05

MotorSaver®
THREE-PHASE ELECTRIC MOTOR PROTECTOR

Specifications
•
Operating Points
•
Special Options

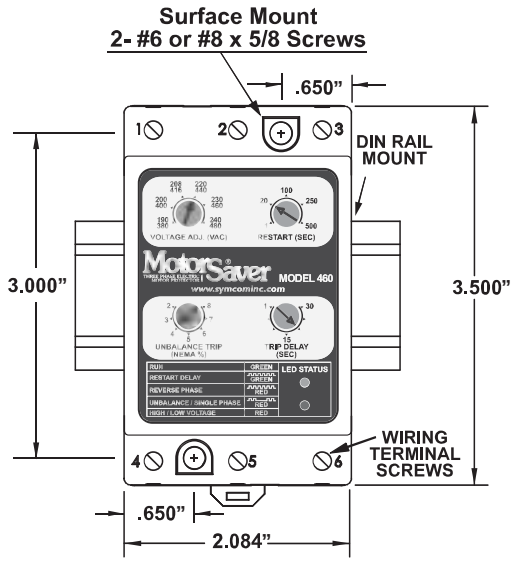
Model 460
Three-Phase Voltage Monitor

Specifications

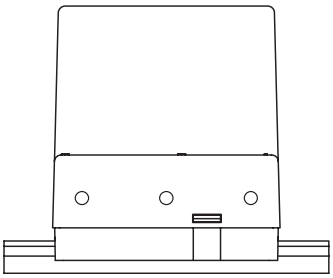
3-Phase Line Voltage	190-480VAC (475-600VAC optional) (95-120VAC optional)
Frequency	50*/60Hz
Low Voltage (% of setpoint)	
•Trip	90% ±1%
•Reset	93% ±1%
High Voltage (% of setpoint)	
•Trip	110% ±1%
•Reset	107% ±1%
Voltage Unbalance (NEMA)	
•Trip	2-8% adjustable
•Reset	Trip setting minus 1% (5 - 8%) Trip setting minus .5% (2 - 4%)
Trip Delay Time	
•Low, High and Unbalanced Voltage	1-30 seconds adjustable
•Single-Phasing Faults	1 second fixed
Restart Delay Time	
•After a Fault	1-500 seconds adjustable
•After a Complete Power Loss	1-500 seconds adjustable
Output Contact Rating	
•1-Form C	10A General Purpose @ 240VAC Pilot Duty 480VA @ 240VAC, B300
Power Consumption	6 Watts (max.)
Weight	14 oz.
Enclosure	Polycarbonate
Terminal Torque	6 in.-lbs.
Wire Type	Stranded or solid 12-20 AWG, one per terminal
Safety Marks	
•UL	UL508
•CE	IEC 60947-6-2
Standards Passed	
•Electrostatic Discharge (ESD)	IEC 1000-4-2, Level 3, 6kV contact, 8kV air
•Radio Frequency Immunity, Radiated	150 MHz, 10V/m
•Fast Transient Burst	IEC 1000-4-4, Level 3, 3.5kV input power & controls
Surge	
•IEC	IEC 1000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
•ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
•Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Environmental	
Temperature Range	Ambient Operating: -20° to 70° C (-4° to 158°F) Ambient Storage: -40° to 80° C (-40° to 176°F)
Class of Protection	IP20, NEMA 1 (FINGER SAFE)
Relative Humidity	10-95%, non-condensing per IEC 68-2-3
Special Options	
Manual Reset	External momentary pushbutton required.

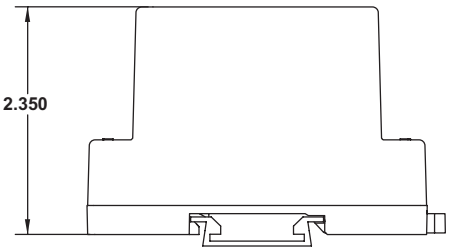
*Note: 50 Hz will increase all delay timers by 20%

SymCom warrants its microcontroller based products against defects in material or workmanship for a period of five (5) years from the date of manufacture. All other products manufactured by SymCom shall be warranted against defects in material and workmanship for a period of two (2) years from the date of manufacture. For complete information on warranty , liability, terms, returns, and cancellations, please refer to the SymCom Terms and Conditions of Sale document.

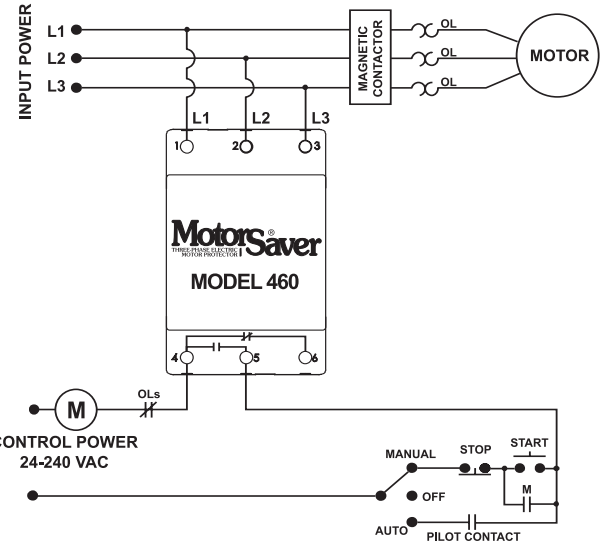


FRONT VIEW


BOTTOM VIEW



SIDE VIEW



TYPICAL WIRING DIAGRAM

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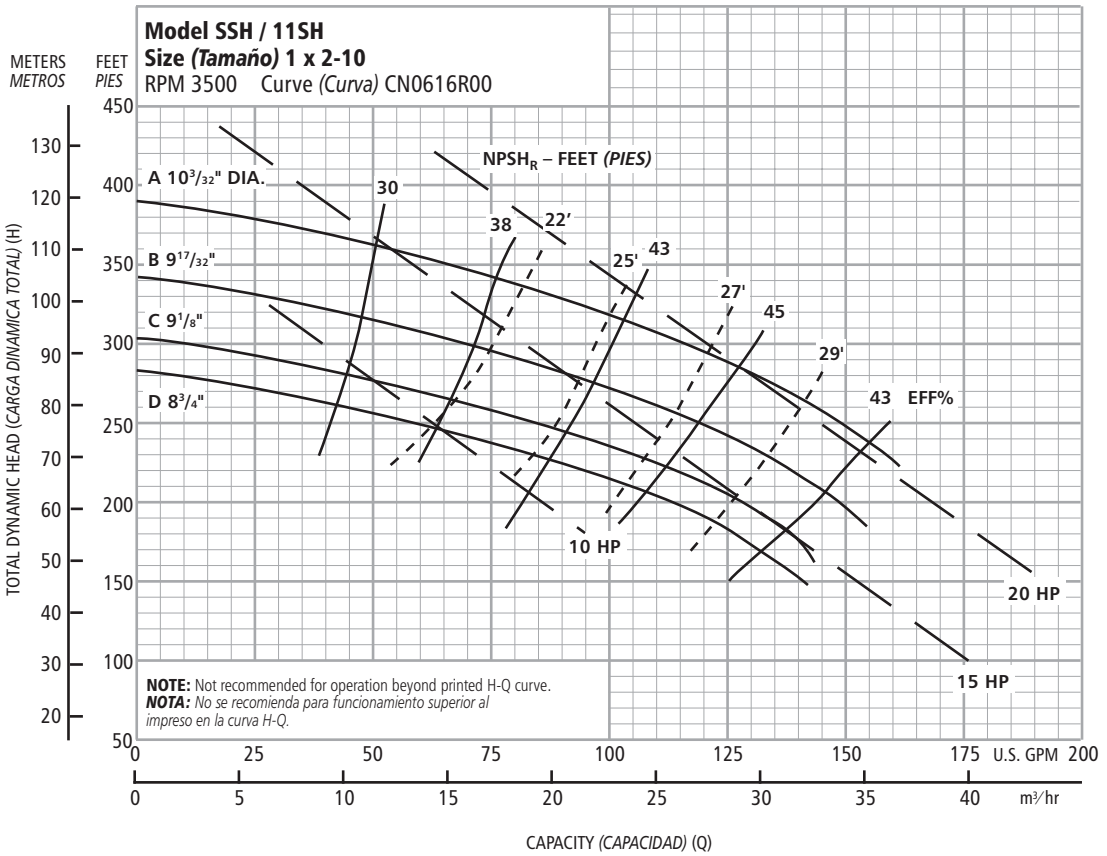
10/05

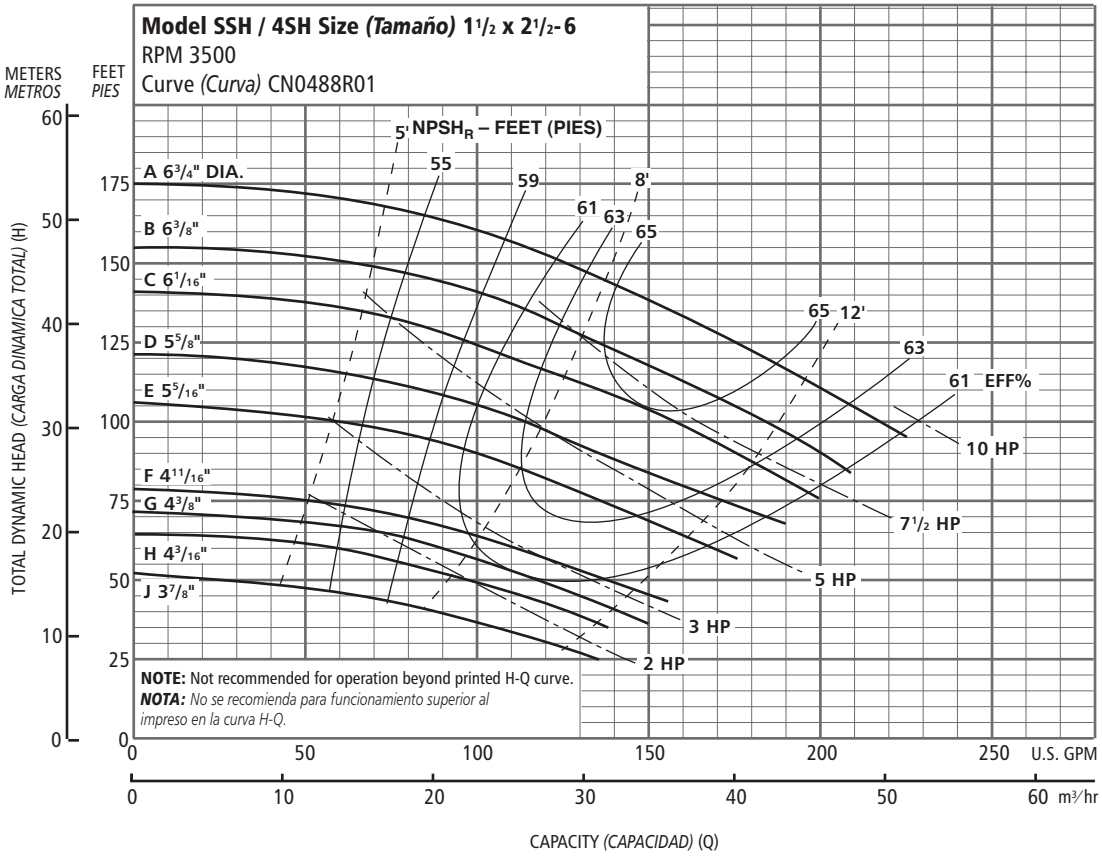
Performance Curves – 60 Hz, 3500 RPM
Curvas de Funcionamiento – 60 Hz, 3500 RPM



Optional Impeller, *Impulsor Opcional*		
Impeller Code, *Código del Impulsor*	**Dia., *Diá.***	**Standard HP Rating, *Estándar HP Potencia***
A	10 3/32"	20
B	9 17/32	15
C	9 1/8	15
D	8 3/4	15

NOTE: Pump will pass a sphere to 1/8" diameter.

NOTA: *La bomba pasará una esfera a 1/8" diámetro.*



Optional Impeller, *Impulsor Opcional*		
Impeller Code, *Código del Impulsor*	**Dia., *Diá.***	**Standard HP Rating, *Estándar HP Potencia***
A	6 3/4"	10
B	6 3/8	7 1/2
C	6 1/16	7 1/2
D	5 5/8	5
E	5 5/16	5
F	4 11/16	3
G	4 3/8	3
H	4 3/16	2
J	3 3/8	2

NOTE: Pump will pass a sphere to 3/16" diameter.

NOTA: *La bomba pasará una esfera a 3/16" diámetro.*

GOULDS PUMPS

Wastewater Pumps
Dewatering, Effluent and Sewage
Installation and Operation Manual

Owner's Information

Pump Model Number: _____

Pump Serial Number: _____

Control Model Number: _____

Dealer: _____

Dealer Phone No. _____

Date of Purchase: _____ Installation: _____

Current Readings at Startup:

1Ø	3Ø	L1-2	L2-3	L3-1
Amps: _____	Amps: _____	_____	_____	_____
Volts: _____	Volts: _____	_____	_____	_____

Table of Contents

Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠ WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void manufacturer's warranty.

⚠ WARNING Standard units are not designed for use in swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist. These fluids and gases may be present in containment areas. Tank or wetwell must be vented per local codes.

Only pumps specifically Listed for Class 1, Division 1 are allowable in hazardous liquids and where flammable gases may exist. *See specific pump catalog bulletins or pump nameplate for all agency Listings*.

⚠ WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment. Many pumps are equipped with automatic thermal overload protection which may allow an overheated pump to restart unexpectedly.

⚠ CAUTION All three phase (3Ø) control panels for submersible pumps must provide Class 10, quick-trip, overload protection.

PRE-INSTALLATION CHECKS

Open all cartons and inspect for shipping damage. Report any damage to your supplier or shipping carrier immediately.

Important: Always verify that the pump nameplate Amps, Voltage, Phase, and HP ratings match your control panel and power supply.

Many of our sewage pumps are oil-filled. If there are any signs of oil leakage or if the unit has been stored for an extended period check the oil level in the motor dome and the seal housing, if so equipped.

Check the motor cover oil level through the pipe plug on top of the unit. The motor chamber oil should just cover the motor. Do not overfill, leave room for expansion!

To check the seal housing oil level, where used, lay the unit on its side with the fill plug at 12 o'clock. Remove the plug. The oil should be within ½" (13mm) of the top. If low, refill with an ASTM 150 turbine oil. Replace the plug.

Oil is available in 5 gallon cans through our distributors. You can also source oil locally at motor repair shops. Typical oil brands are: Shell Turbo 32, Sunoco Sunvis 932, Texaco Regal R&O 32, Exxon Nuto 32 and Mobil DTE Light.

Check the strain relief nut on power cable strain assemblies. Power cables should be torqued to 75 in. lbs. for #16 cables and 80 in. lbs. for all other cable assemblies. Seal/heat sensor cables, where used, should be torqued to 75 in. lbs.

Warranty does not cover damage caused by connecting pumps and controls to an incorrect power source (voltage/phase supply).

Record the model numbers and serial numbers from the pumps and control panel on the front of this instruction manual for future reference. Give it to the owner or affix it to the control panel when finished with the installation.

LIFTING OF PUMP

⚠ WARNING

Hazardous voltage can shock, burn or cause death.

DO NOT LIFT, CARRY OR HANG PUMP BY THE ELECTRICAL CABLES. DAMAGE TO THE ELECTRICAL CABLES CAN CAUSE SHOCK, BURNS OR DEATH.

Lift the pump with an adequately sized chain or cable attached to the lifting eye bolt. **DO NOT** damage electrical and sensor cables while raising and lowering unit.

OPTIONAL GUIDE RAIL OR LIFT-OUT SYSTEM

In many effluent and sewage basins or lift stations it is advisable to install the pump on a guide rail system or on a lift-out adapter to facilitate installation and removal for inspection and/or service. Most codes do not allow personnel to enter a wetwell without the correct protective equipment and training. Guide rails are designed to allow easy removal of the pump without the need for entry into the wetwell or need to disturb piping. The guide rail or lift-out adapter should locate the pump opposite the influent

opening preventing stagnate areas where solids can settle. The basin or pit must be capable of supporting the weight of the pump and guide rail. The pit floor must be flat.

NOTICE: FOLLOW THE INSTRUCTIONS THAT ARE PROVIDED WITH THE GUIDE RAIL ASSEMBLY.

PIPING

Discharge piping should be no smaller than the pump discharge diameter and kept as short as possible, avoiding unnecessary fittings to minimize friction losses.

Install an adequately sized check valve matched to the solids handling capability of the pump to prevent fluid backflow. Backflow can allow the pump to "turbine" backwards and may cause premature seal and/or bearing wear. If the pump is turning backwards when it is called on to start the increased torque may cause damage to the pump motor and/or motor shaft and some single-phase pumps may actually run backwards.

Install an adequately sized gate valve **AFTER** the check valve for pump, plumbing and check valve maintenance.

Important – Before pump installation. Drill a 3⁄16" (4.8mm) relief hole in the discharge pipe. It should be located within the wetwell, 2" (51mm) above the pump discharge but below the check valve. The relief hole allows any air to escape from the casing. Allowing liquid into the casing will insure that the pump can start when the liquid level rises. Unless a relief hole is provided, a bottom intake pump could "air lock" and will not pump water even though the impeller turns.

All piping must be adequately supported, so as not to impart any piping strain or loads on the pump.

The pit access cover must be of sufficient size to allow for inspection, maintenance and crane or hoist service.

WIRING AND GROUNDING

Important notice: Read Safety Instructions before proceeding with any wiring.

⚠ Use only stranded copper wire to pump/motor and ground. The ground wire must be at least as large as the power supply wires. Wires should be color coded for ease of maintenance and troubleshooting.

⚠ Install wire and ground according to the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes.

⚠ Install an all leg disconnect switch where required by code.

⚠ Disconnect and lockout electrical power before performing any service or installation.

⚠ The electrical supply voltage and phase must match all equipment requirements. Incorrect voltage or phase can cause fire, motor and control damage, and voids the warranty.

⚠ All splices must be waterproof. If using splice kits follow manufacturer's instructions.

⚠ WARNING Select the correct type and NEMA grade junction box for the application and location. The junction box must insure dry, safe wiring connections.

⚠ WARNING Seal all controls from gases present which may damage electrical components.

⚠ WARNING Hazardous voltage

FAILURE TO PERMANENTLY GROUND THE PUMP, MOTOR AND CONTROLS BEFORE CONNECTING TO POWER CAN CAUSE SHOCK, BURNS OR DEATH.

SELECTING AND WIRING PUMP CONTROL PANELS AND SWITCHES

FLOAT SWITCH TYPES

There are two basic float switch designs; single-action and wide-angle. Single-action switches operate over a range of 15° so they open and close quickly. Wide-angle floats operate over a 90° swing with the tether length between the float body and the pivot point controlling the On-Off range. The design determines how many floats are required with different systems or controls.

Floats may be normally open (NO) for pump down applications or to empty a tank. Normally closed (NC) switches are used to pump up or to fill a tank.

A single-action control switch may be used only with a control panel, never direct connected to a pump.

The wide-angle, pump down switches may be used as direct connected pump switches or as control switches.

SETTING THE FLOAT SWITCHES

There are no absolute rules for where to set the float switches, it varies from job to job.

Suggested Rules to Follow:
All floats should be set below the Inlet pipe!

Off Float: Best: set so the water level is always above the top of the pump (motor dome). **Next Best:** set so the water level is not more than 6" below the top of the pump.

On Float: set so the volume of water between the On and Off floats allows pumps of 1½ HP and under to operate for 1 minute minimum. Two (2) HP and larger pumps should run a minimum of 2 minutes. Basin literature states the gallons of storage per inch of basin height.

Lag/Alarm Float(s): should be staggered above the Off and On floats. Try to use most of the available storage provided by the basin, save some space for reserve storage capacity. *See Diagrams and Charts in Float Switch Chart Section.*

PANEL WIRING DIAGRAMS

Our control panels are shipped with instructions and wiring diagrams. Use those instructions in conjunction with this IOM. Electrical installation should be performed only by qualified technicians. Any problem or questions pertaining to another brand control must be referred to that control supplier or manufacturer. Our technical people have no technical schematics or trouble shooting information for other companies' controls.

ALARMS

We recommend the installation of an alarm on all Wastewater pump installations. Many standard control panels come equipped with alarm circuits. If a control panel is not used, a stand alone high liquid level alarm is available. The alarm alerts the owner of a high liquid level in the system so they can contact the appropriate service personnel to investigate the situation.

SINGLE PHASE PUMPS
Single phase (1Ø) pumps may be operated using a piggyback or hard wired float switch, a contactor, or a Simplex or Duplex control panel. *See Figures 1, 2 and 5*.

All 1/3 and 1/2 HP, 115 or 230 volt pumps, and some 3/4 and 1 HP pumps, are supplied with plug style power cords. They may be plugged into piggyback float switches for simple installations. It is allowable to remove the plugs in order to hardwire or connect to a Simplex or Duplex controller. Removing the plug neither voids the warranty nor violates the agency Listings. *See Figure 5*.

PLUG-CONNECTED UNITS MUST BE CONNECTED TO A PROPERLY GROUNDED, GROUNDING TYPE RECEPTACLE.

ON NON-PLUG UNITS, DO NOT REMOVE CORD AND STRAIN RELIEF. DO NOT CONNECT CONDUIT TO PUMP.

Pumps with bare lead power cords can be hard-wired to a float switch, wired to a 1Ø contactor, a Simplex controller or a Duplex controller. Always verify that the float switch is rated for the maximum run amperage, maximum starting amperage, and the HP rating on the pump. Single-phase wastewater pumps contain on-winding overloads, unless noted on the pump nameplate. *See Figures 1 and 2*.

THREE PHASE PUMPS:
As a Minimum a 3Ø pump requires a 3 pole circuit breaker/fused circuit, an across the line magnetic starter rated for the pump HP, and ambient compensated Quick Trip Class 10 overloads.

SINGLE AND THREE PHASE CONTROL PANELS:
Control panels are available as Simplex (controls 1 pump) or Duplex (controls 2 pumps). Our standard SES Series Panels are available with many standard features and can be built with our most popular options. We also custom build panels which offer many more design options than the SES panels. Custom control panels are available in many different configurations. Custom panel quote requests may be forwarded to Customer Service through any authorized distributor.

Our "SES" Duplex panels feature a solid-state printed circuit board design with standard high level alarm circuits. Other standard features are: an auxiliary dry alarm contact for signaling a remote alarm and float switch position indicator lights. Our 3Ø panels have built-in, adjustable, Class 10 overloads. The adjustable overloads on all our 3Ø panels mean less labor for the installer and no need to order specific overloads. Most SES panels are in stock for immediate delivery.

On pumps equipped with seal fail and/or heat (high temperature) sensors it is recommended that you use our control panel with the appropriate options. The pump sensors do not function without a seal fail relay or terminal connection in the control panel and a warning device such as a bell, horn or light.

Seal Failure Circuit - Some dual seal pumps are equipped with a standard, built-in seal failure circuit, which may also be called a moisture detection circuit. This circuit must be connected to a control panel with an optional seal fail relay. The panel must be special ordered with the seal fail relay and alarm. There are also stand alone seal fail panels such as the A4-3 or A4-4 available as standard items. The pumps can be identified by an extra control cable exiting the motor cover. The cable contains two wires, a black wire, connects to panel "terminal" going to "probe"; and a white wire, connects to the panel "terminal" going to the relay ground. Do not connect to the panel ground screw. Follow the wiring instructions supplied with the panel.

Heat Sensor and Seal Failure Circuit - Some pumps are equipped with a seal fail and normally closed, on-winding high temperature thermostats (heat sensors). The pumps have a control cable with four (4) leads, black (probe) and green (relay ground) for the seal fail circuit and red and white for the high temperature circuit. Connect the high temperature (heat sensor) circuit to the panel terminal strip as indicated on the panel drawing using the red and white wires. The high temperature panel circuit is also an optional item which you must specifically order when you order your control panel. The high temperature circuit is different from the Class 10 overloads which are always required on three phase pumps. *Follow the wiring instructions supplied with the panel*.

INSTALLATION

Connect the pump(s) to the guide rail pump adapters or to the discharge piping. Slide rail bases should be anchored to the wetwell floor.

Complete all wiring per the control panel wiring diagrams and NEC, Canadian, state, provincial and/or local codes. This a good time to check for proper rotation of the motors/impellers.

DO NOT PLACE HANDS IN PUMP SUCTION WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

Always verify correct rotation. Correct rotation is indicated on the pump casing. Three phase motors are reversible. It is allowable to bump or jog the motor for a few seconds to check impeller rotation. It is easier to check rotation before installing the pump. Switch any two power leads to reverse rotation.

Lower the pump(s) into the wetwell.

Check to insure that the floats will operate freely and not contact the piping.

OPERATION

Once the piping connections are made and checked you can run the pumps.

Piggyback Switch Operation – Plug the piggyback switch into a dedicated grounded outlet and then plug the pump into the switch. Test the pump by filling the wetwell until the pump goes On. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Check the operating range to insure a minimum one minute run time and that the pump goes Off in the correct position.

Control Panel Operation – Fill the wetwell with clear water.

Use the pump H-O-A (Hand-Off-Automatic) switches in Hand to test the pumps. If they operate well in Hand proceed to test Automatic operation. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Place Control Panel switch(es) in Automatic position and thoroughly test the operation of the ON, OFF, and Alarm floats by filling the wetwell with clear water. **Important:** Failure to provide a Neutral from the power supply to a 1Ø, 230 volt Control Panel will not allow the panel control circuit to operate. The Neutral is necessary to complete the 115 volt control circuit.

Check voltage and amperage and record the data on the front of this manual for future reference. Compare the amperage readings to the pump nameplate maximum amperage. If higher than nameplate amperage investigate cause. Operating the pump off the curve, i.e. with too little head or with high or low voltage will increase amperage. The motor will operate properly with voltage not more than 10% above or below pump nameplate ratings. Performance within this range will not necessarily be the same as the published performance at the exact rated nameplate frequency and voltage. Correct the problem before proceeding. Three phase unbalance is also a possible cause. *See Three Phase Power Unbalance and follow the instructions*.

Reset the Alarm circuit, place pump switch(es) in the Automatic position and Control Switch in ON position. The system is now ready for automatic operation.

Explain the operation of the pumps, controls and alarms to the end user. Leave the paperwork with the owner or at the control panel if in a dry, secure location.

FLOAT SWITCH AND PANEL CHART

The purpose of this chart is to show the required switch quantities and the function of each switch in a typical wastewater system. The quantities required vary depending on the switch type, single-action or wide-angle. Switch quantities also vary by panel type: simplex with and without alarms, and duplex with alarms.

Duplex Panels using single-action switches:

Three Float Panel Wiring

SW1	Bottom	Pumps Off
SW2	Middle	1st Pump On
SW3	Top	2nd Pump & Alarm On

Four Float Panel Wiring ②

SW1	Bottom	Pumps Off
SW2	2nd	1st Pump On
SW3	3rd	2nd Pump On
SW4	Top	Alarm On

Duplex Panels using wide-angle switches:

Three Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Top	2nd Pump & Alarm On

Four Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Middle	2nd Pump On
SW3	Top	Alarm On

Simplex Panel using single-action switches:

Simplex Panel with Alarm ①

SW1	Bottom	Pump Off
SW2	Middle	Pump On
SW3	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Bottom	Pump Off
SW2	Top	Pump On

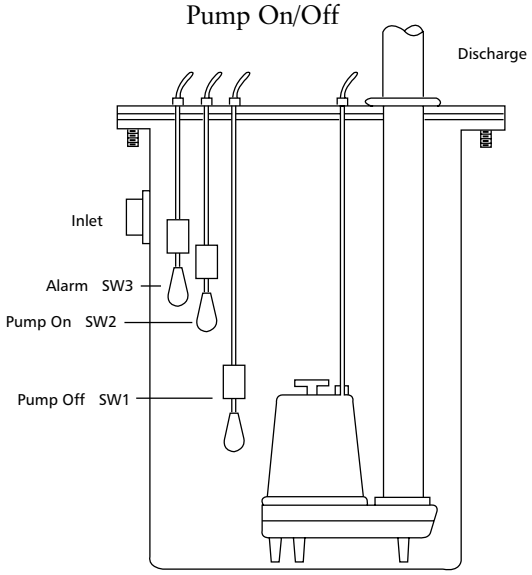
Simplex Panel using wide-angle switches:

Simplex Panel with Alarm

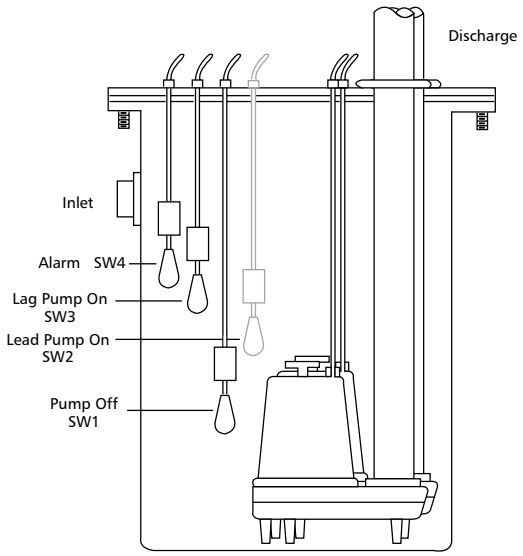
SW1	Bottom	Pump On/Off
SW2	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Pump On/Off



Simplex ①



Duplex ②

THREE PHASE POWER UNBALANCE

A full three phase supply consisting of three individual transformers or one three phase transformer is recommended. "Open" delta or wye connections using only two transformers can be used, but are more likely to cause poor performance, overload tripping or early motor failure due to current unbalance.

Check the current in each of the three motor leads and calculate the current unbalance as explained below.

If the current unbalance is 2% or less, leave the leads as connected.

If the current unbalance is more than 2%, current readings should be checked on each leg using each of the three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.

To calculate percent of current unbalance:

A. Add the three line amp values together.

B. Divide the sum by three, yielding average current.

C. Pick the amp value which is furthest from the average current (either high or low).

D. Determine the difference between this amp value (furthest from average) and the average.

E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.

Current unbalance should not exceed 5% at service factor load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the power source.

Contact your local power company to resolve the imbalance.

	Hookup 1			Hookup 2			Hookup 3		
Starter Terminals	L1	L2	L3	L1	L2	L3	L1	L2	L3
	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T
Motor Leads	R	B	W	W	R	B	B	W	R
	T3	T1	T2	T2	T3	T1	T1	T2	T3

Example:

Hookup 1	Hookup 2	Hookup 3
T3-R = 51 amps	T2-W = 50 amps	T1-B = 50 amps
T1-B = 46 amps	T3-R = 48 amps	T2-W = 49 amps
T2-W = 53 amps	T1-B = 52 amps	T3-R = 51 amps
Total = 150 amps	Total = 150 amps	Total = 150 amps
÷ 3 = 50 amps	÷ 3 = 50 amps	÷ 3 = 50 amps
— 46 = 4 amps	— 48 = 2 amps	— 49 = 1 amps
4 ÷ 50 = .08 or 8%	2 ÷ 50 = .04 or 4%	1 ÷ 50 = .02 or 2%

INSULATION RESISTANCE READINGS

Normal Ohm and Megohm Values between all leads and ground

Condition of Motor and Leads	Ohm Value	Megohm Value
A new motor (without drop cable).	20,000,000 (or more)	20 (or more)
A used motor which can be reinstalled in well.	10,000,000 (or more)	10 (or more)
Motor in well. Readings are for drop cable plus motor.		
New motor.	2,000,000 (or more)	2 (or more)
Motor in good condition.	500,000 - 2,000,000	.5 - 2
Insulation damage, locate and repair.	Less than 500,000	Less than .5

Insulation resistance varies very little with rating. Motors of all HP, voltage and phase ratings have similar values of insulation resistance.

Insulation resistance values above are based on readings taken with a megohmmeter with a 500V DC output. Readings may vary using a lower voltage ohmmeter, consult factory if readings are in question.

This table was reprinted through the courtesy of Franklin Electric.

Engineering data for specific models may be found in your catalog and on our website (address is on the cover).

Control panel wiring diagrams are shipped with the control panels. Please use the control panel drawings in conjunction with this instruction manual to complete the wiring.

PUMP CONSTRUCTION

Minimum Submergence	
Continuous Duty	Fully Submerged
Intermittent Duty	6" Below Top of Motor

Maximum Fluid Temperature	
Continuous Operation	104º F 40º C
Intermittent Operation	140º F 60º C

Pumpmaster and Pumpmaster Plus - Hard Wired

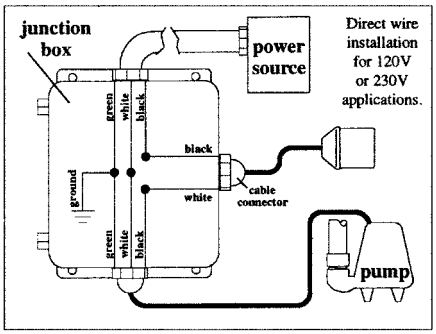


Fig. 1

Single-Action Float Switch "Typical" Installation

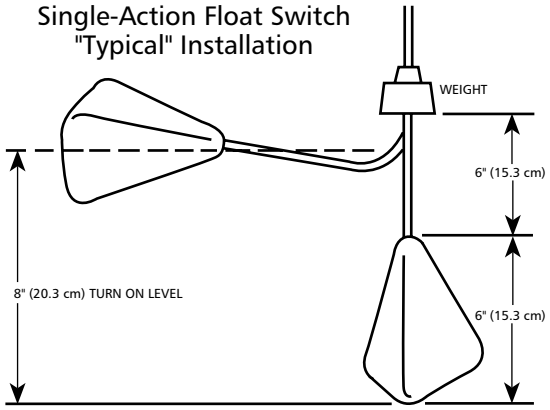


Fig. 4

Double Float - Hard Wired

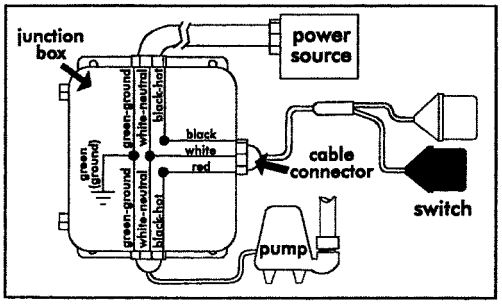


Fig. 2

Wide-Angle Float Switch

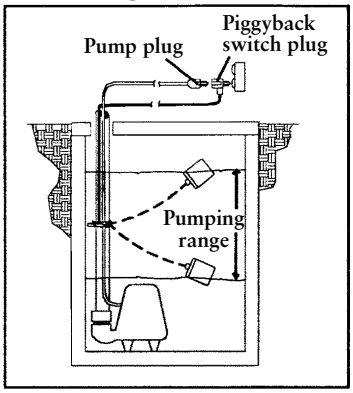


Fig. 5

Determining Pumping Range

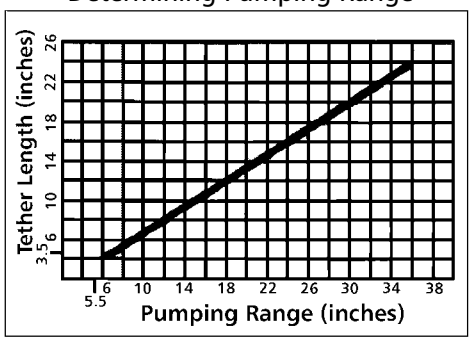


Fig. 3

Three Phase Connection Diagram

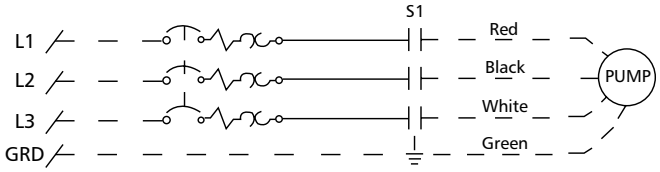
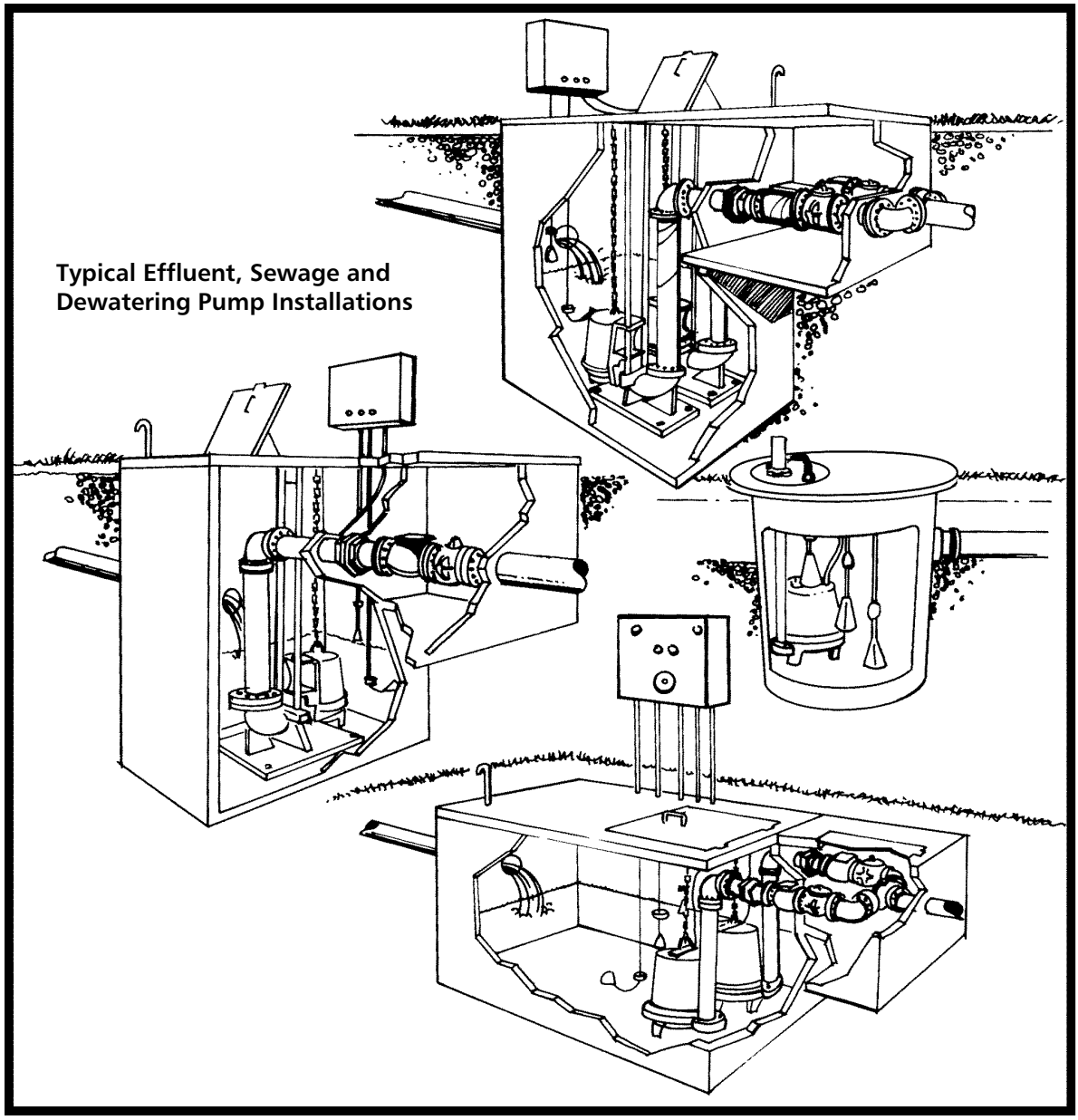


Fig. 6


Typical Effluent, Sewage and
Dewatering Pump Installations

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE CAN CAUSE SHOCK, BURNS OR DEATH.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
MOTOR NOT RUNNING **NOTE:** If circuit breaker "OPENS" repeatedly, **DO NOT** reset. Call qualified electrician.	Motor thermal protector tripped.	Allow motor to cool. Insure minimum pump submergence. Clear debris from casing and impeller.
	Open circuit breaker or blown fuse.	Determine cause, call a qualified electrician.
	Pump impeller binding or jammed.	Check motor amp draw. If two or more times higher than listed on pump nameplate, impeller is locked, motor bearings or shaft is damaged. Clear debris from casing and impeller, consult with dealer.
a) Manual operation	Power cable is damaged.	
	Inadequate electrical connection in control panel.	
b) Automatic operation	No neutral wire connected to control panel.	Resistance between power leads and ground should read infinity. If any reading is incorrect, call a qualified electrician.
	Inadequate electrical connection in control panel.	Inspect control panel wiring. Call a qualified electrician.
NOTE: Check the pump in manual mode first to confirm operation. If pump operates, the automatic control or wiring is at fault. If pump does not operate, see above.	Defective liquid level switch.	With switch disconnected, check continuity while activating liquid level switch. Replace switch, as required.
	Insufficient liquid level to activate controls.	Allow liquid level to rise 3" to 4" (76 mm - 101 mm) above turn-on level.
	Liquid level cords tangled.	Untangle cords and insure free operation.
PUMP WILL NOT TURN OFF	Liquid level cords tangled.	Untangle cords and insure free operation.
	Pump is air locked.	Shut off pump for approximately one minute, then restart. Repeat until air lock clears. If air locking persists in a system with a check valve, a 3⁄16" (4.8 mm) hole may be drilled in the discharge pipe approximately 2" (51 mm) above the discharge connection.
	Influent flow is matching pump's discharge capacity.	Larger pump may be required.
LITTLE OR NO LIQUID DELIVERED BY PUMP	Check valve installed backwards, plugged or stuck closed.	Check flow arrow on valve and check valve operation.
	Excessive system head.	Consult with dealer.
	Pump inlet plugged.	Inspect and clear as required.
	Improper voltage or wired incorrectly.	Check pump rotation, voltage and wiring. Consult with qualified electrician.
	Pump is air locked.	See recommended action, above.
	Impeller is worn or damaged.	Inspect impeller, replace as required.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
PUMP CYCLES CONSTANTLY	Discharge check valve inoperative.	Inspect, repair or replace as required.
	Sewage containment area too small.	Consult with dealer.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
	Influent excessive for this size pump.	Consult with dealer.

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Pumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

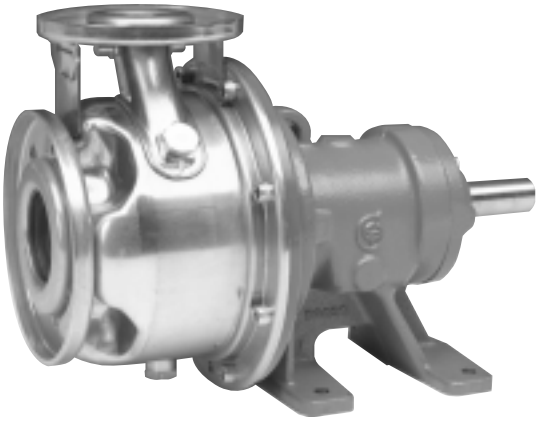
Goulds Pumps

ITT Industries

G&L Pumps

Installation, Operation and Maintenance Instructions

Models SSH-C and SSH-F



Owner's Information

Please fill in data from your pump nameplate.
Warranty information is on page 28.

Pump Model: _____

Serial Number: _____

Dealer: _____

Dealer's Phone Number: _____

Date of Purchase: _____

Installation Date: _____

Table of Contents

Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL.** When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠WARNING

Hazardous fluids can cause fire, burns or death.

UNIT NOT DESIGNED FOR USE WITH HAZARDOUS LIQUIDS OR FLAMMABLE GASES. THESE FLUIDS MAY BE PRESENT IN CONTAINMENT AREAS.

NOTICE: INSPECT UNIT FOR DAMAGE AND REPORT ALL DAMAGE TO THE CARRIER OR DEALER IMMEDIATELY.

1. Important Instructions

1. Inspect unit for damage. Report damage to carrier immediately.
2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

⚠WARNING

Hazardous voltage can shock, burn or cause death.

ALWAYS DISCONNECT ELECTRICAL POWER WHEN HANDLING PUMP OR CONTROLS.

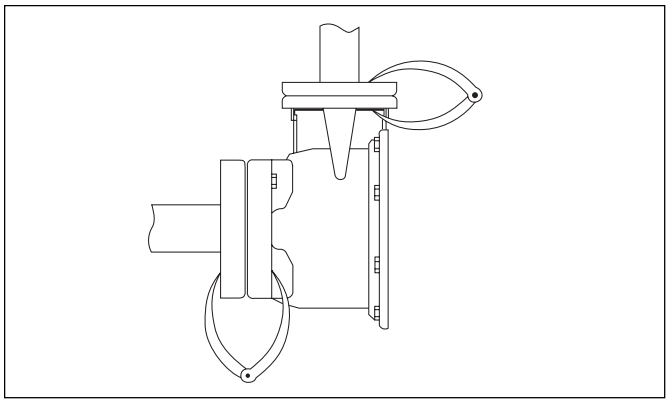
3. Motors must be wired for proper voltage (check nameplate). Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.
4. **Single-Phase:** Thermal protection for single-phase units is sometimes built-in (Check nameplate). If no built-in protection is provided, use a contactor with proper overload. Fusing is permissible if properly fused.
5. **Three-Phase:** Provide three-leg protection with proper size magnetic starter and thermal overloads.
6. Maximum Liquid Temperatures:
   212°F (100°C) with standard seal.
   250°F (120°C) with optional high-temperature seal.
7. Maximum allowable operating pressure: 230 PSI (15 bars).
8. Maximum number of starts per hour: 20, evenly distributed.
9. Regular Inspection and Maintenance will increase service life. Base schedule on operating time.

2. Installation

1. Close-coupled units may be installed inclined or vertical.

⚠ CAUTION **DO NOT INSTALL WITH MOTOR BELOW PUMP. CONDENSATION WILL BUILD UP IN MOTOR.**

2. Locate pump as near liquid source as possible (below level of liquid for automatic operation).
3. Protect from freezing or floods.
4. Allow adequate space for servicing and ventilation.
5. For close-coupled pumps, the foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration. Tighten motor hold-down bolts before connecting piping to pump.
6. For frame-mounted pumps, permanent and solid foundation is required for smooth operation. Bedplate must be grouted to a foundation with solid footing.
7. Place unit in position on wedges located at four points (Two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit, bringing coupling halves into reasonable alignment. Level or plumb suction and discharge flanges.
8. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming if necessary.
9. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before further tightening foundation bolts.
10. All piping must be supported independently of the pump, and must "line-up" naturally. **Never draw piping into place by forcing the pump suction and discharge connections!**
11. Angular alignment of the flanges can best be accomplished using calipers at bolt locations (See illustration).



12. On frame-mounted units, tighten foundation, pump and driver hold-down bolts before connecting piping to pump.
13. Avoid unnecessary fittings. Select sizes to keep friction losses low.
14. After completing piping, rotate unit by hand to check for binding. **Note:** A screwdriver slot or flats are provided in end of motor shaft.

3. Alignment

1. No field alignment is necessary on close-coupled pumps.
2. Even though the pump-motor unit may have a factory alignment, in transit this alignment could be disturbed and must be checked prior to running.
3. Check the tightness of all hold-down bolts before checking the alignment.
4. If re-alignment is necessary, always move the motor. Shim as required.
5. Final alignment is achieved when parallel and angular requirements are achieved with both pump and motor hold down bolts tight.

⚠CAUTION **ALWAYS RECHECK BOTH ALIGNMENTS AFTER MAKING ADJUSTMENTS.**

6. Parallel misalignment exists when the shafts are not concentric. Place dial indicator on one hub and rotate this hub 360° while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005" or less.
7. Angular misalignment exists when the shafts are not parallel. Place dial indicator on one hub and rotate this hub 360° while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005" or less.

4. Suction Piping

1. Low static lift and short, direct suction piping is desired. For suction lift over 15 feet, consult pump performance curve for ***Net Positive Suction Head Required***.
2. Suction pipe size must be at least equal to suction connection of pump.
3. If larger pipe is used, an eccentric pipe reducer (with straight side up) must be used at the pump.
4. Installation with pump below source of supply:
   4.1. Install isolation valve in piping for inspection and maintenance.
   4.2. Do not use suction isolation valve to throttle pump!
5. Installation with pump above source of supply:
   5.1. To avoid air pockets, no part of piping should be higher than pump suction connection. Slope piping upwards from liquid source.
   5.2. All joints must be airtight.
   5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.
   5.4. Suction strainer open area must be at least triple the pipe area.
6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump.

5. Discharge Piping

1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or inspection of pump or check valve.
2. If reducer is required, place between check valve and pump.

6. Rotation

⚠WARNING

Hazardous Machinery

DO NOT PLACE HANDS IN PUMP WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

1. Pumps are right-hand rotation (Clockwise when viewed from the driver end). Switch power on and off. Observe shaft rotation. On frame-mounted units, check rotation before coupling pump to motor.
2. Single-Phase: Refer to wiring diagram on motor if rotation must be changed.
3. Three-Phase: Interchange any two power supply leads to change rotation.

7. Operation

1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

⚠CAUTION **PUMPED LIQUID PROVIDES LUBRICATION. IF PUMP IS RUN DRY, ROTATING PARTS WILL SEIZE AND MECHANICAL SEAL WILL BE DAMAGED.**

2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. Check coupling alignment.
3. **Do not operate at or near zero flow.** Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

8. Maintenance

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

1. Bearings are located in and are part of the motor. For lubrication procedure, refer to manufacturer's instructions.
2. On frame-mounted units, regrease at 2,000 hours use or after 3 months. Use #2 Sodium or Lithium grease and fill until grease comes out of the relief fitting.

9. Disassembly

1. Always turn power off.
2. Drain system. Flush if necessary.
3. Remove motor hold-down bolts on close-coupled or disconnect coupling and remove spacer.
4. Remove casing bolts and pump hold-down bolts.
5. Remove motor and rotating element from casing.
6. Unscrew impeller bolt with a socket wrench. **Do not insert screwdriver between impeller vanes to prevent rotation.** It may be necessary to use a strap wrench around the impeller if impacting the socket wrench will not loosen the impeller bolt.
7. Remove impeller o-ring.
8. Insert two pry bars (180° apart) between impeller and seal housing. Pry off impeller.
9. Remove shaft sleeve, seal spring, cupwasher, seal rotary and impeller key.
10. Remove seal housing.
11. Place seal housing on flat surface. Press out stationary seal parts.
12. Remove deflector from shaft on frame-mounted units.
13. Remove bolts holding bearing cover to frame and remove bearing cover (frame-mount).
14. Remove lip seals from bearing frame and bearing cover (frame-mount).
15. Remove shaft and bearings from frame (frame-mount).
16. Remove bearing retaining ring (frame-mount).
17. Use bearing puller or arbor press to remove ball bearings (frame-mount).
18. Remove wear ring if excessively worn. Use pry bar and/or vicegrips.

10. Reassembly

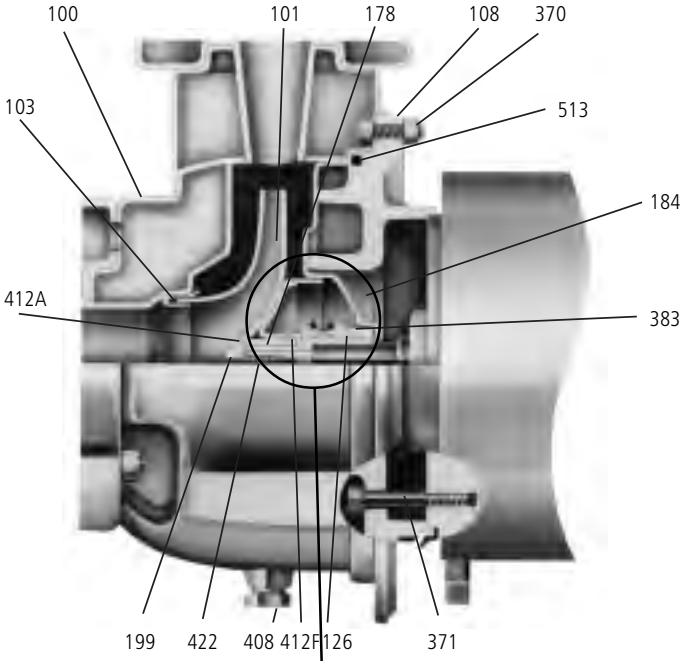
1. All parts should be cleaned before assembly.
2. Refer to parts list to identify required replacement items.
3. Reassembly is the reverse of the disassembly procedure.
4. Replace lip seals if worn or damaged (frame-mount only).
5. Replace ball bearings if loose, rough or noisy when rotated (frame-mount only).
6. Check shaft for maximum runout of .005" TIR. Bearing seats and lip seal areas must be smooth and free of scratches or grooves. Replace if necessary (frame-mount only).
7. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.
8. If wear ring is being replaced, do not use lubricants on the metal-to-metal fit when pressing in the replacement.
9. If the impeller is removed, as for example to effect a mechanical seal change, this procedure must be followed: Old impeller bolt and impeller o-ring cannot be reused.
10. Install the mechanical seal stationary seat in the seal housing, using soapy water as a lubricant to ease insertion.
11. **S-Group –** Install the mechanical seal spring retainer, spring and rotary assembly on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft, be sure that a new shaft sleeve o-ring is used.

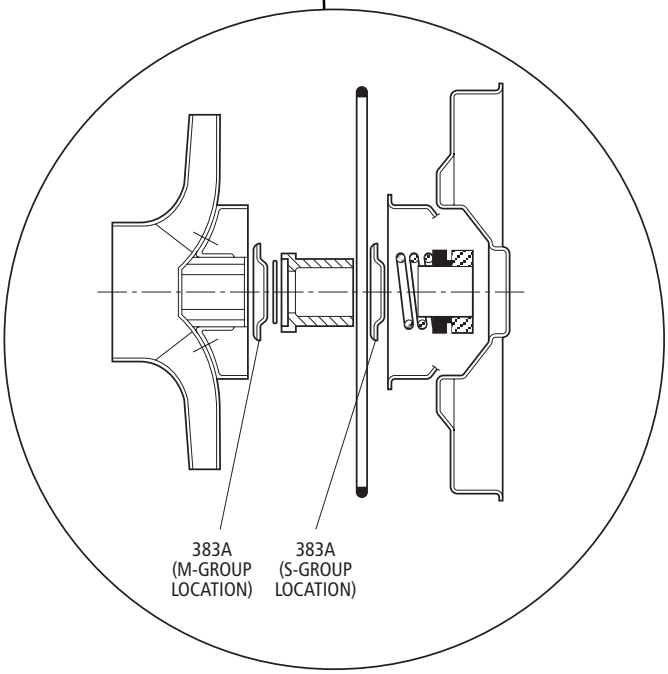
NOTE: THE SHAFT SLEEVE O-RING AND IMPELLER WASHER O-RING ARE ALMOST IDENTICAL IN DIAMETER. BE SURE TO USE THE SQUARE CROSS-SECTION O-RING IN THE IMPELLER WASHER. THE ROUND CROSS-SECTION O-RING IS USED IN THE SHAFT SLEEVE.

11. **M-Group –** Install the mechanical seal spring and rotary on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft. Be sure that a new shaft sleeve o-ring is used. Place the mechanical seal spring retainer over the impeller hub.
12. Place the impeller key into the shaft keyway and slide the impeller in place. Install the impeller stud and impeller washer. Be sure that a new impeller o-ring is used. Tighten S-Group (⅜" thread) to 17 lb.ft. and M-Group (½" thread) to 38 lb.ft.

11. Troubleshooting

1. Motor does not start, and no noise or vibration occurs:
   1.1. Power supply not connected.
   1.2. Fuses or protection device tripped or defective.
   1.3. Loose or broken electrical connections.
2. Motor will not start, but generates noise and vibration:
   2.1. Motor not wired as directed on diagram.
   2.2. Shaft locked due to mechanical obstructions in motor or pump.
   2.3. Low voltage or phase loss on three phase supply.
3. Pump does not deliver rated capacity:
   3.1. Pump not filled and primed.
   3.2. Pump has lost prime due to leaks in suction line.
   3.3. Direction of rotation incorrect. See Rotation.
   3.4. Head required is higher than that originally specified. (Valve may be partially closed.)
   3.5. Foot valve clogged.
   3.6. Suction lift too high.
   3.7. Suction pipe diameter too small.
4. Protection trips as unit starts:
   4.1. Phase loss on three-phase supply.
   4.2. Protection device may be defective.
   4.3. Loose or broken electrical connections.
   4.4. Check motor resistance and insulation to ground.
5. Protection device trips too often:
   5.1. Protection may be set to a value lower than motor full load.
   5.2. Phase loss due to faulty contacts or supply cable.
   5.3. Liquid is viscous or its specific gravity is too high.
   5.4. Rubbing occurs between rotating and stationary parts.
6. Shaft spins with difficulty:
   6.1. Check for obstructions in the motor or the pump.
   6.2. Rubbing occurs between rotating and stationary parts.
   6.3. Check bearings for proper conditions.
7. Pump vibrates, runs noisily, and flow rate is uneven:
   7.1. Pump runs beyond rated capacity.
   7.2. Pump or piping not properly secured.
   7.3. Suction lift too high.
   7.4. Suction pipe diameter too small.
   7.5. Cavitation caused by insufficient liquid supply or excessive suction losses.
   7.6. Impeller blockage.
8. When stopped, unit turns slowly in the reverse direction:
   8.1. Leaks on air locks in suction pipe.
   8.2. Partial blockage in check valve.
9. In pressure boosting applications, the unit starts and stops too often:
   9.1. Pressure switch settings are incorrect.
   9.2. Tank size may be incorrect.
10. In pressure boosting applications, the unit does not stop:
    10.1. Pressure switch maximum setting is higher than was specified.
    10.2. Direction of rotation incorrect. See **Rotation**.



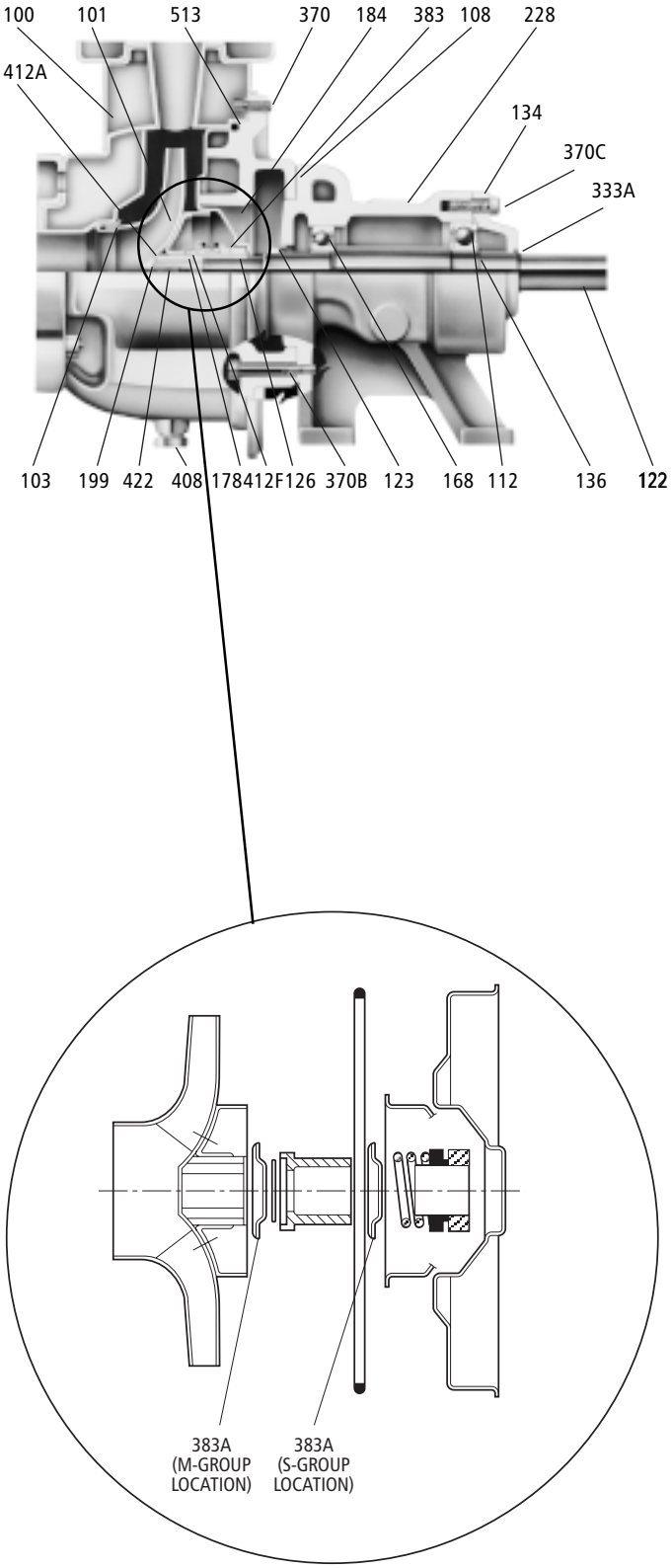


MATERIALS OF CONSTRUCTION

Item	Description	Material
100 101 103 184 370	Casing Impeller Wear Ring Seal Housing Socket Head Cap Screw (Casing to Adapter)	AISI TYPE 316L Stainless Steel
408	Drain Plug — ⅜ NPT	AISI TYPE 316 SS
126	Shaft Sleeve	316 SS
178	Impeller Key	Steel
422	Impeller Stud	Steel
199	Impeller Washer	316 SS
108	Adapter	Cast Iron ASTM A48CL20
371	Hex Head Cap Screw (Adapter to Motor)	Steel
412A	O-ring, impeller	BUNA-N
412F	O-ring, shaft sleeve	BUNA-N
513	O-Ring	BUNA-N
383	Mechanical Seal Part No. 10K13	Carbon/Ceramic Buna Elastomers 316 SS Metal Parts
383A	Spring Retainer	AISI Type 316 SS

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive



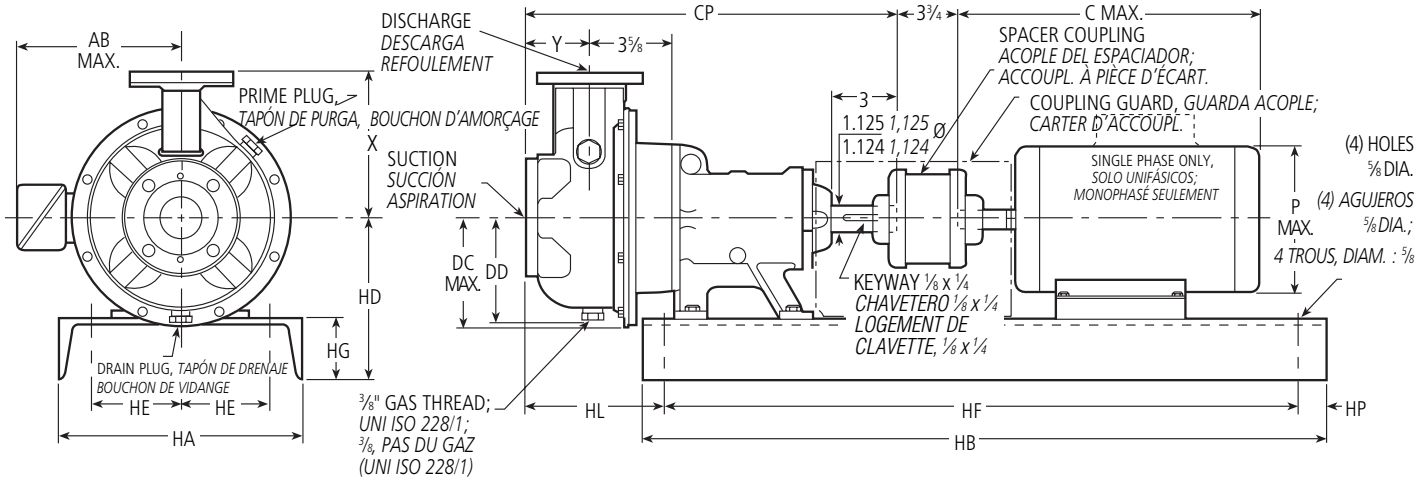
MATERIALS OF CONSTRUCTION

Item		Description	Material
Pump End Components	100 101 103 184 370	Casing Impeller Wear Ring Seal Housing Socket Head Cap Screw	AISI TYPE 316L Stainless Steel
	408	Drain plug – ⅜ NPT	AISI TYPE 316 SS
	126	Shaft Sleeve	316 SS
	178	Impeller Key	Steel
	422	Impeller Stud	Steel
	199	Impeller Washer	316 SS
	412A	O-ring, impeller	BUNA-N
	412F	O-ring, shaft sleeve	BUNA-N
	513	O-Ring	BUNA-N
	383	Mechanical Seal Standard Part No. 10K13	Carbon/Ceramic BUNA-N Elastomers 316 SS Metal Parts
	383A	Spring Retainer	AISI Type 316SS
Power End Components	108 228 134	Adapter Bearing Frame Bearing Cover	Cast Iron ASTM A48 CL20
	122 168 112 136 370B 370C	Pump Shaft Ball Bearing (Inboard) Ball Bearing (Outboard) Retaining Ring Hex Head Cap Screw (Adapter to Bearing Frame) Hex Head Cap Screw (Bearing Frame to Cover)	Steel
	333A	Lip Seal	BUNA-N
	193	Grease Fitting	Steel
	123	V-Ring Deflector	BUNA-N

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End;
Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor;
Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)



Dimensions and Weights – Determined by Pump,
Dimensiones y Pesos – Determinados por la Bomba;
Dimensions et poids – pompe

Pump, *Bomba, Pompe*		Suction ① *Succión Aspir.*	Discharge ① *Descarga Refoul.*	CP	DC Max., *DC Máx. DC max.*	DD	X	Y	Wt. (lbs.), *Peso (lib.) Poids*	Dimension "HL" Determined by Pump and Bedplate, *Dimensión "HL" determinada la bomba y el motor, Dimensions HL – pompe et plaque de base*				
										Motor Frame Size, *Tamaño del bastidor del motor, Carcasse de moteur*				
										143/ 145	183/ 184	213/ 215	254/ 256	284/ 286
9SH	1 X 2–6	2	1	16⅜	5	4¾	6⅜	3⅛	56	9⅛		7⅝	3⅞	
10SH	1 X 2–8				5⅝	5⅜	7⅛		64					
11SH	1 X 2–10			17¼	6⅞	6⅝	8⅞		86	10		8½	4¾	
4SH	1½ X 2½–6	2½	1½	16½	5	4¾	6⅜	3¼	57	9¼		7¾	4	
7SH	1½ X 2½–8			17¼	5⅝	5⅜	7⅛	4	66	10		8½	4¾	
5SH	2 X 2½–6		2		5	4¾			57					
8SH	2 X 2½–8				6	5¾	7 15⁄16		68					
6SH	2½ X 3–6	3	2½						59					

NOTES:
1. All pumps shipped in vertical discharge position. May be rotated in 90° increments. Tighten ⅜ – 16 casing bolts to 12 ft./lbs. torque.
2. Dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not to be used for construction purposes.

NOTAS:
1. Todas las bombas transportadas en posición de descarga vertical. Pueden rotarse en aumentos de 90°. Apretar ⅜ – 16 tornillos de carcasa a 12 pies/libras potencia.
2. Las dimensiones en pulgadas.
3. Las dimensiones puede que varíen con los fabricantes..
4. No para propósitos de construcción.

NOTA :
1. L'orifice de refoulement est orienté vers le haut. On peut le tourner de 90° en 90°. Serrer les vis ⅜ - 16 du corps de pompe à 12 lbf·pi.
2. Les dimensions sont en pouces, et le poids,en livres.
3. Les dimensions et le poids du moteur peuvent varier selon le fabricant.
4. Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

Available Motor and Bedplate Dimensions and Weights,
Pesos y Dimensiones Disponibles de la Fundación y del Motor
Dimensions et poids – moteur et plaque de base

Motor Frame, *Armazón del Motor, Carcasse de moteur*	HP @ 3500 RPM, *HP a 3500 RPM, hp à 3 500 tr/min*				HP @ 1750 RPM, *HP a 1750 RPM, hp à 1 750 tr/min*				AB Max., *AB Máx., AB max.*	C Max., *C Máx., C max.*	P Max., *P Máx., P max.*	Wt. Max., *Peso Máx., Poids max.*	Bedplate Data, *Datos de la Fundación, Plaque de base*									
	Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicos, 3 Ø*		Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicos, 3 Ø*						HA	HB	HD*	HE	HF	HG	HP*	Wt. (lbs.), *Peso (libras), Poids*	Motor Shim, *Plancha de relleno del motor Cale de moteur*	Bearing Frame Shim, *Plancha de relleno del bastidor del cojinete, Cale de palier*
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC														
143T					1	1	1	1	5¼	13⅜	6⅝	45	10	28	8	3¾	24	2¾	¾	48	1¾	–
145T	2	2	2 or *ou* 3	2	1½	1½	1½ or *ou* 2	1½ or *ou* 2		14¼		53										
182T	3	3	5	3	2	2	3	3	5⅞	16⅝	7⅞	74										
184T	5	5	7½	5	3 or *ou* 5	3	5	3		18⅛		95										
213T			10	7½					7⅜	18	9⅝	116	12	31	8¼	4¼	29	3	1	65	–	–
215T			15	10						19⅛		136										
254T			20	15					10⅛	21⅝	13	266	13	42	9¼	5¼	38½	4	1¾	110	–	1
256T			25	20						23⅜		264										
284TS			30	25					12⅝	24⅞	15	392	15	44	10½	5¾	40½	3½		124	–	1¾
286TS			40	30						26⅝		432										

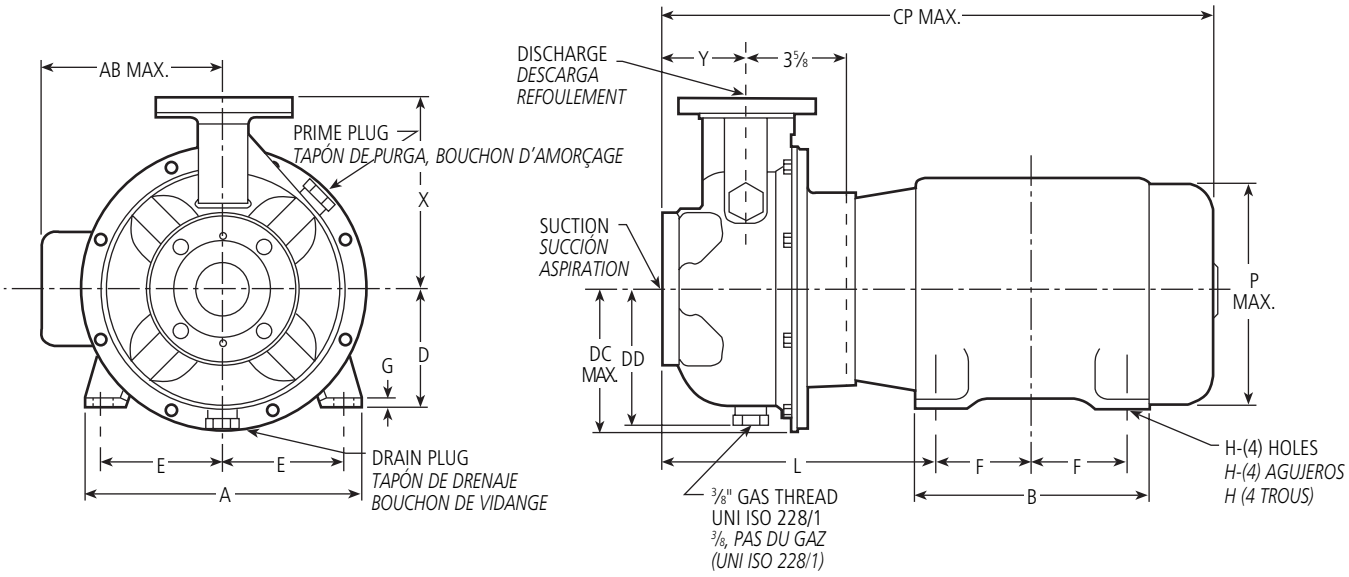
Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs.
"HP" Dimensions at motor end only.
* "HD" Dimension for 254T/256T motor frame on 1 x 2-10 only is 11"; A ¾" motor shim and a 1¾" bearing frame shim are required.

Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.
Dimensiones "HP" sólo en el extremo del motor.
** La dimensión "HD" para el bastidor del motor 254T/256T de 1 x 2 - 10 es sólo 11"; se requieren una cuña del motor de ¾" y una cuña del bastidor de apoyo de 1¾".*

ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée.
**Dimensions HP à l'extrémité du moteur seulement. La dimension HD pour la carcasse 254T ou 256T, version 1X2-10 seulement, est de 11 po ; une cale de moteur de ¾ po et une cale de palier de 1¾ po sont requises.*

SSH S-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe S*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, *Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur*

Pump, *Bomba, Pompe*		150 lb. Flange, *Brida de 150 lib., Bride, 150 lb/po²*		CP Max., *CP Máx., CP max.*	DC Max., *DC Máx., DC max.*	DD	X	Y	Motor Frame Size, *Tamaño del Armazón del Motor, Carcasse de moteur*				Wt. (lbs.), *Pesos (libras), Poids*
		Suct. *Succ.* ① *Aspir.*	Disch. *Desc.* ① *Refoul.*						143/145	182/184	213/215	254/256	
9SH	1 x 2 – 6	2	1	25⅜	5	4¾	6⅜	3⅛	9⅝	10¼	11¼	—	24
10SH	1 x 2 – 8				5⅝	5⅜	7⅛						32
11SH	1 x 2 – 10			27⅞	6⅞	6⅝	8⅞	4	10½	11⅛	12⅛	12⅜	54
4SH	1½ x 2½ – 6	2½	1½	25½	5	4¾	6⅜	3¼	9¾	10⅜	11⅜	—	25
7SH	1½ x 2½ – 8			27⅞	5⅝	5⅜	7⅛	4	10½	11⅛	12⅛	12⅜	34
5SH	2 x 2½ – 6		2		5	4¾	6⅜						25
8SH	2 x 2½ – 8				6	4¾	7¹⁵⁄₁₆						36
6SH	2½ x 3 – 6	3	2½										27

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ – 16 bolts to 12 ft./lbs., 7/16 – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, 7/16 – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes.*
4. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi et 7/16 - 14 à 20 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

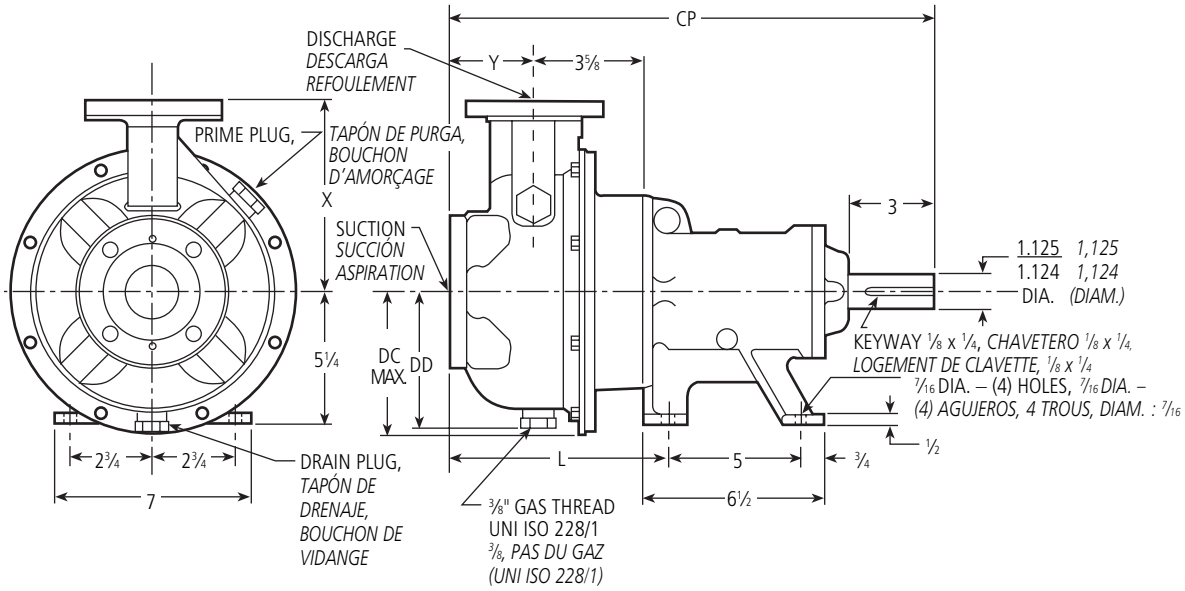
JM Frame, *JM Armazón, Carcasse*	A	AB	B	D	E	F	G	H Dia., *H Diám., H (diam.)*	P Max., *P Máx., P max.*	Motor Wt. (lbs.) *Peso Motor (lib.), Poids du moteur*
143JM	6½	5¼	6	3½	2¾	2	⅛	11/32	6⅝	41
145JM						2½				57
182JM	8½	5⅞	6½	4½	3¾	2¼	3/16	13/32	7⅞	77
184JM						2¾				97
213JM	9½	7⅜	8	5¼	4¼	2¾	7/32		9⅝	122
215JM						3½				155
254TCZ	11¼	9	9½	6¼	5	4⅛	¼	17/32	11½	265
256TCZ			11¾			5				320

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Motor Frame, *Armazón del Motor, Carcasse*	Motor Horsepower, *Potencia del Motor, Puissance (hp)*							
	3500 RPM, *3500 RPM, 3 500 tr/min*				1750 RPM, *1750 RPM, 1750 tr/min*			
	1Ø, *Monofásicos 1 Ø*		3Ø, *Trifásicos 3 Ø*		1Ø, *Monofásicos 1 Ø*		3Ø, *Trifásicos 3 Ø*	
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC
143JM	–	–	–	–	–	–	1	1
145JM	2	2	2-3	2	1-1½	1-1½	1½-2	1½-2
182JM	3	3	5	3	2	2-3	3	3
184JM	5	5	7½	5	3	–	5	5
213JM	7½	–	10	7½	5	–	7½	7½
215JM	10	–	15	10-15	–	–	–	–
254TCZ	–	–	20	–	–	–	–	–
256TCZ	–	–	25	20-25	–	–	–	–

ODP = carcasse abritée (à ouvertures de ventilation protégées) ;
TEFC = carcasse fermée autoventilée.

SSH S-Group Frame-Mounted – Dimensions and Weights, *SSH Armazón Montado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur palier, groupe S*



Dimensions and Weights – Bare Pump Only,
Dimensiones y Pesos – Solamente Bomba,
Dimensions et poids – pompe nue seulement

Pump, *Bomba, Pompe*		150 lb. Flange, *Brida de 150 lib., Bride, 150 lb/po²*		DC Max., *DC Máx., DC max.*	DD	CP Max., *CP Máx., CP max.*	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
		Suction ① *Succión ① Aspir.*	Discharge ① *Descarga ① Refoul.*							
9SH	1 x 2 – 6	2	1	5	4¾	16⅜	7⅝	6⅜	3⅛	56
10SH	1 x 2 – 8			5⅝	5⅜			7⅛		64
11SH	1 x 2 – 10			6⅞	6⅝	17¼	8½	8⅞	4	86
4SH	1½ x 2½ – 6	2½	1½	5	4¾	16½	7¾	6⅜	3¼	56
7SH	1½ x 2½ – 8			5⅝	5⅜	16½	8½	7⅛	4	64
5SH	2 x 2½ – 6		2	5	4¾					57
8SH	2 x 2½ – 8			6	5¾			6⅜		66
6SH	2½ x 3 – 6	3	2½							57

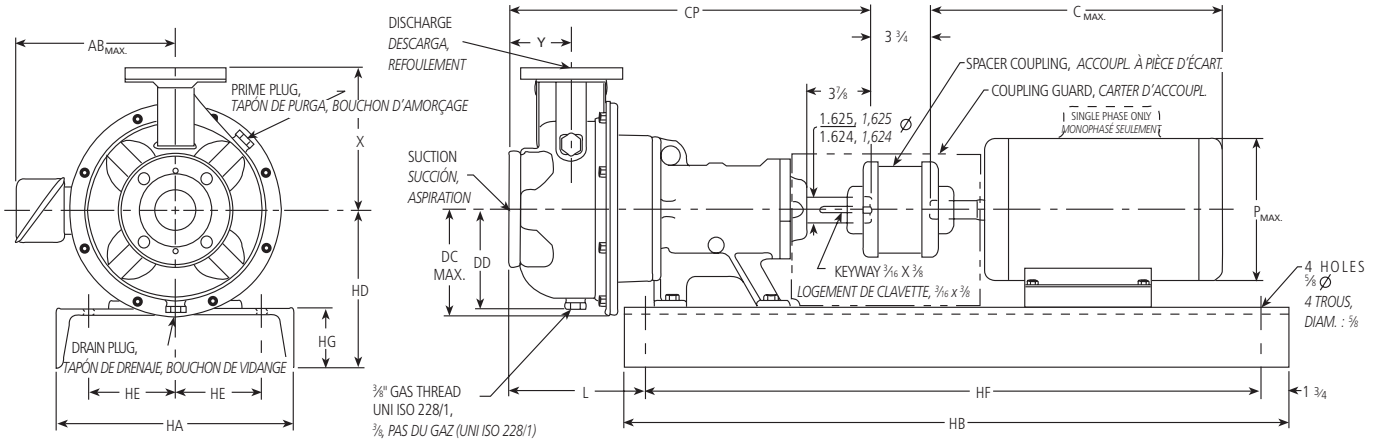
① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ –16 bolts to 12 ft./lbs., 7/16 – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, 7/16 – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ – 16 à 12 lbf·pi et 7/16 – 14 à 20 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End;
Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor;
Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)



Dimensions and Weights – Determined by Pump,
Dimensiones y Pesos – Determinados por la Bomba,
Dimensions et poids – pompe

Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP	DC Max., *DC Máx., DC max.*	DD	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
24SH	1½ x 2 ½-10	2½	1½	23	6⅞	6⅝	10⅛	8 15/16	4	125
25SH	2 x 2 ½-10		2							125
22SH	2½ x 3-8	3	2½		6⅛	5⅞				125
27SH	2½ x 3-10				6⅞	6⅝		9 15/16		134
23SH	3 x 4-8	4	3	24			11⅛		5	136
28SH	3 x 4-10				7⅝	7⅜		11⅛		148

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position and tighten ⅜ – 16 bolts to 12 ft./lbs.
2. ALL dimensions in inches.
3. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Available Motor and Bedplate Dimensions and Weights,
Pesos y Dimensiones Disponibles de la Fundación y del Motor,
Dimensions et poids – moteur et plaque de base

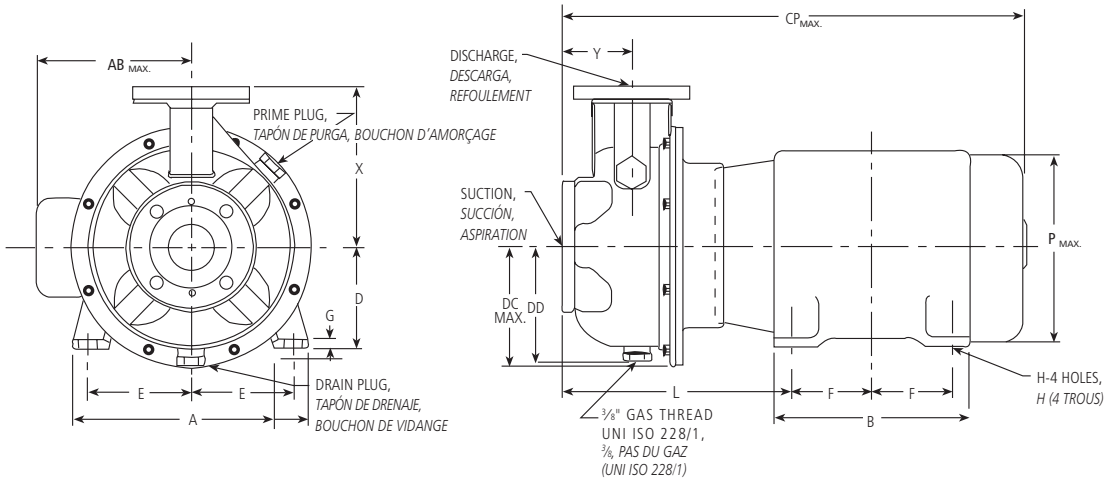
Motor Frame, *Armazón del Motor, Carcasse de moteur*	HP @ 3500 RPM, *hp à 3 500 tr/min*		HP @ 1750 RPM – T-Frame Only *hp à 1 750 tr/min – carc. T seulem.*				AB Max., *AB Máx., AB max.*	C Max., *C Máx., C max.*	P Max., *P Máx., P max.*	Wt. Max., *Peso Máx., Poids max.*	Bedplate Data, *Datos de la Fundación, Plaque de base*						
	Three Phase, *Trifásicos, 3 Ø*		Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicos, 3 Ø*						HA	HB	HD	HE	HF	HG	Wt. (lbs.), *Peso (libras), Poids*
	ODP	TEFC	ODP	TEFC	ODP	TEFC											
184T			3 or *ou* 5	3	5	5	5⅞	18⅛	7⅞	95	13	42	10¼	5¼	38½	4	111
213T					7½	7½	7⅜	18	9⅝	116							
215T	15				10	10		19⅛		136							
254T	20	15			15	15	9½	21⅝	13	266							
256T	25	20			20	20		23⅜		264							
284TS/T	30	25			25	25	12⅝	24⅞	15	392	15	44	10½	5¾	40½	3½	124
286TS/T	40	30						26⅝		422							
324TS/T	50	40					14⅛	28¾	17⅜	592	18	48	12	7¼	44½	4	183
326TS/T	60	50						30¼		634							
364TS/T	75	60					15⅛	31⅝	18⅞	834			13				
365TS/T	100	75						32⅝		1000							
405TS/T		100					18	36⅞	20⅝	1060	22	56	14	7¼	52½	4	214

Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs.
Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.

ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée.

SSH M-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe M*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, *Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur*

Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP Max., *CP Máx., CP max.*	DC Max., *DC Máx. , DC max.*	DD	X	Y	Wt. (lbs.), *Peso (libras), Poids*	Motor Frame Size, *Tamaño del Armazón del Motor, Carcasse de moteur*						
										140	180	210	250	280	320	360
24SH	1½ x 2 ½-10	2½	1½	34½	6⅞	6⅝	8 15/16	4	75	10½	11⅛	12⅛	13⅞		14⅜	-
25SH	2 x 2½-10		2	36					75							15
22SH	2½ x 3-8	3	2½		6⅛	5⅞			72	-						
27SH	2½ x 3-10				6⅞	6⅝	9 15/16		84	-	-					
23SH	3 x 4-8	4	3	37				5	86	11½	12⅛	13⅜	14⅞		15⅜	16
28SH	3 x 4-10				7⅝	7⅜	11⅛		98	-	-					

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:
1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten 3/8 – 16 bolts to 12 ft./lbs., 7/16 – 14 bolts to 20 ft./lbs., ½ – 13 bolts to 35 ft./lbs.
2. Motor dimensions may vary with motor manufacturer.
3. Not for construction purposes.

NOTAS:
1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar 3/8 – 16 tornillos a 12 pies/libras, 7/16 – 14 tornillos a 20 pies/libras, ½ – 13 tornillos a 35 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis 3/8 - 16 à 12 lbf·pi, 7/16 - 14 à 20 lbf·pi et ½ - 13 à 35 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

Frame, *Armazón, Carcasse*	A	AB Max., *AB max.*	B	D	E	F	G	H	P Max., *P Máx., P max.*
145JM	6½	5¼	6	3½	2¾	2½	⅛	11/32	7 3/16
182JM	8½	5⅞	6½	4½	3¾	2¼	3/16	13/32	8½
184JM						2¾			
213JM	9½	7⅜	8	5¼	4¼		7/32		10 3/16
215JM						3½			
254JM	11¼	9	11¾	6¼	5	4⅛	¼	17/32	13¼
256JM						5			
284JM	12¼	12¼	12¼	7	5½	4¾			15
286JM						5½			
324JM	14	13¼	14	8	6¼	5¼	5/16	21/32	16 15/16
326JM						5½			
364TCZ	17¾	15⅛	15½	9	7	5⅝	1		19
365TCZ						6⅛			

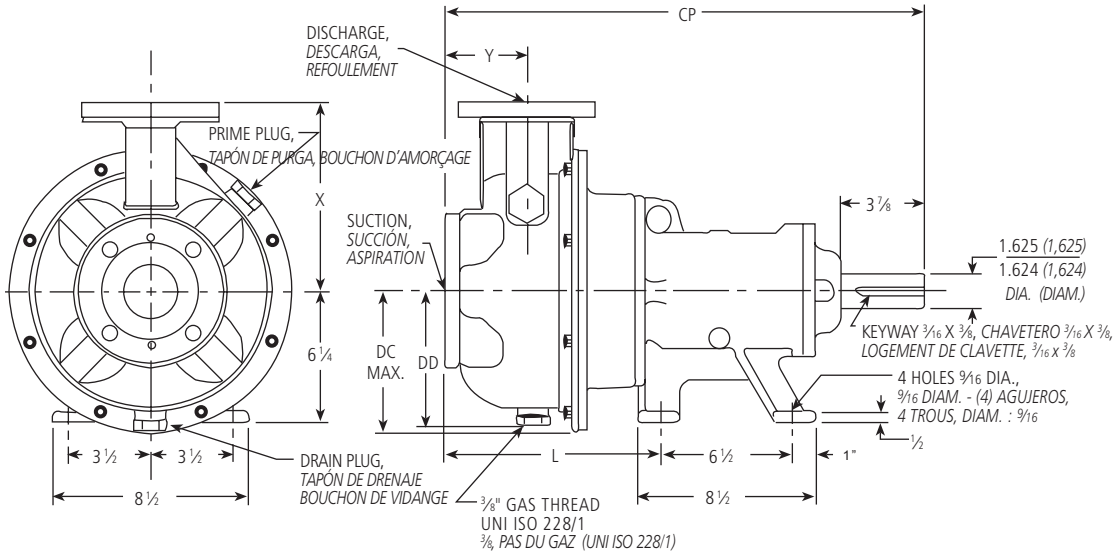
364TCZ and 365TCZ frames are built with 326JM shaft extensions.
Dimensions may vary with manufacturer.;
Los armazones 364TCZ y 365TCZ se construyen con extensiones del eje 326JM.
Las dimensiones puede que varíen con los fabricantes.;
Les carcasses 364TCZ et 365TCZ possèdent la rallonge d'arbre de la 326JM.

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Frame, *Armazón, Carcasse*	Motor Horsepower, *Potencia del Motor, Puissance (hp)*						Wt. Max., *Peso Máx., Poids max.*
	3500 RPM, *3500 tr/min*		1750 RPM, *1750 tr/min*				
	3 PH, *Trifásicos, 3 Ø*		1 PH, *Monofásicos, 1 Ø*		3 PH, *Trifásicos, 3Ø*		
	ODP	TEFC	ODP	TEFC	ODP	TEFC	
145JM	–	–	–	–	2	2	57
182JM	–	–	2	2, 3	3	3	77
184JM	–	–	3	–	5	5	97
213JM	10	–	5	–	7½	7½	141
215JM	15	10	–	–	10	10	155
254JM	20	15	–	–	15	15	265
256JM	25	20	–	–	20	20	320
284JM	30	25	–	–	25	25	419
286JM	40	30	–	–	–	–	422
324JM	50	40	–	–	–	–	562
326JM	60	50	–	–	–	–	625
364TCZ	75	60	–	–	–	–	775
365TCZ	100	75, 100	–	–	–	–	905

364TCZ and 365TCZ frames are built with 326JM shaft extensions.
Los armazones 364TCZ y 365TCZ se construyen con extensiones del eje 326JM.
ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée. Les carcasses 364TCZ et 365TCZ possèdent la rallonge d'arbre de la 326JM.

SSH M-Group Frame Mounted – Dimensions and Weights, *SSH Armazón Montado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur palier, groupe M*



Dimensions and Weights – Bare Pump Only,
Dimensiones y Pesos – Solamente Bomba
Dimensions et poids – pompe nue seulement

Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP	DC Max., *DC Máx., DC max.*	DD	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
24SH	1½ x 2 ½-10	2½	1½	23	6 7/8	6 5/8	10½	8 15/16	4	125
25SH	2 x 2½-10		2							125
22SH	2½ x 3-8	3	2½		6 1/8	5 7/8				125
27SH	2½ x 3-10				6 7/8	6 5/8		9 15/16		134
23SH	3 x 4-8	4	3	24			11½		5	136
28SH	3 x 4-10				7 5/8	7 3/8		11 1/8		148

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

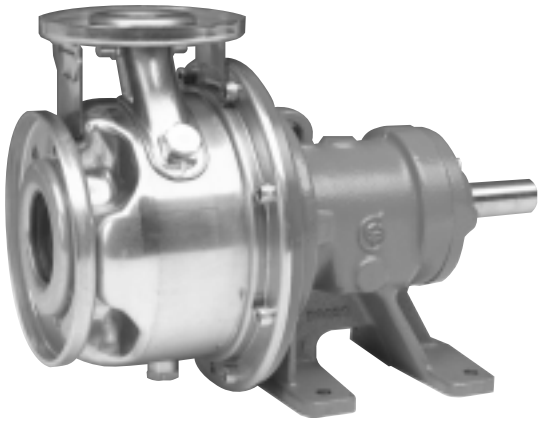
NOTES:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, replace and tighten 3/8–16 bolts to 12 ft./lbs.
2. Motor dimensions may vary with motor manufacturer.
3. Not for construction purposes.

NOTAS:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar 3/8 – 16 tornillos a 12 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA *:*
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis 3/8 – 16 à 12 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Instrucciones de instalación, operación y mantenimiento

Modelos SSH-C y SSH-F



Información del propietario

Por favor complete los datos consultando la placa del fabricante de la bomba. La información de la garantía está en la página 28.

Modelo de la Bomba: _____

Número de Serie: _____

Agente: _____

Nº. telefónico del agente: _____

Fecha de compra: _____

Fecha de instalación: _____

Índice

Goulds Pumps

ITT Industries

INSTRUCCIONES DE SEGURIDAD

PARA EVITAR LESIONES CORPORALES SERIAS O FATALES O DAÑOS MAYORES A LA PROPIEDAD, LEA Y SIGA TODAS LAS INSTRUCCIONES DE SEGURIDAD EN EL MANUAL Y EN LA BOMBA.

ES INTENCIÓN QUE ESTE MANUAL ASISTA EN LA INSTALACIÓN Y OPERACIÓN DE ESTA UNIDAD Y DEBE MANTENERSE CON LA BOMBA.

Este es un **SÍMBOLO DE ALERTA DE SEGURIDAD**. Cuando vea este símbolo en la bomba o en el manual, busque una de las palabras de señal y esté alerta a las lesiones corporales potenciales o daños a la propiedad.

⚠ PELIGRO Advierte los peligros que **CAUSARÁN** lesiones corporales serias, la muerte o daños mayores a la propiedad.

⚠ ADVERTENCIA Advierte los peligros que **PUEDEN** causar lesiones corporales serias, la muerte o daños mayores a la propiedad.

⚠ PRECAUCIÓN Advierte los peligros que **PUEDEN** causar lesiones corporales o daños a la propiedad.

AVISO: INDICA INSTRUCCIONES ESPECIALES QUE SON MUY IMPORTANTES Y DEBEN SEGUIRSE.

EXAMINE A FONDO TODAS LAS INSTRUCCIONES Y ADVERTENCIAS ANTES DE REALIZAR ALGÚN TRABAJO EN ESTA BOMBA.

MANTENGA TODAS LAS CALCOMANÍAS DE SEGURIDAD.

⚠ ADVERTENCIA

Los fluidos peligrosos pueden originar fuego, quemaduras o causar la muerte.

UNIDAD NO DISEÑADA PARA USO CON LÍQUIDOS PELIGROSOS O GASES INFLAMABLES. ESTOS FLUIDOS PUEDEN ESTAR PRESENTES EN LAS ÁREAS DE CONTENCIÓN.

AVISO: INSPECCIONE LA UNIDAD SI TIENE DAÑOS Y REPORTE INMEDIATAMENTE CUALQUIER DAÑO AL TRANSPORTISTA O AL AGENTE.

1. Instrucciones Importantes

1. Inspeccione la unidad para determinar si está dañada. Informe immediatemente los daños al transportista.
2. La alimentación eléctrica debe ser un circuito de rama separada con los fusibles o interruptores automáticos, tamaños de cables, etc., conforme a los códigos Eléctricos Nacional y local. Instale un interruptor de desconexión en todos los hilos exteriores cerca de la bomba.

⚠ ADVERTENCIA

La tensión peligrosa puede causar electrochoque, quemaduras o la muerte.

SIEMPRE DESCONECTE LA ALIMENTACIÓN ELÉCTRICA CUANDO MANEJE LA BOMBA O LOS CONTROLES.

3. Los motores deben estar alambrados para la tensión apropiada (verifique la placa del fabricante). El tamaño del alambre debe eliminar la máxima caída de tensión a 10% de la tensión de la placa del fabricante en los terminales del motor, o la vida del motor y de la bomba serán disminuidos.
4. **Unidades monofásicas:** La protección térmica de las unidades monofásicas a veces está incorporada (verifique la placa del fabricante). Si no se proporciona protección incorporada, use un contactor con la sobrecarga apropiada. Se permite el uso de fusibles, los que deben ser apropiados.
5. **Unidades trifásicas:** Proporcione la protección de tres hilos exteriores con el arrancador magnético del tamaño adecuado y sobrecargas térmicas.
6. Máximas temperaturas del liquido:
   212°F (100°C) con sello estándar.
   250°F (120°C) con sello de alta temperatura, opcional.
7. Máxima presión de operación permisible: 230 lib/pulg^2 (15 baras).
8. Máximo número de arranques/hora: 20 distribuidos uniformemente.
9. La inspección y mantenimiento regulares aumentarán la vida útil. Base el programa en el tiempo de funcionamiento.

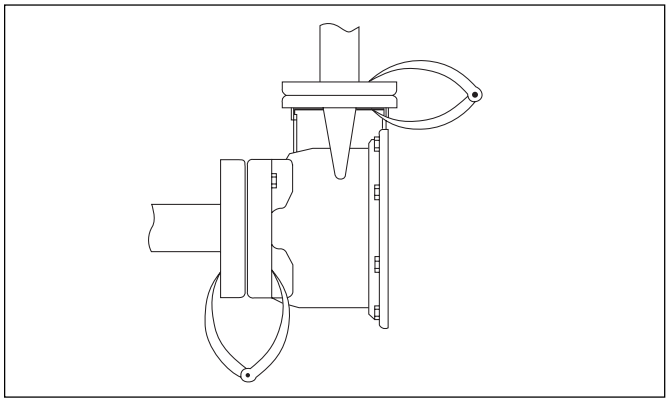
2. Instalación

1. Las unidades compactas se pueden instalar inclinadas o verticales.

⚠ PRECAUCIÓN **NO INSTALE CON EL MOTOR DEBAJO DE LA BOMBA. LA CONDENSACIÓN SE ACUMULARÁ EN EL MOTOR.**

2. Coloque la bomba tan cerca de la fuente del líquido como sea posible (abajo del nivel del líquido para operación automática).
3. Proteja contra la congelación e inundaciones.
4. Deje suficiente espacio libre para darle servicio y ventilación.
5. Para las bombas compactas, la cimentación debe ser plana y substancial para eliminar las deformaciones cuando se aprietan los pernos. Use montajes de goma para minimizar el ruido y las vibraciones. Apriete los pernos de sujeción del motor antes de conectar la tubería a la bomba.
6. Para las bombas montadas en marco, se requiere una cimentación sólida y permanente para funcionamiento seguro. La placa de base debe adherirse con lechada a la cimentación con una zapata sólida.
7. Coloque la unidad sobre cuñas puestas en cuatro pumtos. (Dos aproximadamente abajo del centro del motor y dos aproximadamente abajo de la bomba). Ajuste las cuñas para nivelar la unidad, trayendo las mitades del acoplamiento a una alineación razonable. Nivele o ponga a escuadra las bridas de succión y de descarga.
8. Asegúrese de que la placa de base no esté distorsionada y que la alineación final del acoplamiento se pueda hacer dentro de los límites del movimiento del motor o poniendo calzas, si fuese necesario.

9. Apriete con los dedos los pernos de la cimentación, y construya una presa alrededor de la cimentación. Derrame lechada debajo de la placa de base, asegurándose de que las áreas debajo de la bomba y del motor estén bien llenas. Permita que la lechada fragüe por 48 horas antes de apretar más los pernos de la cimentación.
10. Toda la tubería debe estar soportada independientemente de la bomba y debe "alinearse" naturalmente. **Nunca estire la tubería en el lugar forzando las conexiones de la succión o descarga.**
11. La alineación angular de las bridas se puede lograr mejor usando calibradores en los lugares de los pernos (vea la ilustración).



12. En las unidades montadas en marco, apriete la cimentación, la bomba y los pernos de sujeción del impulsor, antes de conectar la tubería a la bomba.
13. Evite los accesorios innecesarios. Seleccione los tamaños para mantener bajas las pérdidas de presión.
14. Después de completar la tubería, gire a mano la unidad para verificar el trabado. Nota: En el extremo del eje del motor se proveen una ranura de destornillador o filos normales al eje.

3. Alineación

1. Las bombas compactas no necesitan alineación en el campo.
2. Aunque la unidad de bomba y motor pueda tener una alineación de fábrica, la misma puede haberse alterado en tránsito y se debe verificar antes del funcionamiento.
3. Verifique que todos los pernos de sujeción estén bien apretados antes de verificar la alineación.
4. Si es necesario realinear, siempre mueve el motor, Aplique calzas según se requiera.
5. La alineación final se logra cuando se cumplen los requerimientos paralelo y angular, con los pernos de sujeción y de la bomba y del motor, apretados.

⚠ PRECAUCIÓN **SIEMPRE VUELVA A VERIFICAR AMBAS ALINEACIONES DESPUÉS DE HACER AJUSTES.**

6. La alineación paralela es incorrecta cuando los ejes no están concéntricos. Ponga el indicador de cuadrante en un cubo y gire este cubo 360º mientras hace lecturas en el diámetro exterior del otro cubo. Hay alineación paralela cuando la lectura total del indicador es de 0,005" o menos.
7. La alineación angular es incorrecta cuando los ejes no están paralelos. Coloque el indicador de cuadrante en un cubo y gire este cubo 360º mientras hace lecturas en el diámetro del otro cubo. Hay alineación angular cuando la lectura total del indicador es de 0,005" o menos.

4. Tubería de succión

1. Es deseable tener una tubería de succión directa con altura estática de aspiración baja y corta. Para una altura de succión superior a 15 pies, consulte la curva de rendimiento de la bomba para ver *la Altura de succión positiva neta requerida*.
2. El tamaño del tubo de succión debe ser por lo menos igual a la conexión de succión de la bomba.
3. Si se usa un tubo más grande, un reductor de tubo excéntrico (con el lado recto arriba) debe usarse en la bomba.
4. Instalación con la fuente de suministro abajo de la bomba:
   4.1. Instale la válvula de aislación en la tubería para inspección y mantenimiento.
   4.2. No use la válvula de aislación de succión para estrangular la bomba.
5. Instalación con la fuente de suministro arriba de la bomba:
   5.1. Para evitar bolsas de aire, ninguna parte de la tubería debe estar más alta que la conexión de succión de la bomba. Incline la tubería hacia arriba, partiendo de la fuente del líquido.
   5.2. Todas las juntas deben ser estancas.
   5.3. La válvula de pie debe usarse sólo si es necesario para cebar, o sostener el cebado en el servicio intermitente.
   5.4. El área abierta del colador de succión debe ser por lo menos el triple del área del tubo.
6. El tamaño de la entrada de la fuente del líquido y la mínima inmersión sobre la entrada deben ser suficientes para impedir que el aire entre a la bomba.

5. Tubería de descarga

1. La disposición debe incluir una válvula de retención localizada entre una válvula de compuerta y la bomba. La válvula de compuerta es para regulación de la capacidad, o la inspección de la bomba o de la válvula de retención.
2. Si se requiere un reductor, instale entre la válvula de retención y la bomba.

6. Rotación

NO PONGA LAS MANOS EN LA SUCCIÓN DE LA BOMBA MIENTRAS VERIFICA LA ROTACIÓN DEL MOTOR. HACERLO CAUSARÁ SEVERAS LESIONES CORPORALES.

1. Las bombas son de rotación derecha (sentido dextroso visto desde el extremo del motor). Encienda y apague el interruptor. Observe la rotación del eje. En las unidades montadas en marco, verifique la rotación antes de acoplar la bomba al motor.

2. **Motor monofásico:** Consulte el diagrama de cableado en el motor si debe cambiarse la rotación.
3. **Motor trifásico:** Intercambie dos cualesquiera de los conductores de alimentación para cambiar la rotación.

7. Operación

1. Antes de arrancar, se debe cebar la bomba (el tubo de succión lleno y sin aire) y abrir parcialmente la válvula de descarga.

⚠ PRECAUCIÓN **EL LÍQUIDO BOMBEADO PROPORCIONA LUBRICACIÓN. SI LA BOMBA FUNCIONA SECA, LAS PIEZAS GIRATORIAS SE AGARROTARÁN Y SE DAÑARÁ EL SELLO MECÁNICO.**

2. Haga una verificación completa después que la unidad funcione bajo condiciones de operación y se estabilice la temperatura. Verifique la expansión de la tubería. Verifique la alineación del acoplamiento.
3. **No haga funcionar con caudal cero o cerca de cero.** La energía impartida al líquido se convierte en calor y el líquido puede convertirse en vapor. Las piezas giratorias requieren líquido para impedir las estrías o agarrotamiento.

8. Mantenimiento

⚠ ADVERTENCIA Tensión peligrosa **LA OMISIÓN DE DESCONECTAR Y BLOQUEAR LA ALIMENTACIÓN ELÉCTRICA ANTES DE INTENTAR NINGÚN MANTENIMIENTO PUEDE CAUSAR CHOQUES, QUEMADURAS O LA MUERTE.**

1. Los cojinetes están localizados adentro y son parte del motor. Para el procedimiento de lubricación, consulte las instrucciones del fabricante.
2. En las unidades montadas en marco, reengrase cada 2.000 horas de uso o cada 3 meses. Use grasa con base de Litio o Sodio #2 y llene hasta que la grasa salga de la grasera.

9. Desmontaje

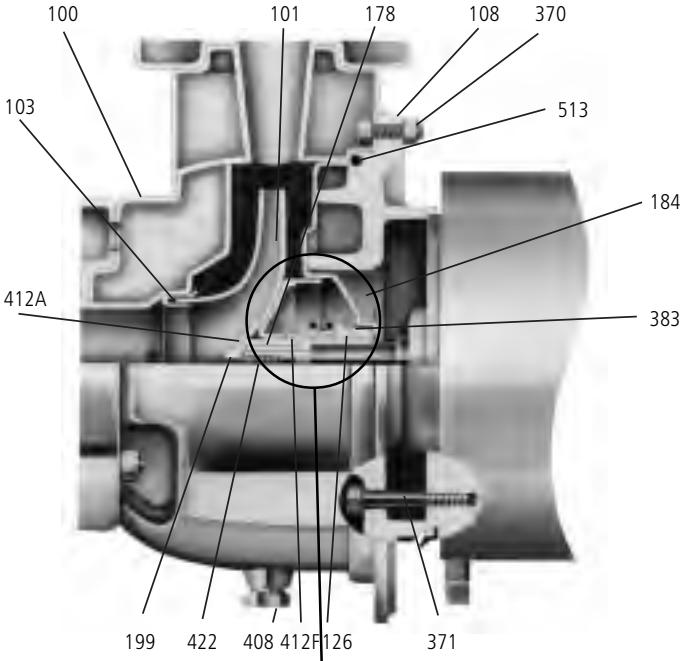
1. **Apague la alimentación eléctrica.**
2. Drene el sistema. Lave con chorro de agua si es necesario.
3. Quite los pernos de sujeción del motor en las unidades compactas o desconecte el acoplamiento y quite el espaciador.
4. Quite los pernos de la carcasa y los pernos de sujeción de la bomba.
5. Quite el motor y el elemento giratorio de la carcasa.
6. Destornille el perno del impulsor con una llave de casquillo. No inserte un destornillador entre los álabes del impulsor para impedir la rotación. Puede ser necesario usar una llave de correa alrededor del impulsor si el impacto de la llave de casquillo no afloja el perno del impulsor.
7. Quite la arandela del impulsor.
8. Inserte dos barras de hacer palanca (espaciadas 180º) entre el impulsor y el alojamiento del sello. Haga palanca sacando el impulsor.
9. Quite el resorte del sello, la arandela acopada y la chaveta del impulsor.
10. Quite el alojamiento del sello, quitando con él las partes del sello rotatorio. (donde sea necesario se proveen ranuras para la barra de palanca).
11. Coloque el alojamiento del sello en una superficie plana. Presione fuera las partes del sello estacionario.
12. Quite el deflector del eje, en las unidades montadas en marco.
13. Quite los pernos que sujetan la tapa del cojinete al marco y quite la tapa del cojinete (montado en marco).
14. Quite los sello de reborde del marco del cojinete y la tapa del cojinete (montado en marco).
15. Quite el eje y los cojinetes del marco (montado en marco).
16. Quite el anillo de retención de los cojinetes.
17. Use un extractor de cojinete o prensa para quitar cojinetes de bolas (montado en marco).
18. Quite la camisa del eje si está muy rayada. La camisa del eje está adherida al eje y debe calentarse a unos 250ºF para facilitar quitarla.
19. Quite el anillo de desgaste si está excesivamente dañado. Use una barra de hacer palanca y/o prensas de mordazas.

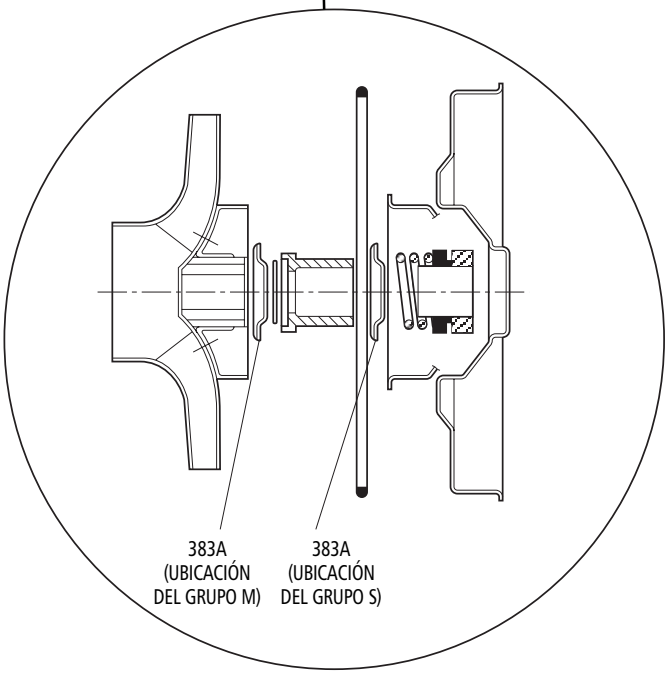
10. Reensamble

1. Todas las piezas se deben limpiar antes de montar.
2. Consulte la lista de piezas para identificar las artículos de reemplazo requeridos.
3. Reensamblar es lo contrario del procedimiento de montar.
4. Cambie los sellos de reborde si están desgastados o dañados (montado en marco solamente).
5. Cambie los cojinetes de bolas si están flojos, ásperos o ruidosos cuando giran (montado en marco solamente).
6. Verifique que el valor máximo fuera de redondez del eje no supere 0,005" de lectura total del indicador. Los asientos de cojinetes y áreas de sello de reborde deben ser suaves y estar libres de rayaduras o muescas. Cambie si es necesario (montado en marco solamente).
7. Todos los componentes de sello mecánico deben estar en buenas condiciones o pueden producirse fugas. El cambio del conjunto del sello completo, es buena práctica normal, siempre que se quite el sello.
8. Si se cambia el anillo de desgaste, no use lubricantes en el encaje de metal a metal cuando empuje la pieza de reemplazo.
9. Si se quita el impulsor, como por ejemplo para efectuar un cambio de sello mecánico, se debe seguir el procedimiento siguiente: El perno viejo del impulsor y las juntas de empaque del impulsor no se pueden volver a usar.
10. Instale el asiento estacionario del sello mecánico en la caja del sello, usando agua jabonosa como lubricante para facilitar la inserción.
11. Instale el retén de resorte del sello mecánico, el resorte y el conjunto rotatorio sobre la camisa del eje. Deslice la camisa del eje sobre el eje de la bomba. Asegúrese de que se use un nuevo anillo en O para la camisa del eje.
12. Coloque la chaveta del impulsor dentro del chavetero del eje y deslice el impulsor a su lugar. Instale el perno y arandela del impulsor. Asegúrese de que se use un nuevo anillo en O para el impulsor. Apriete a 35 pie-lbs.

11. Investigación de averías

1. El motor no arranca y no hay ruido o vibración:
   1.1. No está conectada la alimentación eléctrica.
   1.2. Los fusibles o dispositivos de protección están disparados o defectuosos.
   1.3. Conexiones eléctricas flojas o rotas.
2. No arranca el motor pero hace ruido y vibra:
   2.1. Motor no conectado como indica el diagrama.
   2.2. Eje trabado debido a obstrucciones mecánicas en el motor o en la bomba.
   2.3. Tensión baja o pérdida de fase en el abastecimiento trifásico.
3. La bomba no entrega la capacidad nominal:
   3.1. La bomba no está llena o cebada.
   3.2. La bomba perdió el cebado debido a fugas en la línea de succión.
   3.3. Dirección de rotación incorrecta. Vea la **Rotación**.
   3.4. La altura requerida es mayor que la especificada originalmente. (La válvula puede estar parcialmente cerrada.)
   3.5. La válvula de pie está taponada.
   3.6. La altura de succión es demasiado alta.
   3.7. El diámetro del tubo de succión es demasiado pequeño.
4. La protección dispara al arrancar la unidad:
   4.1. Pérdida de fase en la alimentación trifásica.
   4.2. El dispositivo de protección puede estar defectuoso.
   4.3. Las conexiones eléctricas están flojas o rotas.
   4.4. Verifique la resistencia del motor y la aislación a tierra.
5. El dispositivo de protección dispara demasiado frecuentemente:
   5.1. La protección puede regularse a un valor inferior al de la carga plena del motor.
   5.2. Pérdida de fase debido a contactos defectuosos o del cable de alimentación.
   5.3. Líquido es viscoso o su gravedad específica demasiado alta.
   5.4. Ocurre roce entre las partes giratorias y estacionarias.
6. El eje gira con dificultad:
   6.1. Verifique si hay obstrucciones en el motor o en la bomba.
   6.2. Hay roce entre las partes giratorias y estacionarias.
   6.3. Verifique la buena condición de los cojinetes.
7. La bomba vibra, funciona ruidosamente y el caudal no es uniforme:
   7.1. La bomba funciona más allá de la capacidad nominal.
   7.2. Bomba o tubería no bien asegurada.
   7.3. Altura de succión demasiado alta.
   7.4. Diámetro de la tubería de succión demasiado pequeño.
   7.5. Cavitación causada por suministro inadecuado del líquido o excesivas pérdidas de succión.
   7.6. El impulsor está bloqueado.
8. Cuando se para, la unidad gira lentamente en la dirección inversa:
   8.1. Fugas u obturaciones de aire en la tubería de succión.
   8.2. Bloqueo parcial en la válvula de retención.
9. En aplicaciones de refuerzo de presión, la unidad arranca y se para con demaisado frecuencia:
   9.1. Los reglajes del interruptor de presión son incorrectos.
   9.2. El tamaño del tanque es incorrecto.
10. En aplicaciones de refuerzo de presión, la unidad no se para:
    10.1. El reglaje máximo del interruptor de presión es mayor que el especifiado.
    10.2. La dirección de rotación es incorrecta. Vea **Rotación**.



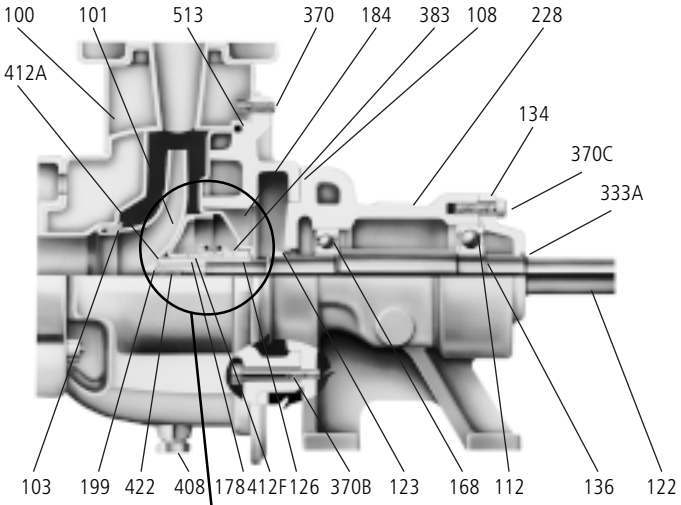


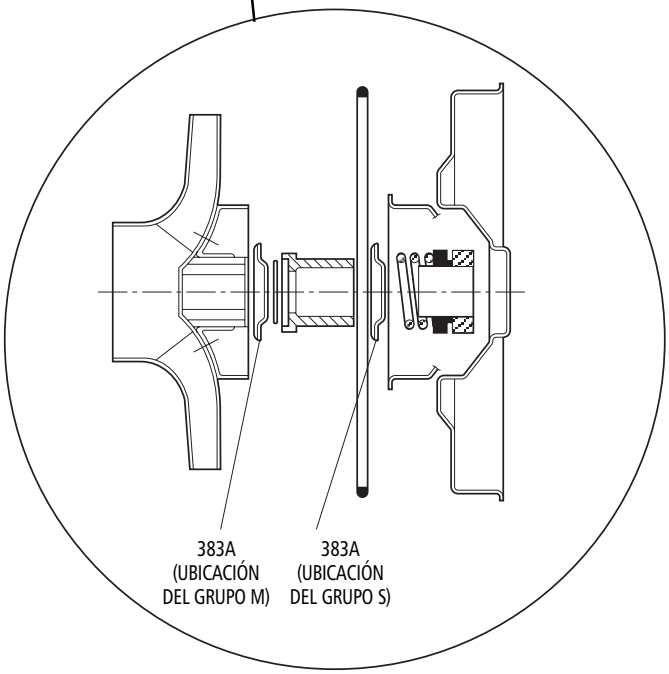
MATERIALES DE CONSTRUCCIÓN

Artículo	Descripción	Material
100 101 103 184 370	Carcasa Impulsor Anillo de desgaste Alojamiento del sello Tornillo de casquete de cabeza hueca (carcasa al adaptador)	AISI A.I. Tipo 316L
408	Tapón de drenaje — ⅜ NPT	AISI A.I. Tipo 316
126	Camisa del eje	316 SS
178	Chaveta del impulsor	Acero
422	Perno del impulsor	Acero
199	Arandela del impulsor	316 SS
108	Adaptador	Hierro fundido ASTM A48 CL20
371	Tornillo de casquete de cabeza hexagonal (adaptador al motor)	Acero
412A	Anillo en O, impulsor	Buna-N
412F	Anillo en O, camisa del eje	Buna-N
513	Anillo en O	Buna-N
383	Sello mecánico, Pieza No. 10K13	Carbono/cerámica elastómeros de buna piezas metálicas A.I. 316

SELLOS MECÁNICOS OPCIONALES

Sellos mecánicos John Crane Tipo 21						
Artículo	Pieza No.	Giratorio	Estacionario	Elastómeros	Partes metálicas	Servicio previsto
383 Opciones	10K19	Carbono	Resist. Ni.	EPR	A.I. 316	Alta temperatura
	10K25		Resist. Ni.	Viton		Serv. químico
	10K27		Carburo de tungsteno	EPR		Alta temperatura, abrasivo suave





MATERIALES DE CONTRUCCIÓN

Artículo		Descripción	Material
Componentes del extremo de la bomba	100 101 103 184 370	Carcasa Impulsor Anillo de desgaste Alojamiento del sello Tornillo de casquete de cabeza hueca	AISI A.I. Tipo 316L
	408	Tapón de drenaje – ⅜ NPT	AISI A.I. Tipo 316
	126	Camisa del eje	316 SS
	178	Chaveta del impulsor	Acero
	422	Perno del impulsor	Acero
	199	Arandela del impulsor	316 SS
	412A	Anillo en O, impulsor	Buna N
	412F	Anillo en O, camisa del eje	Buna N
	513	Anillo en O	Buna N
	383	Sello mecánico Pieza No. 10K13	Carbono/cerámica Elastómeros Buna N Piezas metálicas A.I. 316
Componentes del extremo motriz	108 228 134	Adaptador Marco del cojinete Tapa del cojinete	Hierro fundido ASTMA48 CL20
	122 168 112 136 370B 370C	Eje de la bomba Cojinete de bolas (interior) Cojinete de bolas (exterior) Arandela de seguridad, cojinete Tornillo de casquete de cabeza hex. (adaptador al marco del cojinete) Tornillo de casquete de cabeza hex. (marco del cojinete a la tapa)	Acero
	333A	Reborde del sello	Buna N
	193	Grasera	Acero
	123	Deflector de anillo en V	Buna N

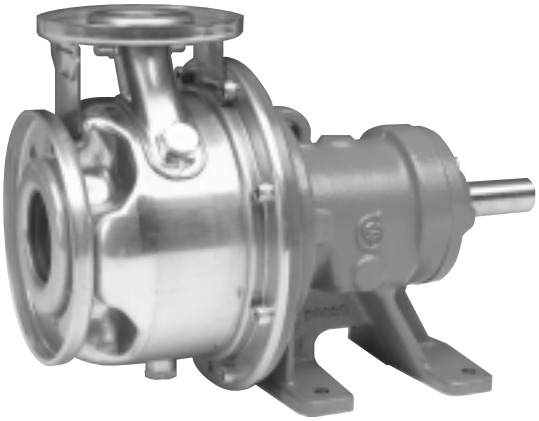
SELLOS MECÁNICOS OPCIONALES

Sellos mecánicos John Crane Tipo 21						
Artículo	Pieza No.	Giratorio	Estacionario	Elastómeros	Partes metálicas	Servicio previsto
383 Opciones	10K19	Carbono	Resist. Ni.	EPR	A.I. 316	Alta temperatura
	10K25		Resist.Ni.	Viton		Serv. químico
	10K27		Carburo de Tungsteno	EPR		Alta temperatura, abrasivo suave

G&L Pumps

Directives d'installation, d'utilisation et d'entretien

Modèles SSH-C et SSH-F



Informations pour le propriétaire

Noter ci-dessous les informations de la plaque signalétique de la pompe. La garantie est présentée en page 28.

Modèle de pompe : _____

Numéro de série : _____

Détaillant : _____

N° de téléphone du détaillant : _____

Date d'achat : _____

Date d'installation : _____

Table des matières

Goulds Pumps

ITT Industries

CONSIGNES DE SÉCURITÉ

AFIN DE PRÉVENIR LES BLESSURES GRAVES OU MORTELLES ET LES DOMMAGES MATÉRIELS IMPORTANTS, LIRE ET SUIVRE TOUTES LES CONSIGNES DE SÉCURITÉ FIGURANT DANS LE MANUEL ET SUR LA POMPE.

LE PRÉSENT MANUEL A POUR BUT DE FACILITER L'INSTALLATION ET L'UTILISATION DE LA POMPE ET DOIT RESTER PRÈS DE CELLE-CI.

Le symbole ci-contre est un **SYMBOLE DE SÉCURITÉ** employé pour signaler sur la pompe et dans le manuel les mots-indicateurs dont on trouvera la description ci-dessous. Sa présence sert à attirer l'attention afin d'éviter les blessures et les dommages matérials.

⚠ DANGER Prévient des risques qui **VONT** causer des blessures graves, la mort ou des dommages matériels importants.

⚠ AVERTISSEMENT Prévient des risques qui **PEUVENT** causer des blessures graves, la mort ou des dommages matériels importants.

⚠ ATTENTION Prévient des risques qui peuvent causer des blessures ou des dommages matériels.

AVIS: SERT À ÉNONCER LES DIRECTIVES SPÉCIALES DE GRANDE IMPORTANCE QUE L'ON DOIT SUIVRE.

LIRE SOIGNEUSEMENT CHAQUE DIRECTIVE ET AVERTISSEMENT AVANT D'EFFECTUER TOUT TRAVAIL SUR LA POMPE.

N'ENLEVER AUCUNE DÉCALCOMANIE DE SECURITE.

⚠ AVERTISSEMENT

Les fluides dangereux peuvent causer un incendie, des brûlures ou la mort.

APPAREIL NON CONÇU POUR LES LIQUIDES DANGEREUX NI POUR LES GAZ INFLAMMABLES. CES FLUIDES PEUVENT ÊTRE PRÉSENTS DANS LES INSTALLATIONS DE CONFINEMENT (PUITS COLLECTEURS).

AVIS: INSPECTER L'APPAREIL ET SIGNALER IMMÉDIATEMENT TOUT DOMMAGE AU TRANSPORTEUR OU AU DÉTAILLANT.

1. Imformations importantes

1. Inspecter l'appareil et signaler immédiatement tout dommage au transporteur.
2. L'alimentation en électricité doit être assurée par un circuit de dérivation distinct ont les fusibles ou les disjoncteurs, le calibre des fils, etc. sont conformes aux prescriptions du code provincial ou national de l'électricité. Poser un sectionneur tout conducteur près de la pompe.

⚠ AVERTISSEMENT

Les tensions dangereuses peuvent causer un choc électrique, des brûlures ou la mort.

ON DOIT TOUJOURS COUPER LE COURANT LORSQUE L'ON EFFECTUE QUELQUE TRAVAIL QUE CE SOIT SUR LA POMPE OU SUR LES COMMANDES.

3. Le câblage d'alimentation du moteur doit convenir à la tension de fonctionnement (consulter la plaque signalétique). Les fils doivent avoir un calibre limitant la chute de tension maximale, aux bornes du moteur, à 10% de la valeur de tension indiquée sur la plaque signalétique, sinon la durée de vie du moteur et les performances de la pompe diminueront.
4. **Moteurs monophasés** : Ces moteurs sont parfois munis d'une protection thermique intégrée (consulter la plaque signalétique). Dans le cas contraire, utiliser un contacteur à protection appropriée contre les surcharges. Les dispositifs fusibles utilisés correctement sont permis.
5. **Moteurs triphasés** : Employer une protection trois conducteurs appropriée contre les surcharges thermiques ainsi qu'un démarreur magnétique convenent à la charge électrique.
6. Température maximale du liquide : 100°C (212°F), avec garniture mécanique standard ; 120°C (250°F), avec garniture mécanique pour hautes températures en option.
7. Pression de service maximale admissible – 230 lb/po^2.
8. Nombre maximal de démarrages par heure : 20, répartis uniformément.
9. Une inspection et un entretien réguliers augmenteront la durée de vie de l'appareil. Établir un programme d'entretien et d'inspection basé sur le temps de fonctionnement.

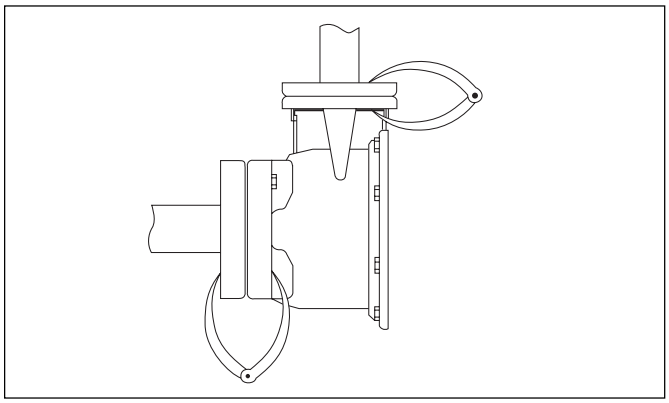
2. Installation

1. Les groupes monobloc (pompes sur moteur) peuvent être installés sur une surface inclinée ou verticale.

⚠ CAUTION **AFIN D'EMPÊCHER L'ACCUMULATION D'EAU DE CONDENSATION DANS LE MOTEUR, NE PAS PLACER CELUI-CI PLUS BAS QUE LA POMPE.**

2. Placer la pompe aussi près de la source de liquide que possible (au-dessous du niveau du liquide pour qu'elle fonctionne automatiquement).
3. Protéger l'appareil contre les inondations et le gel.
4. Laisser assez d'espace pour l'entretien et l'aération.
5. Les groupes monobloc doivent être fixés à une surface (dalle) plane et solide pour empêcher que le serrage des boulons ne cause de contraintes. Monter l'appareil sur caoutchouc pour réduire le bruit et les vibrations au minimum. Serrer les boulons de fixation du moteur avant de raccorder la tuyauterie à la pompe.
6. Les pompes montées sur palier doivent être fixées à une surface (dalle) permanente et solide pour fonctionner en douceur. On doit assujettir la plaque de base à une dalle reposant sur une semelle de foundation solide et remplir de coulis l'espace séparant la plaque et la dalle.

7. Placer l'appareil sur des coins de nivellement situés en quatre points distincts : deux sous le centre approximatif du moteur et deux sous celui de la pompe. À l'aide des coins, mettre l'appareil et les brides d'aspiration et de refoulement de niveau (avec un fil à plomb ou un niveau), tout en alignment les demi-accouplements raisonnablement bien.
8. S'assurer que la plaque de base n'est pas déformée et que l'alignement final de l'accouplement est possible dans les limites de déplacement du moteur ou de calage au besoin.
9. Serrer les boulons d'ancrage à la main et construire un coffrage autour de la plaque de base. Verser du coulis sous la plaque et s'assurer que les zones situées sous les pattes de la pompe et du moteur sont entièrement plaines. Laisser le coulis durcir pendant 48 heures avant de resserrer les boulons d'ancrage.
10. La tuyauterie doit posséder ses propres supports et « être alignée » sans constraintes sur la pompe. **La tuyauterie doit être posée de façon à ne jamais appliquer de contraintes sur les raccords d'aspiration et de refoulement de la pompe.**
11. Pour obtenir de meilleurs résultants, effectuer l'alignement angulaire des brides d'aspiration et de refoulement à l'aide d'un compas d'épaisseur placé près des trous de boulon (v. illustration).



12. Dans le cas des pompes sur palier, serrer les boulons d'ancrage et de fixation du palier et du moteur avant de raccorder les tuyaux à la pompe.
13. Ne poser aucun accessoire ni raccord de tuyauterie superflus. Choisir le calibre qui réduit les pertes de charge par frottement.
14. Une fois la tuyauterie raccordée, faire tourner la pompe à la main pour vérifier s'ily a grippage. ***Nota*** : une fente ou des méplats sont prévus à cette fin à l'extrémité de l'arbre de moteur.

3. Alignement

1. Aucun alignement sur place n'est requis pour les pompes montées sur moteur.
2. Bien que l'alignement pompe-moteur air été exécuté en usine, il peut avoir été déréglé pendant le transport. On doit donc le vérifier avant la mise en service.
3. S'assurer que tous les boulons de fixation sont bien serrés avant de vérifier l'alignement.
4. If re-alignment is necessary, always move the motor. Shim as required.
5. L'alignement final convient lorsqu'il satisfait aux exigences relatives à l'alignement parallèle et angulaire, après le serrage à fond des boulons de fixation de la pompe et du moteur.

⚠ ATTENTION **ON DOIT TOUJOURS VÉRIFIER LES DEUX TYPES D'ALIGNEMENT APRÈS CHAQUE RÉGLAGE.**

6. Il y a désalignement parallèle quand les arbres ne sont pas concentriques. Fixer au moyeu d'un demi-accouplement un comparateur à cadran, dont on déplace le curseur de 360° le long de la périphérie de l'autre demi-accouplement tout en notant l'écart indiqué par l'aiguille. L'alignement est correct si le faux-rond total est de 0,127 mm (0,005 po) ou moins.
7. Il y a désalignement angulaire quand les arbres ne sont pas parallèles. Fixer au moyeu d'un demi-accouplement un comparateur à cadran et déplacer le curseur de celui-ci de 360° le long du plateau de l'autre demi-accouplement tout en notant l'écart indiqué par l'aiguille. L'alignement est correct si le faux-rond total est de 0,127 mm (0,005 po) ou moins.

4. Tuyauterie d'aspiration

1. Une hauteur géométrique d'aspiration réduite et une tuyaterie directe et courte sont souhaitables. Consulter la courbe de performances de la pompe pour obtenir la ***hauteur nette d'aspiration requise (NPSHR)***.
2. Le calibre du tuyau d'aspiration doit être au moins égal à celui du raccord d'aspiration de la pompe.
3. S'il faut un tuyau plus gros, on doit installer près de la pompe un raccord réducteur excentré (le côté non oblique en haut).
4. Pompe placée plus bas que la source de liquide :
   4.1. Poser un robinet d'isolement sur le tuyau d'aspiration pour l'inspection et l'entretien.
   4.2. Ne pas employer lerobinet d'isolement pour réduire la section de passage vers la pompe !
5. Pompe placée plus haut que la source de liquide :
   5.1. Afin de prévenir les poches d'air, aucun élément de la tuyauterie d'aspiration ne devrait être plus haut que le raccord d'aspiration de la pompe. Donner à la tuyauterie une inclinaison vers le haut à partir de la source de liquide.
   5.2. Chaque joint doit être étanche.
   5.3. N'employer un clapet de pied que s'il est nécessaire pour amorcer la pompe ou la maintenir amorcée au cours des interruptions de service.
   5.4. La section de passage de la crépine du tuyau d'aspiration doit être au moins le triple de celle du tuyau.
6. Le diamètre et la hauteur d'immersion de l'entrée du tuyau d'aspiration doivent être suffisants pour empêcher l'aspiration d'air dans la pompe.

5. Tuyauterie de refoulement

1. L'installation doit comporter un robinet-vanne, ainsi qu'un clapet de non-retour placé entre le robinet-vanne et la pompe. Le robinet-vanne sert à la régularisation du débit et à l'inspection de la pompe et du clapet de non-retour.
2. Si un raccord réducteur est nécessaire, le poser entre le clapet de non-retour et la pompe.

6. Sens de rotation

⚠ AVERTISSEMENT

Équipements dangereux

ÉVITER LES BLESSURES GRAVES : NE PAS S'INTRODUIRE LA MAIN DANS L'ORIFICE D'ASPIRATION DE LA POMPE PENDANT LA VÉRIFICATION DU SENS DE ROTATION.

1. La rotation s'effectue en sens horaire (vers la droite, vue de l'extrémité du moteur). Démarrer et arrêter la pompe immédiatement pour en observer le sens de rotation. Dans le cas des pompes sur palier, vérifier le sens de rotation avant d'accoupler le moteur à la pompe.
2. **Moteur monophasé** : si l'on doit inverser le sens de rotation, consulter le schéma de câblage sur le moteur.
3. **Moteur triphasé** : intervertir deux conducteurs d'alimentation pour inverser le sens de rotation.

7. Utilisation

1. Avant la mise en service, on doit amorcer la pompe (pour en faire sortir l'air et remplir de liquide le tuyau d'aspiration) et entrouvrir le robinet de refoulement.

⚠ ATTENTION

LES LIQUIDES POMPÉS SERVENT DE LUBRIFICANT. EN CAS DE FONCTIONNEMENT À SEC, LES PIÈCES MOBILES GRIPPERAIENT, ET LA GARNITURE MÉCANIQUE S'ENDOMMAGERAIT.

2. Faire fonctionner l'appareil dans des conditions normales jusqu'à ce que sa température se stabilise, puis vérifier tout le système. Vérifier aussi si la tuyauterie se dilate et si l'accouplement est désaligné.
3. Ne pas faire fonctionner la pompe lorsque le débit est nul ou presque, car le liquide absorberait alors la chaleur produite par frottement et pourrait se changer rapidement en vapeur. Les pièces mobiles doivent être lubrifiées par le liquide pour ne pas s'endommager ni gripper.

8. Entretien

⚠ AVERTISSEMENT

Tension dangereuse

OMETTRE LE VERROUILLAGE DU DISJONCTEUR DU CIRCUIT ÉLECTRIQUE EN POSITION OUVERTE AVANT D'EFFECTUER TOUT TRAVAIL D'ENTRETIEN SUR LA POMPE PEUT CAUSER UN CHOC ÉLECTRIQUE, DES BRÛLURES OU LA MORT.

1. Les roulements sont situés à l'intérieur du moteur. Suivre les directives du fabricant du moteur pour leur graissage.
2. Dans le cas des pompes sur palier, graisser les roulements de palier toutes les 2 000 heures ou tous les 3 mois. Employer une graisse au lithium ou au sodium nº 2 et remplir les roulements jusqu'à ce que la graisse sorte par les garnitures.

9. Démontage

1. **Il faut toujours couper le courant avant de procéder au démontage.**
2. Vidanger le système. Le rincer au besoin.
3. S'il s'agit d'une pompe sur moteur, enlever les boulons de fixation de ce dernier. Sinon, détacher l'accouplement, puis en ôter la pièce d'écartement.
4. Enlever les vis de fixation du corps de pompe et les boulons de fixation du moteur.
5. Écarter l'ensemble d'entraînement de la roue d'avec le corps de pompe.
6. Enlever la vis de blocage de la roue avec une clé à douille. **Ne pas insérer de tournevis entre les aubes de la roue pour l'empêcher de tourner.** Il faudra peut-être bloquer la roue avec un serre-tubes à sangle si l'on ne parvient pas à desserrer la vis en donnant des coups secs sur la clé.
7. Enlever le joint torique de roue.
8. Sortir la roue au moyen de deux leviers placés dans un angle de 180º entre la roue et le logement de garniture.
9. Retirer la chemise d'arbre, le ressort de garniture, la rondelle cuvette, l'élément mobile de garniture et la clavette de roue.
10. Enlever le logement de garniture.
11. Placer le logement de garniture sur une surface plane et pousser l'élément fixe de la garniture hors du logement.
12. Dans le cas des pompes sur palier, ôter le déflecteur de l'arbre de pompe.
13. Enlever les vis du couvercle de palier (des pompes sur palier), puis le couvercle.
14. Retirer les joints à lèvre du palier et de son coucercle.
15. Sortir l'arbre et les roulements du palier.
16. Enlever la bague de retenue du roulement (pompes sur palier).
17. À l'aide d'une arrache-roulement ou d'une presse à mandriner, ôter les roulements.
18. Enlever la bague d'usure si elle est trop usée : employer un levier ou une pince-étau.

10. Remontage

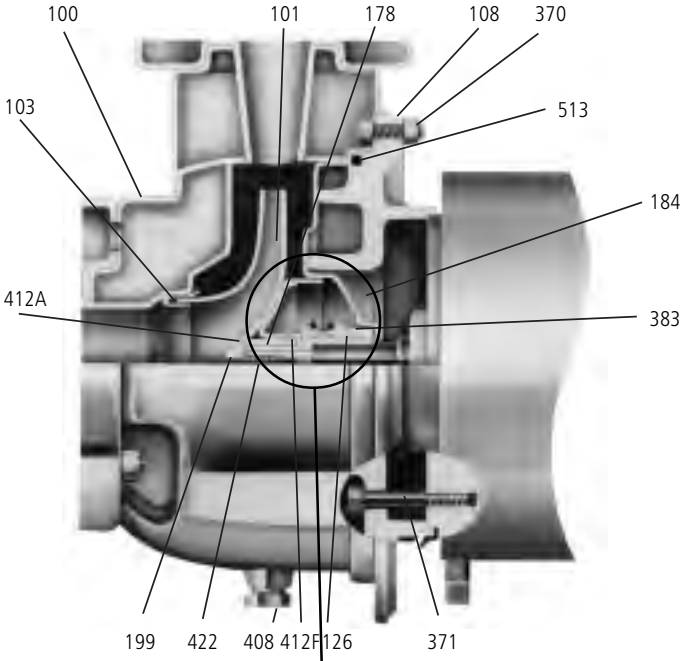
1. Chaque pièce devrait être nettoyée avant le remontage.
2. Voir la liste des pièces pour déterminer celles qui sont requises.
3. Le remontage se fait dans l'ordre inverse du démontage.
4. Remplacer les joints à lèvre s'ils sont usés ou endommagés (pompes sur palier seulement).
5. Remplacer les roulements à billes s'ils ont du jeu, s'ils ne tournent pas rond ou s'ils sont bruyants (pompes sur palier seulement).
6. Vérifier si l'arbre de pompe comporte un faux-rond : le faux-rond maximal admissible est de 0,127 mm (0,005 po). Les surfaces d'appui des roulements à billes et des joints à lèvre doivent être lisses (exemptes d'éraflures et d'encoches). Remplacer ces pièces au besoin (pompes sur palier seulement).
7. Tous les composants de la garniture mécanique doivent être en bon état pour empêcher les fuites. Le remplacement de la garniture en entier est une pratique courante appropriée chaque fois que la garniture est enlevée.
8. Lorsque l'on remplace la bague d'usure, ne pas em ployer de lubrifiant pour faciliter la pose de la bague neuve.
9. Si l'on enlève la roue (pour remplacer la garniture mécanique par exemple), on ne doit pas réutiliser la vis de blocage ni le joint torique de la roue.
10. Insérer l'élément fixe de la garniture mécanique dans le logement de garniture. L'enduire d'eau savonneuse pour en faciliter l'insertion.
11. Poser l'étrier de retenue du ressort de garniture, le ressort, puis l'élément mobile de la garniture sur la chemise d'arbre. Mettre celle-ci en place sur l'arbre. Voir à poser un joint torique neuf sur la chemise d'arbre.

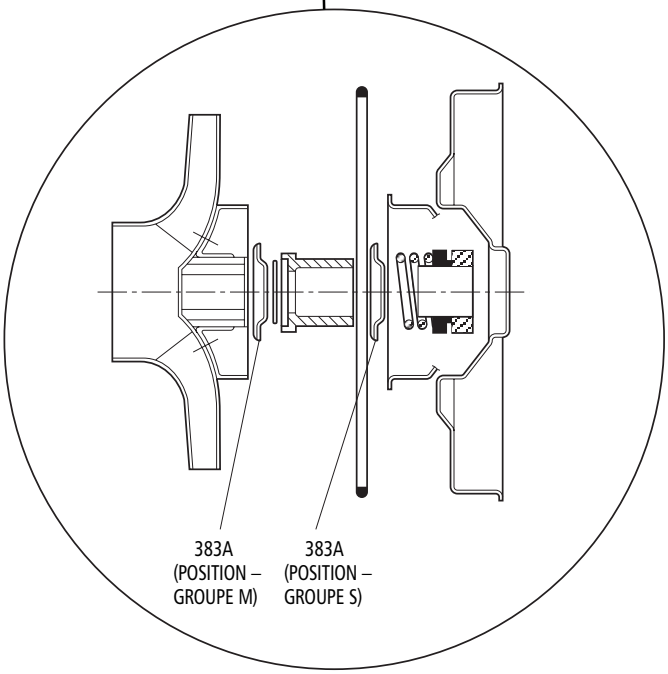
NOTA : LE JOINT TORIQUE DE LA CHEMISE D'ARBRE ET CELUI DE LA RONDELLE DE BLOCAGE DE LA ROUE ONT UN DIAMÈTRE PRESQUE IDENTIQUE. VOIR À POSER LE PLUS GRAND DES DEUX SUR LA CHEMISE D'ARBRE.

12. Insérer la clavette dans sa rainure (sur l'arbre), puis poser la roue, la rondelle et la vis de blocage de la roue. Voir à utiliser un joint torique de roue neuf. Serrer la vis de ⅜ po (groupe S) à 23,0 N·m (17 lbf·pi) et celle de ½ po (groupe M) à 51,5 N·m (38 lbf·pi).

11. Diagnostic des anomalies

1. Le moteur ne démarre pas, et il n'y a ni bruit ni vibration :
   1.1. Câble d'alimentation non connecté.
   1.2. Fusibles sautés ou dispostif de protection déclenché ou défectueux.
   1.3. Connexions lâches ou endommagées.
2. Le moteur ne démarre pas, mais il y a du bruit et des vibrations :
   2.1. Moteur non connecté conformément au schéma de câblage.
   2.2. Moteur ou pompe bloqués.
   2.3. Basse tension ou perte de phase (alimentation triphasée).
3. Le débit de la pompe est inférieur au débit nominal :
   3.1. Pompe non remplie ni amorcée.
   3.2. Pompe non amorcée en raison de fuites dans le tuyau d'aspiration.
   3.3. Mauvais sens de rotation (v. Sens de rotation).
   3.4. Hauteur de charge requise supérieure à la hauteur spécifiée à l'origine. (Le robinet peut être partiellement fermé.)
   3.5. Clapet de pied obstrué.
   3.6. Hauteur d'aspiration excessive.
   3.7. Calibre du tuyau d'aspiration trop petit.
4. La protection se déclenche lorsque le moteur démarre :
   4.1. Perte de phase (alimentation triphasée).
   4.2. Dispositif de protection défectueux.
   4.3. Connexions lâches ou endommagées.
   4.4. Résistance moteur-terre et isolation-terre à vérifier.
5. Le dispositif de protection se déclenche trop souvent :
   5.1. Protection réglée à une valeur inférieure à celle du moteur à pleine charge.
   5.2. Perte de phase en raison de contacts ou de fils d'alimentation défectueux.
   5.3. Viscosité ou densité du liquide trop élevées.
   5.4. Frottement entre les pièces mobiles et fixes.
6. L'arbre tourne à peine :
   6.1. Pompe ou moteur obstrués.
   6.2. Frottement entre les pièce mobiles et fixes.
   6.3. Roulements en mauvais état.
7. La pompe vibre, est bruyante et fournit un débit irrégulier :
   7.1. Débit supérieur au débit nominal de la pompe.
   7.2. Pompe ou tuyauterie non assujetties correctement.
   7.3. Hauteur d'aspiration excessive.
   7.4. Calibre du tuyau d'aspiration trop petit.
   7.5. Cavitation produite par une alimentation en liquide insuffisante ou perte d'aspiration excessive.
   7.6. Obstruction de la roue.
8. Une fois arrêtée, la pompe tourne lentement dans le sens opposé :
   8.1. Déplacement de poches d'air dans le tuyau d'aspiration.
   8.2. Obstruction partielle du clapet de non-retour.
9. Lorsqu'elle sert à augmenter la pression, la pompe démarre et s'arrête trop souvent :
   9.1. Réglage du manostat (pressostat) non correct.
   9.2. Grosseur du réservoir non appropriée.
10. Lorsqu'elle sert à augmenter la pression, la pompe ne s'arrête pas :
    10.1. Valeur de réglage maximale du manostat (pressostat) supérieure à la valeur spécifiée.
    10.2. Mauvais sens de rotation (v. Sens de rotation).



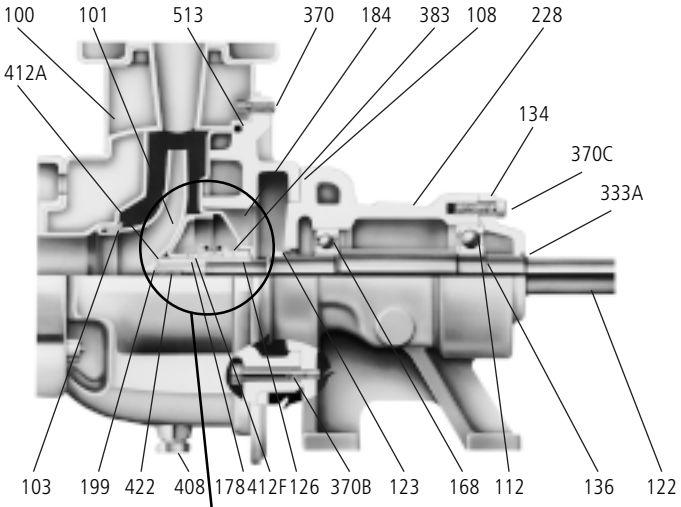


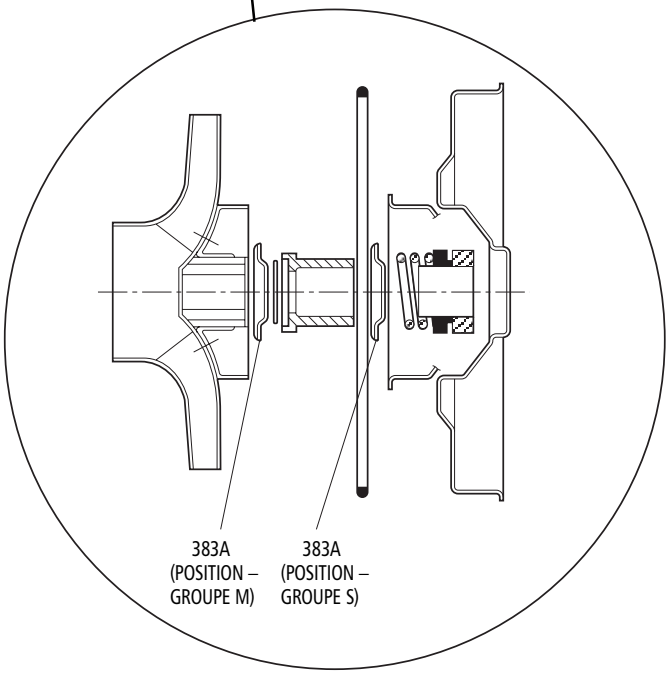
MATÉRIAUX DE FABRICATION

N° d'article	Description	Matériau
100 101 103 184 370	Corps de pompe Roue Bague d'usure Logement de garniture Vis à chapeau à tête creuse (adaptateur-corps de pompe)	Inox AISI, type 316L
408	Bouchon de vidange — ⅜ po, NPT	Inox AISI, type 316
126	Chemise d'arbre	316 SS
178	Clavette (roue)	Acier
422	Vis de blocage (roue)	Acier
199	Rondelle de blocage (roue)	316 SS
108	Adaptateur	Fonte ASTM A48, CL20
371	Vis de fixation à tête hexagonale (adaptateur-moteur)	Acier
412A	Joint torique, roue	Buna-N
412F	Joint torique, chemise d'arbre	Buna-N
513	Joint torique	Buna-N
383	Garniture mécanique, pièce n° 10K13	Carbone, céramique Buna Inox 316

GARNITURES MÉCANIQUES EN OPTION

Garnitures mécaniques John Crane, type 21						
N° d'art.	N° de pièce	Élément mobile	Élément fixe	Élastomères	Métal	Service prévu
383 (en option)	10K19	Carbone	Fonte Ni-Resist	Éthyl.-propyl.	Inox 316	Hautes tempér.
	10K25			Viton		Prod. chimiques
	10K27		Carbure de tungstène	Éthylène-propylène		Hautes tempér. Abrasifs légers





MATÉRIAUX DE FABRICATION

	N° d'article	Description	Matériau
Organes de pompage	100 101 103 184 370	Corps de pompe Roue Bague d'usure Logement de garniture Vis à chapeau à tête creuse	Inox AISI, type 316L
	408	Bouchon de vidange – ⅜ po, NPT	Inox AISI, type 316
	126	Chemise d'arbre	316 SS
	178	Clavette (roue)	Acier
	422	Vis de blocage (roue)	Acier
	199	Rondelle de blocage (roue)	316 SS
	412A	Joint torique, roue	Buna-N
	412F	Joint torique, chemise d'arbre	Buna-N
	513	Joint torique	Buna-N
	383	Garniture mécanique, pièce standard n° 10K13	Carbone, céramique Buna-N Inox 316
Organes d'entraînement	108 228 134	Adaptateur Corps de palier Couvercle de palier	Fonte ASTM A48, CL20
	122 168 112 136 370B 370C	Arbre de pompe Roulement à billes interne Roulement à billes externe Bague de retenue (roulement) Vis de fixation à tête hexagonale (adaptateur-corps de palier) Vis de fixation à tête hexagonale (couvercle de palier-corps de palier)	Acier
	333A 193 123	Joint à lèvre Graisseur Déflecteur annulaire en V	Buna-N Acier Buna-N

GARNITURES MÉCANIQUES EN OPTION

Garnitures mécaniques John Crane, type 21						
N° d'art.	N° de pièce	Élément mobile	Élément fixe	Élastomères	Métal	Service prévu
383 (en option)	10K19	Carbone	Fonte Ni-Resist	Éthyl.-propyl.	Inox 316	Hautes tempér.
	10K25			Viton		Prod. chimiques
	10K27		Carbure de tungstène	Éthylène-propylène		Hautes tempér. Abrasifs légers

G&L Pumps

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized GouldsPumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

GARANTÍA LIMITADA DE GOULDS PUMPS

Esta garantía es aplicable a todas las bombas para sistemas de agua fabricadas por Goulds Pumps. Toda parte o partes que resultaren defectuosas dentro del período de garantía serán reemplazadas, sin cargo para el comerciante, durante dicho período de garantía. Tal período de garantía se extiende por doce (12) meses a partir de la fecha de instalación, o dieciocho (18) meses a partir de la fecha de fabricación, cualquiera se cumpla primero.

Todo comerciante que considere que existe lugar a un reclamo de garantía deberá ponerse en contacto con el distribuidor autorizado de Goulds Pumps del cual adquiriera la bomba y ofrecer información detallada con respecto al reclamo El distribuidor está autorizado a liquidar todos los reclamos por garantía a través del Departamento de Servicios a Clientes de Goulds Pumps.

La presente garantía excluye:

(a) La mano de obra, el transporte y los costos relacionados en los que incurra el comerciante;
(b) los costos de reinstalación del equipo reparado;
(c) los costos de reinstalación del equipo reemplazado;
(d) daños emergentes de cualquier naturaleza; y
(e) el reembolso de cualquier pérdida causada por la interrupción del servicio

A los fines de esta garantía, los términos "Distribuidor", "Comerciante" y "Cliente" se definen como sigue:

(1) "Distribuidor" es aquel individuo, sociedad, corporación, asociación u otra persona jurídica que opera en relación legal entre Goulds Pumps y el comerciante para la compra, consignación o contratos de venta de las bombas en cuestión.
(2) "Comerciante" es todo individuo, sociedad, corporación, asociación u otra persona jurídica que en el marco de una relación legal realiza negocios de venta o alquiler-venta (leasing) de bombas a clientes.
(3) "Cliente" es toda entidad que compra o que adquiere bajo la modalidad de leasing las bombas en cuestión de un comerciante. El término "cliente" puede significar un individuo, sociedad, corporación, sociedad de responsabilidad limitada, asociación o cualquier otra persona jurídica con actividades en cualquier tipo de negocios.

LA PRESENTE GARANTÍA SE EXTIENDE AL COMERCIANTE ÚNICAMENTE.

GARANTIE LIMITÉE DE GOULDS PUMPS

La présente garantie s'applique à chaque pompe de système d'alimentation en eau fabriquée par Goulds Pumps.

Toute pièce se révélant défectueuse sera remplacée sans frais pour le détaillant durant la période de garantie suivante expirant la première : douze (12) mois à compter de la date d'installation ou dix-huit (18) mois à partir de la date de fabrication.

Le détaillant qui, aux termes de cette garantie, désire effectuer une demande de règlement doit s'adresser au distributeur Goulds Pumps agréé chez lequel la pompe a été achetée et fournir tous les détails à l'appui de sa demande. Le distributeur est autorisé à régler toute demande par le biais du service à la clientèle de Goulds Pumps.

La garantie ne couvre pas :

a) les frais de main-d'œuvre ou de transport ni les frais connexes encourus par le détaillant ;
b) les frais de réinstallation de l'équipement réparé ;
c) les frais de réinstallation de l'équipement de remplacement ;
d) les dommages indirects de quelque nature que ce soit ;
e) ni les pertes découlant de la panne.

Aux fins de la présente garantie, les termes ci-dessous sont définis comme suit :

1) « Distributeur » signifie une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique servant d'intermédiaire entre Goulds Pumps et le détaillant pour les achats, les consignations ou les contrats de vente des pompes en question.
2) « Détaillant » veut dire une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique dont les activités commerciales sont la vente ou la location de pompes à des clients.
3) « Client » signifie une entité qui achète ou loue les pompes en question chez un détaillant. Un « client » peut être une personne, une société de personnes, une société de capitaux, une société à responsabilité limitée, une association ou autre entité juridique se livrant à quelque activité que ce soit.

CETTE GARANTIE SE RAPPORTE AU DÉTAILLANT SEULEMENT.

Goulds Pumps

ITT Industries

ITT

Wastewater

Goulds Pumps

WS_BHF Series Model 3887BHF

Submersible Sewage Pump

Prosurance available for residential applications.

FEATURES

- **Impeller:** Cast iron, enclosed, non-clog, dynamically balanced with pump out vanes for mechanical seal protection.
- **Casing:** Cast iron flanged volute type for maximum efficiency. Designed for easy installation on A10-20 slide rail or base elbow rail systems.
- **Mechanical Seal:** Silicon Carbide vs. Silicon Carbide sealing faces for superior abrasive resistance, stainless steel metal parts, BUNA-N elastomers.
- **Shaft:** Corrosion resistant, 300 series stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.
- **Fasteners:** 300 series stainless steel.
- Capable of running dry without damage to components.
- Designed for continuous operation, when fully submerged.

GOULDS PUMPS

AGENCY LISTINGS

C SA US

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association — File #LR38549

Goulds Pumps is ISO 9001 Registered.

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Sewage systems
- Dewatering/Effluent
- Water transfer
- Light industrial
- Commercial applications

Anywhere waste or drainage must be disposed of quickly, quietly and efficiently.

SPECIFICATIONS

Pump

- Solids handling capabilities: 2" maximum.
- Capacities: up to 220 GPM.
- Total heads: up to 81 feet TDH.
- Discharge size: 2" NPT threaded companion flange as standard. 3" option available but must be ordered separately. (Order no. A1-3)
- Temperature: 104°F (40°C) continuous
  140°F (60°C) intermittent.

MOTORS

- Fully submerged in high grade turbine oil for lubrication and efficient heat transfer. All ratings are within the working limits of the motor.
- Class B insulation on ⅓-1½ HP models.
- Class F insulation on 2 HP models.

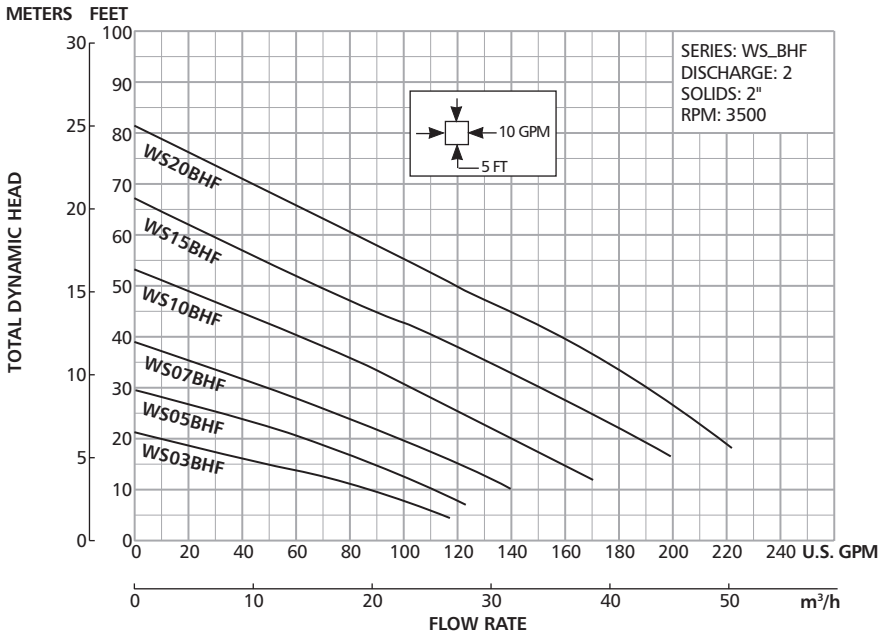
Single phase (60 Hz):

- Capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ – 1 HP models have NEMA three prong grounding plugs.
- 1½ HP and larger units have bare lead cord ends.

Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.

- **Designed for Continous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- **Bearings:** Upper and lower heavy duty ball bearing construction.
- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- **Motor Cover O-ring:** Assures positive sealing against contaminant and oil leakage.

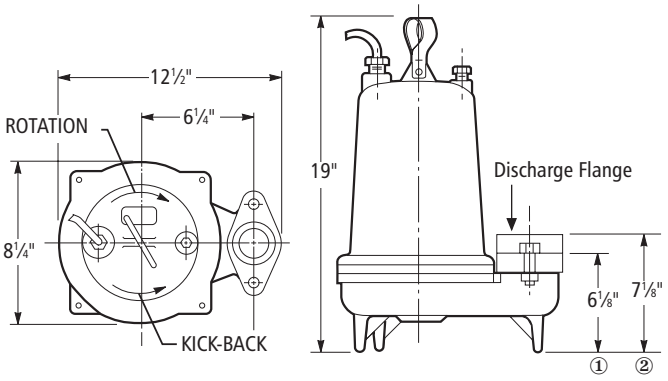


MOTOR AND MODEL INFORMATION

ORDER NUMBER	HP	PHASE	VOLTS	RPM	IMPELLER DIA. (IN.)	MAX. AMPS	LOCKED ROTOR AMPS	KVA CODE	FULL LOAD MOTOR EFF. %	RESISTANCE	
										START	LINE-LINE
WS0311BHF	0.33	1	115	3500	2.94	12.4	46.0	M	54	7.5	1.0
WS0318BHF	0.33	1	208			6.8	31.0	K	68	9.7	2.4
WS0312BHF	0.33	1	230			6.2	34.5	M	53	9.6	4.0
WS0511BHF	0.5	1	115		3.19	14.5	46.0	M	54	7.5	1.0
WS0518BHF	0.5	1	208			8.4	31.0	K	68	9.7	2.4
WS0512BHF	0.5	1	230			7.6	34.5	M	53	9.6	4.0
WS0538BHF	0.5	3	200			4.9	22.6	R	68	–	3.8
WS0532BHF	0.5	3	230			3.6	18.8	R	70	–	5.8
WS0534BHF	0.5	3	460			1.8	9.4	R	70	–	23.2
WS0537BHF	0.5	3	575			1.5	7.5	R	62	–	35.3
WS0718BHF	0.75	1	208		3.44	11.0	31.0	K	68	9.7	2.4
WS0712BHF	0.75	1	230			10.0	27.5	J	65	12.2	2.7
WS0738BHF	0.75	3	200			6.2	20.6	L	64	–	5.7
WS0732BHF	0.75	3	230			5.4	15.7	K	68	–	8.6
WS0734BHF	0.75	3	460			2.7	7.9	K	68	–	34.2
WS0737BHF	0.75	3	575			2.2	9.9	L	78	–	26.5
WS1018BHF	1	1	208		3.75	14.5	59.0	K	68	9.3	1.1
WS1012BHF	1	1	230			13.0	36.2	J	69	10.3	2.1
WS1038BHF	1	3	200			8.6	27.6	M	77	–	2.7
WS1032BHF	1	3	230			7.5	24.1	L	79	–	4.1
WS1034BHF	1	3	460			3.8	12.1	L	79	–	16.2
WS1037BHF	1	3	575			3.1	9.9	L	78	–	26.5
WS1512BHF	1.5	1	230		4.00	18.0	52.0	J	67	2.76	0.53
WS1538BHF	1.5	3	200			10.0	42.4	K	78	–	1.7
WS1532BHF	1.5	3	230			9.6	42.4	K	78	–	1.7
WS1534BHF	1.5	3	460			4.8	21.2	K	78	–	6.6
WS1537BHF	1.5	3	575			3.9	16.3	L	78	–	10.5
WS2012BHF	2	1	230		4.44	18.0	49.6	F	78	3.2	1.1
WS2038BHF	2	3	200			12.0	42.4	K	78	–	1.7
WS2032BHF	2	3	230			11.6	42.4	K	78	–	1.7
WS2034BHF	2	3	460			5.8	21.2	K	78	–	6.6
WS2037BHF	2	3	575			4.7	16.3	L	78	–	10.5

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



Discharge Flange:

① 2" NPT standard

② 3" NPT optional (order an A1-3)

ITT

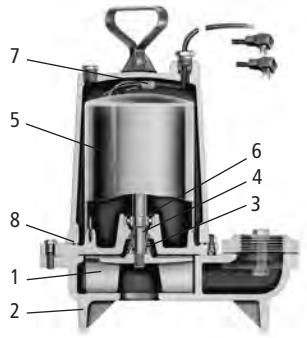
Wastewater

PERFORMANCE RATINGS (gallons per minute)

Order No.		WS03BHF	WS05BHF	WS07BHF	WS10BHF	WS15BHF	WS20BHF
	HP ▶	⅓	½	¾	1	1½	2
	RPM ▶	3500	3500	3500	3500	3500	3500
Total Head Feet of Water	10 ▶	86	110	140	–	–	–
	15	48	88	120	158	–	–
	20	–	62	98	139	186	217
	25	–	32	74	120	170	204
	30	–	–	49	101	150	190
	35	–	–	21	82	130	175
	40	–	–	–	60	110	159
	45	–	–	–	38	88	140
	50	–	–	–	–	67	120
	55	–	–	–	–	47	100
	60	–	–	–	–	29	80
	65	–	–	–	–	–	62
	70	–	–	–	–	–	43
	75	–	–	–	–	–	23

COMPONENTS *(for reference only)*

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring

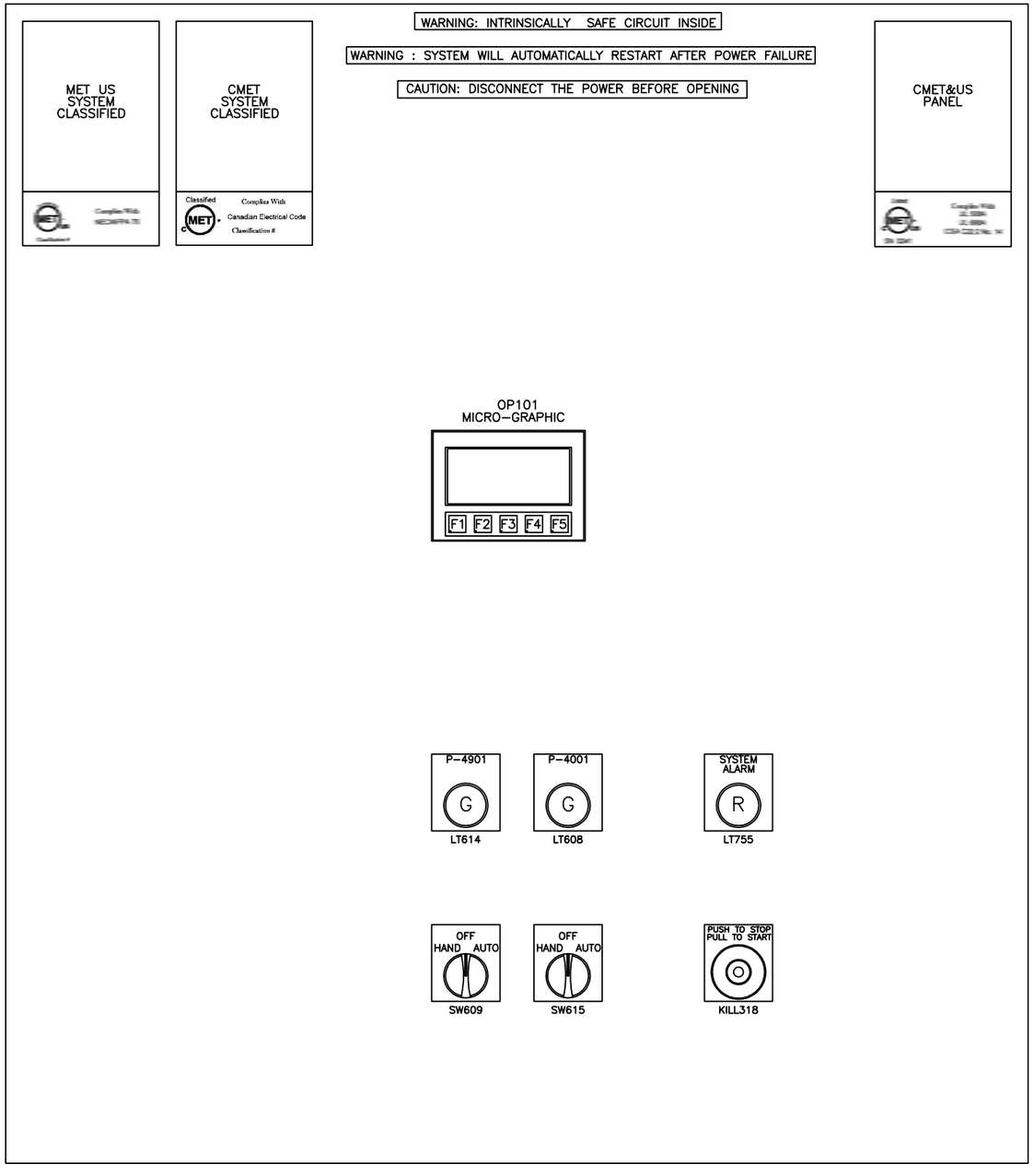


**** For repair parts, reference repair parts book.***

GOULDS PUMPS

B3887BHF April, 2007

Engineered for life



DS201

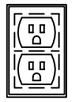
MAIN
DISCONNECT

200 AMP
125A FUSES
208V 3PH
108 FLA

NOTE 1: NEMA 3R LOCKABLE PANEL(S)

NOTE 2: LIGHTS & SWITCHES MOUNTED ON INNER SWING PANEL DOOR

REC337



15A GFI

WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

MET US CERTIFIED, CONTROL ROOM BUILT TO NEC GENERAL PURPOSE STANDARDS, PROCESS ROOM BUILT TO NEC CLASS 1 DIV 2 STANDARDS, ALL WIRING COMPLETE AND ALL EQUIPMENT PRE-PIPED, FACTORY TESTED AND MOUNTED IN ENCLOSURE.

REV	DATE(mm/dd/yy)	BY	DESCRIPTION
E	08/14/13	dbelisle	FOR PROJECT 102140

	NAME	DATE(mm/dd/yy)
DRAWN	PR	JUN18/07
CKD		
APPR		

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1325 CALIFORNIA AVE.
BROCKVILLE, ONTARIO
CANADA
K6V 5Y6
www.newterra.com

PROJECT:
RTS151 / 150GPM OWS
Baffinland Iron Mines Corp
Mary River Project/ PM 005

DRAWING-NO:

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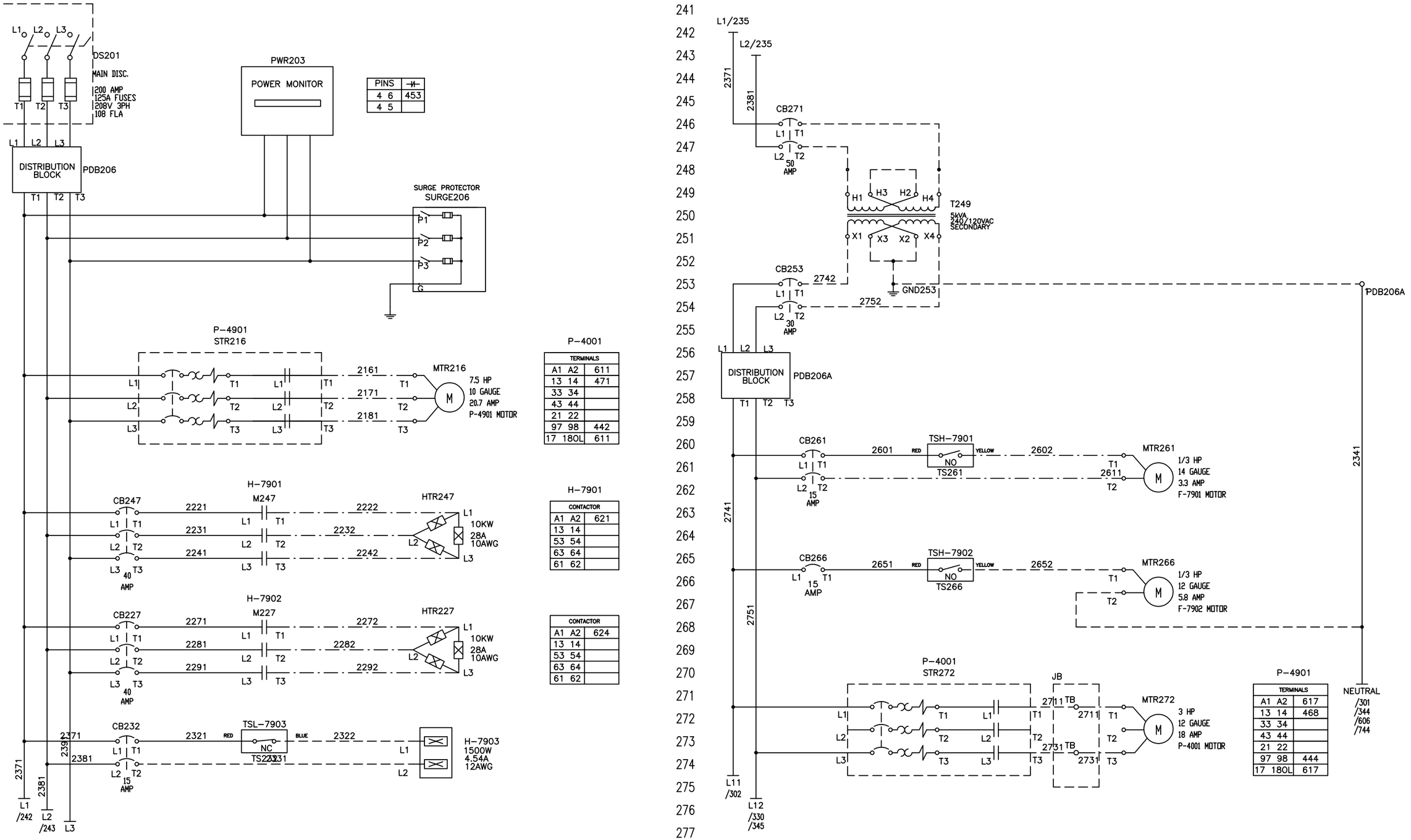
102140

PAGE DESCRIPTION
PANEL VIEW

PAGE:
1 OF 8



WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

MET US CERTIFIED, CONTROL ROOM BUILT TO NEC GENERAL PURPOSE STANDARDS, PROCESS ROOM BUILT TO NEC CLASS 1 DIV 2 STANDARDS, ALL WIRING COMPLETE AND ALL EQUIPMENT PRE-PIPED, FACTORY TESTED AND MOUNTED IN ENCLOSURE.

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RTS151 / 150GPM OWS
Baffinland Iron Mines Corp
Mary River Project/ PM 005

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PAGE DESCRIPTION
MOTORS

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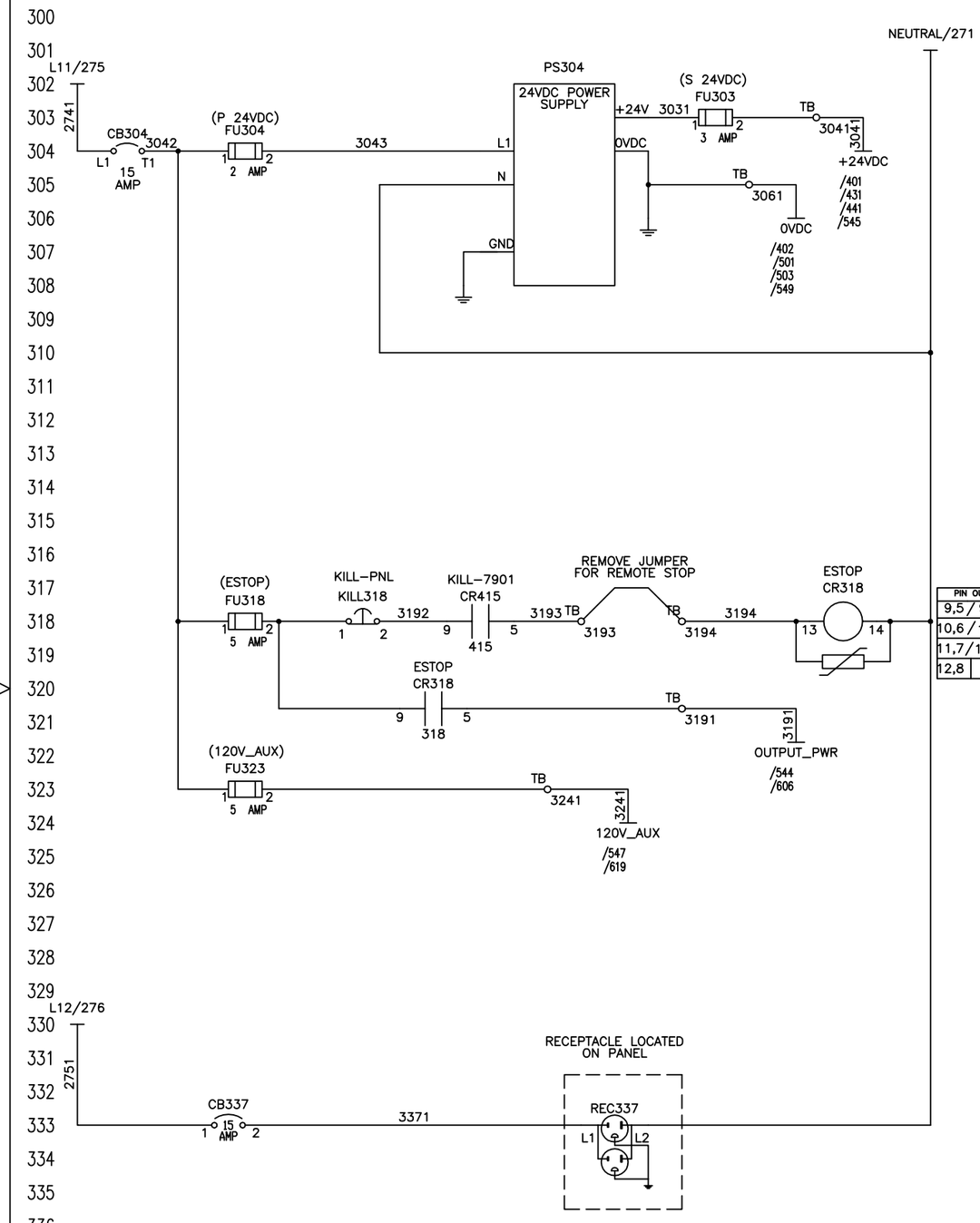

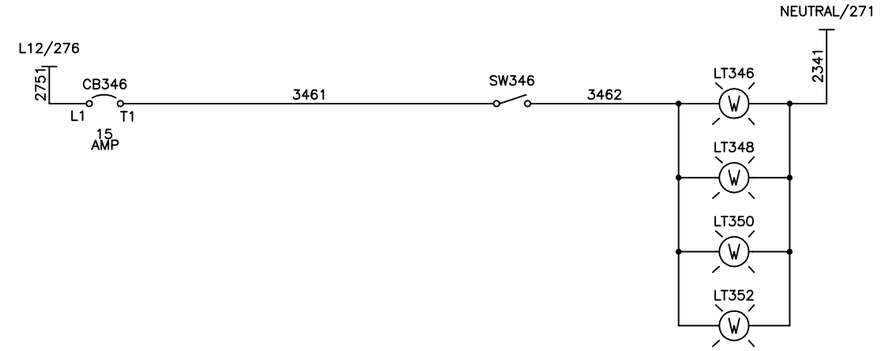

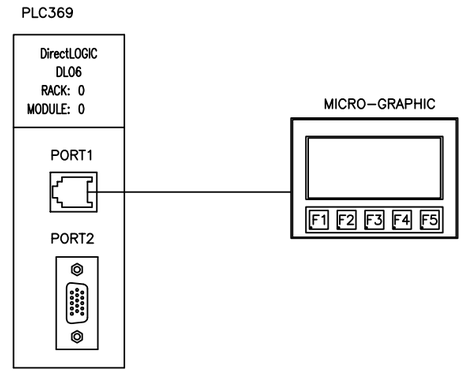

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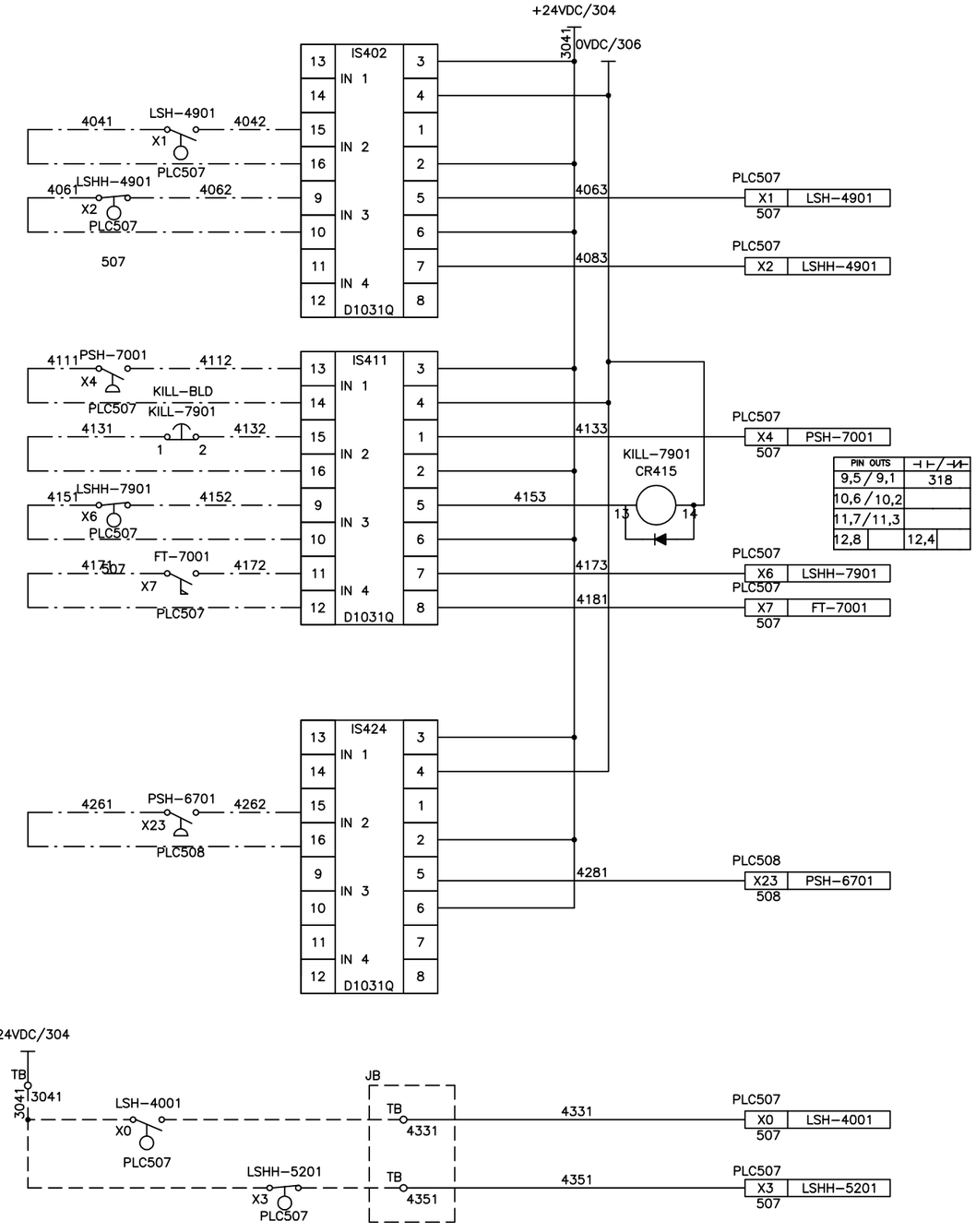

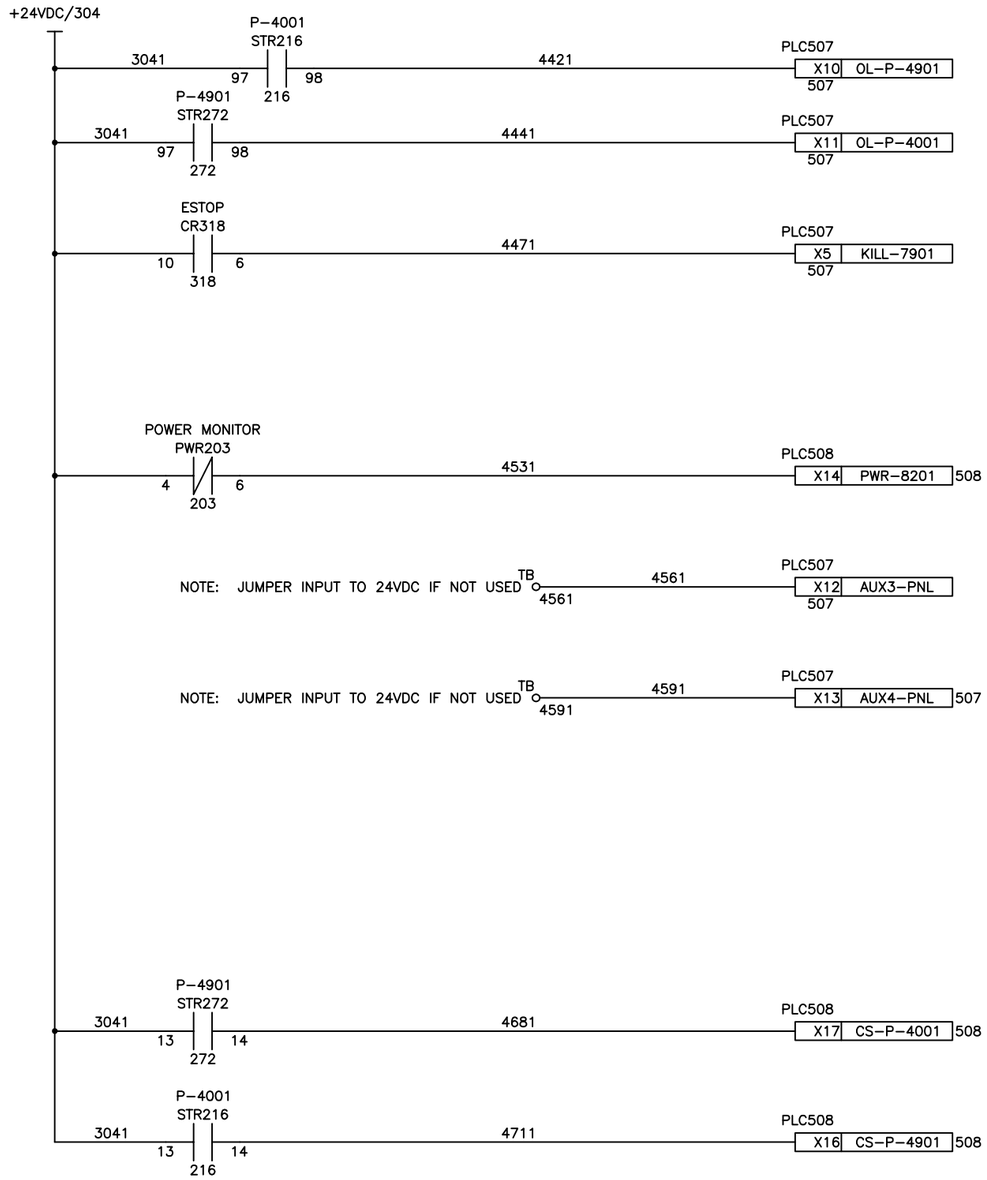

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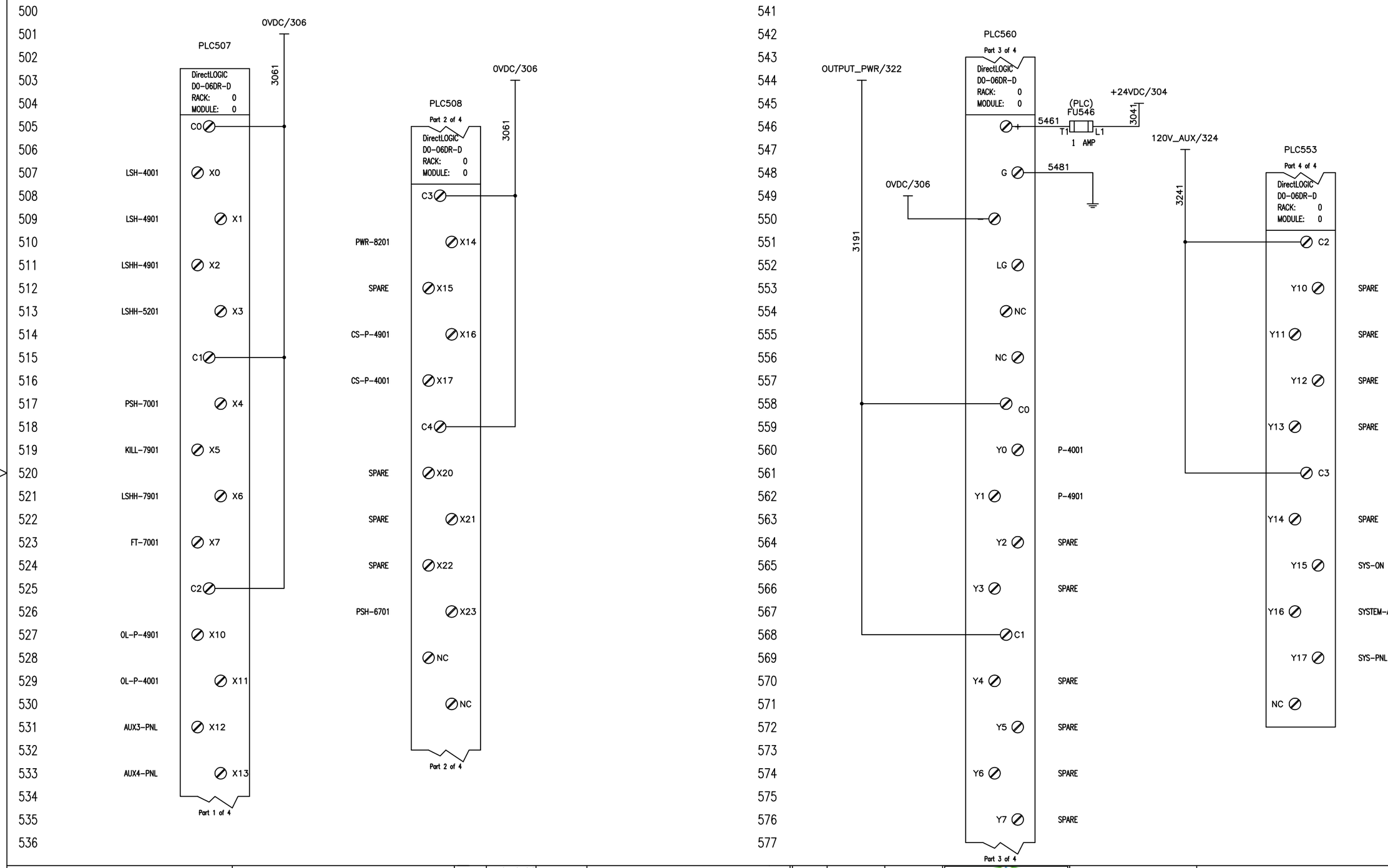

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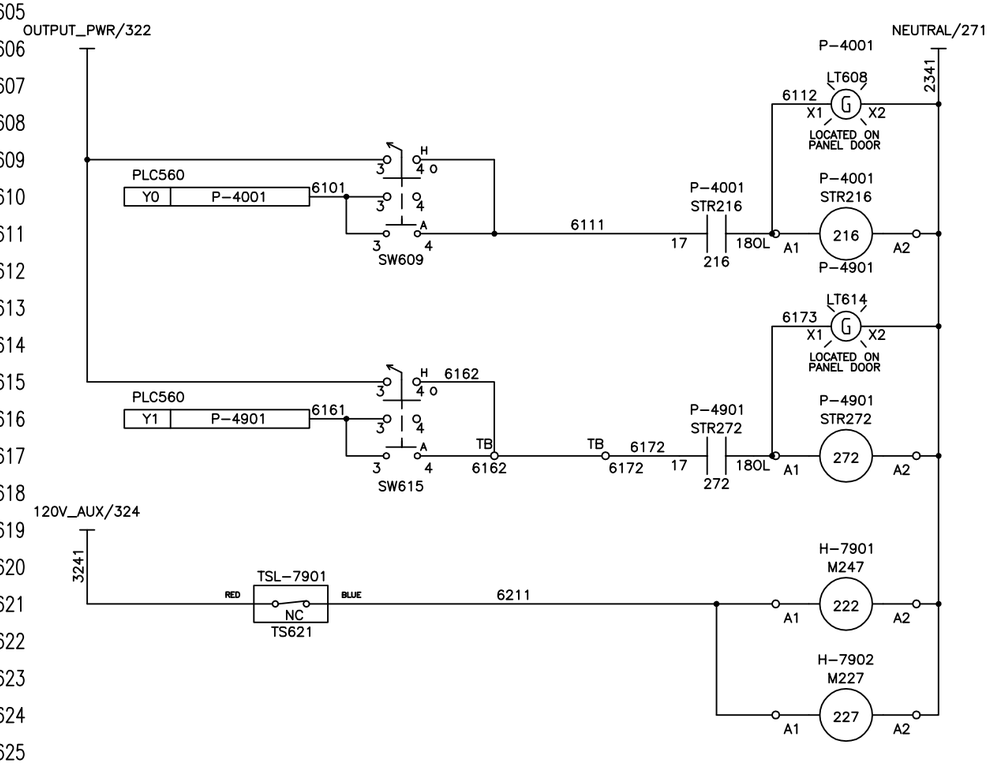

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PLC OUTPUTS

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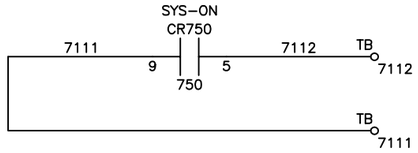

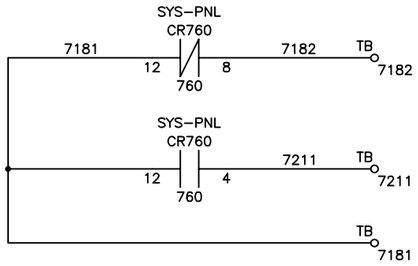

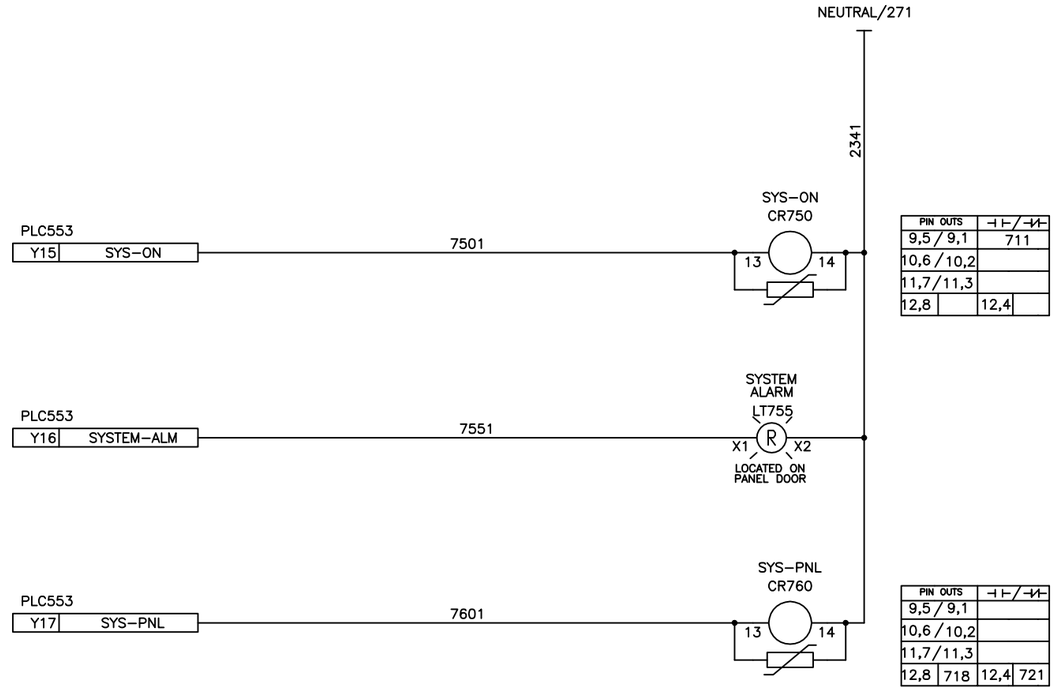

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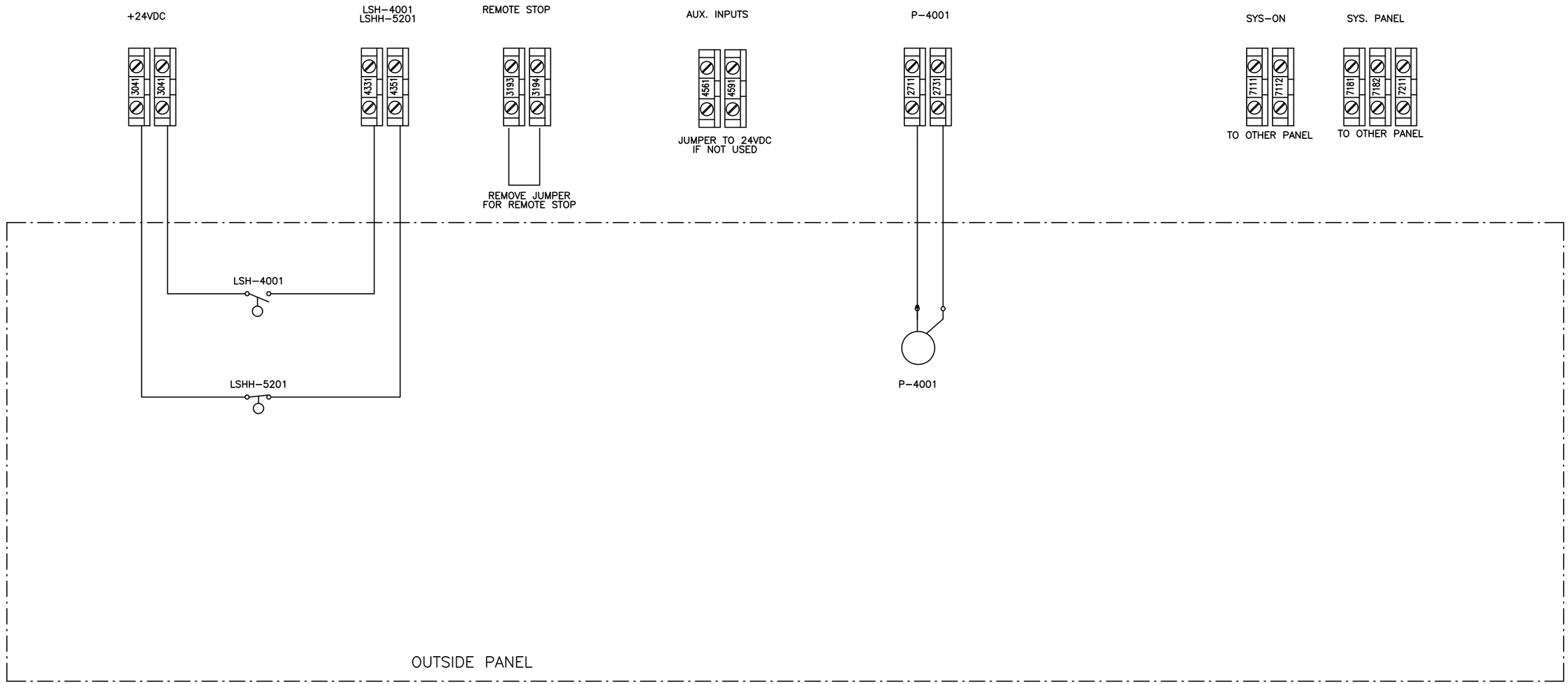
TERMINAL PLAN



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PAGE DESCRIPTION
FIELD WIRING

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Bill of Material

Project RTS151
Description Baffinland Iron Mines Corp^Mary River Project/ PM
Ordernumber 102140
Drawing Number

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Installation

No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
1	CB227		1	17717	Breaker, Techna, JTE	Breaker, Techna, JTEC4893C40 , 240V 40 AMP 3P C Trip Cuve	
2	CB232		1	17397	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C15 , 480/277V 15 AMP 2P C Trip Curve	
3	CB247		1	17717	Breaker, Techna, JTE	Breaker, Techna, JTEC4893C40 , 240V 40 AMP 3P C Trip Cuve	
4	CB253		1	17698	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C20 , 480/277V 20 AMP 2P C Trip Curve	
5	CB261		1	17397	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C15 , 480/277V 15 AMP 2P C Trip Curve	
6	CB266		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
7	CB271		1	17701	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C50 , 240V 50 AMP 2P C Trip Curve	
8	CB304		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
9	CB337		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
10	CB346		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
11	CR318	ESTOP	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
12	CR318	ESTOP	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
13	CR415	KILL-7901	1	21888	Relay, SQT RXM4AB1BD	Relay, SQT RXM4AB1BD , Miniature Relay 4PDT 24 V DC	Telemechanique
14	CR415	KILL-7901	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
15	CR750	SYS-ON	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
16	CR750	SYS-ON	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
17	CR760	SYS-PNL	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
18	CR760	SYS-PNL	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
19	DS201	200 AMP	1	11163	Disconnect, 3ph, D32	Disconnect, 3ph, D324N , 200A, UL,240V,Nema 1,fusible disconnect	SQD
20	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould
21	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould

Installation

No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
22	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould
23	FU303		1	E1187	Fuse, GLD GDL3	Fuse, GLD GDL3 , 3A 250V Time Delay	Gould
24	FU303		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
25	FU304		1	E1186	Fuse, GLD GDL2	Fuse, GLD GDL2 , 2A 250V Time Delay	Gould
26	FU304		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
27	FU318		1	E1188	Fuse, GLD GDL5	Fuse, GLD GDL5 , 5A 250V Time Delay	Gould
28	FU318		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
29	FU323		1	E1188	Fuse, GLD GDL5	Fuse, GLD GDL5 , 5A 250V Time Delay	Gould
30	FU323		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
31	FU546		1	E1190	Fuse, GLD GGC1	Fuse, GLD GGC1 , 1A 250V Fast Acting	Gould
32	FU546		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
33	IS402		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
34	IS411		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
35	IS424		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
36	KILL318		1	14607	Button, E-Stop, ZB5	Button, E-Stop, ZB5 AT4 , E-Stop Button	SQD
37	KILL318		1	14607	Button, E-Stop, ZB5	Button, E-Stop, ZB5 AT4 , E-Stop Button	SQD
38	KILL318		1	14609	Button, ZB5 AZ105	Collar with 1-N/0 and 1-N/C Contact Block	SQD
39	KILL318		1	14609	Button, ZB5 AZ105	Collar with 1-N/0 and 1-N/C Contact Block	SQD
40	KILL318		1	23054	Label, Emergency Sto	Label, Emergency Stop, SQT ZBY9330 ,	
41	KILL318		1	23054	Label, Emergency Sto	Label, Emergency Stop, SQT ZBY9330 ,	
42	LT608	P-4001	1	18625	Button, XB7EV03GP	Button, XB7EV03GP , Green LED Pilot Light 120VAC	Square D
43	LT614	P-4901	1	18625	Button, XB7EV03GP	Button, XB7EV03GP , Green LED Pilot Light 120VAC	Square D
44	LT755	SYSTEM	1	18626	Button, XB7EV04GP	Button, XB7EV04GP , Red LED Pilot Light 120VAC	Square D
45	M227	H-7902	1	10520	Contactor, SQD LC1D3	Contactor, SQD LC1D32G7 , 32A, 10/10/20/25HP	SQD
46	M247	H-7901	1	10520	Contactor, SQD LC1D3	Contactor, SQD LC1D32G7 , 32A, 10/10/20/25HP	SQD
47	OP367	MICRO-GRAPHIC	1	17233	PLC, EA1-S3ML	PLC, EA1-S3ML , C-more micro graphic user interface	
48	OP367	MICRO-GRAPHIC	1	17234	PLC, DV-1000CBL	PLC, DV-1000CBL , 2m Cable RJ12 to RJ12	
49	PDB206		1	E1217	Power Block, GLD 675	Power Block, GLD 67583 , 175A 1Pri 8Sec Aluminum	Gould
50	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
51	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
52	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
53	PDB206A		1	E1215	Power Block, GLD 631	Power Block, GLD 63163 , 90A 1Pri 4Sec Aluminum 3P	Gould

Installation

No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
54	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
55	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
56	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
57	PLC369		1	DLO6			
58	PLC507		1	12752	PLC, D0-06DR-D	PLC, D0-06DR-D , 20PT 24VDC Input 16PT Relay Output Base Unit DL06	Koyo
59	PLC507		1	E1024	PLC, D2-Bat-1	PLC, D2-Bat-1 , Battery for PLC DL05/06/205	
60	PLC508		1	D0-06DR-D			
61	PS304		1	20780	Power supply, Teleme	Power supply, Telemecanique ABL7 RM24025 , In 100-240VAC Out 24VDC 2.5A	Telemechanique
62	PWR203		1	18396	Motor Saver, 460 w/D	Motor Saver, 460 w/Diagnostic 3ph , Finger Safe, DIN Rail Mountable	
63	REC337		1	GFI-15			
64	STR216	P-4001	1	19274	Combination Starter,	Combination Starter, SQT LUCA32FU , TeSysU Standard Control Unit 8-32A	
65	STR216	P-4001	1	19273	Combination Starter,	Combination Starter, SQT LUB32 , TeSysU Power Base 32A	
66	STR216	P-4001	1	19269	Combination Starter,	Combination Starter, SQT LUA1C20 , TeSysU Aux Contact Module	Telemechanique
67	STR216	P-4001	1	19270	Combination Starter,	Combination Starter, SQT LU9SP0 , TeSysU UL508 Type E Phase Barrier	
68	STR272	P-4901	1	20669	Combination Starter,	Combination Starter, SQT LUCC18FU , TeSysU 1 Phase Control Unit 4.5-18	
69	STR272	P-4901	1	19273	Combination Starter,	Combination Starter, SQT LUB32 , TeSysU Power Base 32A	
70	STR272	P-4901	1	19269	Combination Starter,	Combination Starter, SQT LUA1C20 , TeSysU Aux Contact Module	Telemechanique
71	STR272	P-4901	1	19270	Combination Starter,	Combination Starter, SQT LU9SP0 , TeSysU UL508 Type E Phase Barrier	
72	SW609		1	14660	Button, ZB5 AD3	Button, ZB5 AD3 , 3 Pos. Switch, Maintained	SQD
73	SW609		1	14610	Button, ZB5 AZ103	Button, ZB5 AZ103 , 3	SQD
74	SW615		1	14660	Button, ZB5 AD3	Button, ZB5 AD3 , 3 Pos. Switch, Maintained	SQD
75	SW615		1	14610	Button, ZB5 AZ103	Button, ZB5 AZ103 , 3	SQD
76	T249		1	19999	Transformer, Hammond	Transformer, Hammond, HAT Q005YEKF , 208V to 240V,5KVA,UL/CSA,3R.1ph	

Inputs and Setpoints *Project: RTS151 WTS, 150gpm, OWS-24, Carbon, 4*

Input Summary	
Digital PLC Inputs:	15
Digital PLC Frequency:	1
Analog(4-20) Inputs:	0
Analog(5V) Inputs:	0
Analog(10V) Inputs:	0

IS Barrier Summary	
Analog IS:	0
Digital IS :	9

Legend for Class

ISA : Intrinsically Safe Analog
ISD: Intrinsically Safe Digital
GP: Wire General Purpose
D1: Wire as DIV1
D2: Wire as DIV2

				PLC			Signal							Datalogger (DLO6)	
Tag	Name	Type	Class	Input	Value	State	Low	High	Units	SQRT	Fctr	Offsite_Col	Note	Main	Monthly (Daily for 30 days)
Digital_PLC															
4000 Submersible Pump															
LSH-4001	Level Switch Hi Well Pump 4001	Digital_PLC	ISD	X000		NormOpen	0	0		☐	0			☐ 0	☐ 0
CS-P-4001	P-4001 Status	Digital_PLC	GP	X017		NormOpen	0	0		☐	0			☐ 0	☐ 0
4900 Oil/Water Separator															
LSH-4901	Level Switch High - Oil Water Separato	Digital_PLC	ISD	X001		NormOpen	0	0		☐	0			☐ 0	☐ 0
LSHH-4901	Level Switch High High - Oil Water Sep	Digital_PLC	ISD	X002		NormClose	0	0		☐	0			☐ 0	☐ 0
CS-P-4901	P-4901 Status	Digital_PLC	GP	X016		NormOpen	0	0		☐	0			☐ 0	☐ 0
5200 Product Storage Tank															
LSHH-5201	Level Switch High High - Product Stora	Digital_PLC	ISD	X003		NormClose	0	0		☐	0			☐ 0	☐ 0
6700 Bag Filter															
PSH-6701	Pressure Switch High Bag Filter 6701	Digital_PLC	ISD	X023		NormOpen	0	0		☐	0			☐ 0	☐ 0
7000 Liquid Phase Carbon															
PSH-7001	High Pressure Switch	Digital_PLC	ISD	X004		NormClose	0	0		☐	0			☐ 0	☐ 0
7900 Building, Trailer or Skid															
KILL-7901	Kill Switch 1 - Building	Digital_PLC	ISD	X005		NormClose	0	0		☐	0			☐ 0	☐ 0
LSHH-7901	Level Switch High High - Building	Digital_PLC	ISD	X006		NormClose	0	0		☐	0			☐ 0	☐ 0
8200 Main Control Panel															
OL-P-4901	P-4901 Overload	Digital_PLC	GP	X010		NormOpen	0	0		☐	0			☐ 0	☐ 0
OL-P-4001	P-4001 Overload	Digital_PLC	GP	X011		NormOpen	0	0		☐	0			☐ 0	☐ 0
AUX-8201	Auxiliary Contact - Control Panel	Digital_PLC	GP	X012		NormClose	0	0		☐	0			☐ 0	☐ 0
AUX-8202	Auxiliary Contact - Control Panel	Digital_PLC		X013		NormClose	0	0		☐	0			☐ 0	☐ 0
PWR-8201	Power/Phase Monitor Panel	Digital_PLC		X014		NormClose	0	0		☐	0			☐ 0	☐ 0
Digital_PLC_Freq															
7000 Liquid Phase Carbon															
FT-7001	Flow Transmitter - Liquid Phase Carbo	Digital_PLC_	ISD	X007		NormOpen	0	0		☐	0			☐ 0	☐ 0
Direct															
7900 Building, Trailer or Skid															
TSH-7901	Temperature Switch High - Room #1	Direct				NormOpen	0	0		☐	0			☐ 0	☐ 0
TSH-7902	Temperature Switch High - Room #2	Direct				NormOpen	0	0		☐	0			☐ 0	☐ 0
TSL-7901	Temp Switch Low - Room #1	Direct				NormClose	0	0		☐	0			☐ 0	☐ 0

				PLC			Signal							Datalogger (DLO6)	
Tag	Name	Type	Class	Input	Value	State	Low	High	Units	SQRT	Fctr	Offsite_Col	Note	Main	Monthly (Daily for 30 days)
TSL-7902	Temp Switch Low - Room #2	Direct				NormClose	0	0		☐	0			☐ 0	☐ 0

Outputs Project RTS151 WTS, 150gpm, OWS-24, Carbon, 40

Largest Motor	7.5

575V-3ph:	0
460V-3ph:	0
230V-3ph:	0
208V-3ph:	20.46

230V-1ph	11.43
208V-1ph	0
115V-1ph	12

230V/115-3ph	0

Tag	PLC Loc	Device	Voltage	Watts	HP	Amps	Switches: At Device	Switches: On Panel	Panel Setup: Hourmeter	Panel Setup: Ammeter	Analog Setup: Signal_Low	Analog Setup: Signal_High	Offsite Communication Package: Offsite_Switch	Offsite Communication Package: Offsite_Color	Offsite_Name	Hourmeter	Datalog: Ammeter	Datalog: Monthly	Datalog: Mai
							Logic												
Digital_PLC																			
4000 Submersible Pump																			
P-4001	Y000	Motor Cntr	230V-1ph		1.5	7.83	None	Hand/Off/Auto	Display Only	None						☐	☐	☐ 0	☐ 0
Well Pump 4001							PUMPS FEEDING OWS PUMP START: SYSTEM IN RUN AND LAHH-4901 OFF PUMP STOP: SYSTEM NOT IN RUN OR LAHH-4901 ON												
4900 Oil/Water Separator																			
P-4901	Y001	Motor Cntr	208V-3ph		7.5	20.46	None	Hand/Off/Auto	Display Only	None						☐	☐	☐ 0	☐ 0
Pump - Oil Water Separator							PUMP START: SYSTEM IN RUN AND LSH-4901 ON PUMP STOP: SYSTEM NOT IN RUN OR LSH-4901 OFF												
8200 Main Control Panel																			
AL-8201	Y016	Light	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
Alarm Light							LIGHT ON: SYSTEM IN ALARM. LIGHT OFF: SYSTEM NOT IN ALARM.												
AR-8201	Y017	Relay(110)	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
Alarm Relay							RELAY ON: SYSTEM IN SHUTDOWN ALARM. RELAY OFF: SYSTEM NOT IN SHUTDOWN ALARM.												
SYS ON	Y015	Relay(110)	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
System On Relay							RELAY ON: SYSTEM IN RUN AND KILL SWITCH NOT PRESSED RELAY OFF: SYSTEM NOT IN RUN OR KILL SWTICH PRESSED												
Power																			
7900 Building, Trailer or Skid																			
F-7901		Fan	230V-1ph		0.33	3.6	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Fan - Process Room							FAN START: TSH-7901 ON FAN STOP: TSH-7901 OFF												
F-7902		Fan	115V-1ph	0	0.25	2	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Fan - Control Room							FAN START: TSH-7902 ON FAN STOP: TSH-7902 OFF												
H-7901		Heater	208V/120V-3	10000	0	28	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Process Room #1							HEATER START: TSL-7901 OFF HEATER STOP: TSL-7901 ON												
H-7902		Heater	208V/120V-3	10000		28	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Process Room #2							HEATER START: TSL-7901 OFF HEATER STOP: TSL-7901 ON												
H-7903		Heater	208V/120V-3	1500	0	4.1	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Control Room							HEATER START: TSL-7902 OFF HEATER STOP: TSL-7902 ON												
Lights		Light	115V-1ph	600		5	None	None	None	None						☐	☐	☐ 0	☐ 0
Inside Lights							LIGHTS ON: LIGHT SWITCH ON LIGHTS OFF: LIGHT SWITCH OFF												

Tag		PLC Loc	Device	Voltage	Watts	HP	Amps	Switches		Panel Setup		Analog Setup		Offsite Communication Package			Hourmeter	Datalog	
								At Device Logic	On Panel	Hourmeter	Ammeter	Signal_Low	Signal_High	Offsite_Switch	Offsite_Color	Offsite_Name	Ammeter	Monthly	Mai
8200	Main Control Panel																		
	120V CB		Control Powe	115V-1ph	600		5	None	None	None	None						☐	☐ 0	☐ 0
	120V Control Power																		

Alarms Project RTS151 WTS, 150gpm, OWS-24, Carbon, 40' Contai

Tag		PLC Loc / Logic	Alarm Type	Delay(sec)	Alarms On..	Alarm Setting / Comment

Type: Alarm_PLC

4900 Oil/Water Separator

LAHH-4901	**High High Level Alarm - Oil Water Separator**	C103	Recovers	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND LSHH-4901 OPEN FOR DELAY SHOWN ALARM STOP: SYSTEM RESET				

5200 Product Storage Tank

LAHH-5201	**High High Level Alarm - Product Storage Tank**	C104	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND LSHH-5201 DEACTIVATED FOR DELAY SHOWN (see table) ALARM STOP: SYSTEM RESET				

5800 Bag Filter

PAH-6701	**High Pressure Alarm Bag Filter 6701**	C110	Light_Only	5	Open	0
		SOFT ALARM: ALARM START: SYSTEM IN RUN AND PSH-6701 ACTIVATED FOR 5 SECONDS ALARM STOP: SYSTEM RESET				

7000 Liquid Phase Carbon

PAH-7001	**Pressure Alarm High**	C106	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM ON AND PSH-7001 OPEN FOR DELAY SHOWN (see table) ALARM STOP: SYSTEM RESET				

7900 Building, Trailer or Skid

KILLA-7901	**Kill Switch Alarm 1 - Building**	C102	Sys_Shutdown	0	Open	0
		SYSTEM SHUTDOWN: ALARM START: ANY KILL INPUT OPEN ALARM STOP: SYSTEM RESET				
LAHH-7901	**Level Alarm High High - Building**	C105	Sys_Shutdown	5	Open	0
		STANDARD LOGIC SYSTEM SHUTDOWN: ALARM START: LSHH-7901 OPEN FOR DELAY SHOWN ALARM STOP: SYSTEM RESET				

8200 Main Control Panel

OLA-P-4901	**Overload Alarm OWS Discharge Pump**	C111	Sys_Shutdown	1	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND OL-P-4901 ACTIVATED ALARM STOP: SYSTEM RESET				

Tag		PLC Loc	Alarm Type	Delay(sec)	Alarms On..	Alarm Setting
		Logic				Comment
OLA-P-4001	**Overload Alarm Inlet Discharge Pump**	C112	Sys_Shutdown	1	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND OL-P-4001 ACTIVATED ALARM STOP: SYSTEM RESET				
AUXA-8201	**Auxiliary Alarm - Control Panel**	C113	Sys_Shutdown	5	Open	0
		STANDARD LOGIC SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND AUX-8201 DEACTIVATED ALARM STOP: SYSTEM RESET				
AUXA-8202	**Auxiliary Alarm - Control Panel**	C113	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND AUX-8202 DEACTIVATED ALARM STOP: SYSTEM RESET				
PWRA-8201	**Panel Power Alarm**	C114	Sys_Shutdown	0	Open	0
		SYSTEM SHUTDOWN: ALARM START: POWER LOSS OR INCOMING VOLTAGE FAULT ALARM STOP: SYSTEM RESET AND INCOMING POWER IS WITHIN LIMITS Note: Power limits and tolerance, as well as recovery time is all set locally on device.				

Warning: This document does not replace the manufacturer's recommended maintenance schedules as referenced in the OM manual provided by the equipment manufacturer. It is provided as a quick guide to required OM activities for this project.

General Maintenance Activities

Daily

- Check the control panel for running status.
- Contact the system remotely to check system operation for:
  - Alarms
  - Operating Conditions

Weekly

- Check for Leaks.
- Check the volume of consumables. i.e. Chemicals, oil etc
- Check for excessive noise of various components.
- Check for Alarms.
- Check and record Flow Rates, Vacuums, Pressures, Temperatures, pH.
- Check for excessive moisture inside the control panels and transducer wiring boxes.
- Check for corrosion and grease the moving parts if required to reduce corrosion.

Monthly

- Test critical inputs for proper shutdown capacity.
- Test the operation of the overloads.
- Test building sump switch if it is present.

Yearly

- Test each input.
- Test alarm conditions.
- Test the operation of each output device.

Parts Listing per Maintenance Code

Fan

	Part		Qty	Module
F-7901	10329	Fan, Building, 24", 1/3hp, 1625rpm, 120/230V, 1ph, XPF	1	Building, Trailer or Skid
F-7903	M1072	Fan, Building, 12", 1/4hp, 1750rpm, 120V, 1ph, TEFC	1	Building, Trailer or Skid

Flow Meter (Liquid)

	Part		Qty	Module
FQI,FT-7001	15499	Meter, Water, 2", US Gal, w/ pulse, Turbine, DLJ	1	Liquid Phase Carbon

Gauge, Pressure

	Part		Qty	Module
PI-7001	16203	Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	2	Liquid Phase Carbon
P-4901	16203	Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	1	Oil/Water Separator

Oil Water Separator

	Part		Qty	Module
OWS-4901	16263	Oil Water Separator, OWS-24, Stainless	1	Oil/Water Separator

Pump, Discharge

	Part		Qty	Module
P-4901	21028	Pump, Suction, Goulds, SSH Series, 4SH2K52C0	1	Oil/Water Separator

Strainer

	Part		Qty	Module
P-4901	M1523	Strainer, Wye, Brass, 3"	1	Oil/Water Separator

Vertical Level Switch (Almeg)

	Part		Qty	Module
LSHH-5201	12351	Switch, Level, Almeg, Vertical, ATB3-48B	1	Product Storage Tank

EVERY 200 OPERATING HOURS

Strainer

Remove strainer basket. Inspect strainer and empty if necessary.

EVERY 800 OPERATING HOURS

Pump, Discharge

Close-Coupled Unit
Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

Frame-Mounted Units
Regrease frame with a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seal. Then wipe off excess. Follow motor and coupling manufacturers' lubrication instructions.

Note: Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

Fan

1) Check the fan outlet pressure.
2) Check to ensure nothing is obstructing the air intake.
3) Check the fan wheel for corrosion.
4) Check the fan wheel alignment and positioning.

Flow Meter (Liquid)

Test the operation of the flow meter. Disassemble and clean the internal components if dirt or particles are preventing the meter from working properly.

Vertical Level Switch (Almeg)

1) Test the operation of the switch.
2) Remove the switch and check for debris buildup that can potentially cause a failure of normal operation.

EVERY 4000 OPERATING HOURS

Gauge, Pressure

1) Check accuracy of gauges.
2) Zero gauge if required.

Oil Water Separator

After the first 6 months of operation, the inlet should be inspected and cleaned as follows:
1) Stop the flow of influent to the separator.
2) Remove separator cover.
3) Dispose of separated oil per regular procedures.
4) Remove water from separator through drain or hose. Measure and record the depth of the solids. Use this measurement as the timing basis for the next solids inspection and clean out. Consult OWS drawing for depth of sludge baffle. Solids should not exceed this depth.
5) The HD Q-PAC plates can be either cleaned in place or removed and cleaned.
6) Examine the tank interior for damage and repair any damage to internal coating.
7) To restart separator, install HD Q-PAC plate packs and polishing pack in original position. Make sure that both are securely in place so that they do not float when unit is operational.

RTS - 151
150 GPM WATER TREATMENT SYSTEM
STARTUP PROCEDURE

- If the system is being started for the first time then work your way through the commissioning checklist in the installation guide or system manual before starting the system.
- If kill switch on panel (red mushroom shaped button) is pulled out then push it in to confirm that system is off.
- Pull kill button out in process room so the system can start at the appropriate time.
- Walk through process piping and check the position of all process valves.
- Check that there are no obstructions over any moving parts.
- Check that main disconnect is on.
- Put all hand/off/auto switches in auto.
- Pull the kill Button (red button on panel) out to start the process.
- Push the reset button on the operator interface to reset all alarms.
- Push the start button on the Operator Interface.
- If an alarm occurred on startup, then review the alarm descriptions and troubleshooting guide in the installation guide or manual for guidance on how to troubleshoot the problem. Fix the alarm condition and restart the system with the above procedure.

RTS - 151 150 GPM

Mech Eng:		**Control:**		**Tester #1:** Warren, Kevin
Mechanical Team:	**Electrical Team:**	**Panel Team:**		**Tester #2:**
-Select One-	-Select One-	-Select One-		
				Start Date: 8/20/2013
				End Date: 8/27/2013

SECTION A - PRE-TEST FLOW RATES AND POWER DETAILS

P-VLS		B-STRIP	
B-SVE		P-STRIP	
P-OWS		C-SPRG	
OTHER:		OTHER:	

System Certifications	**Panel Standard**	**System Standard**	**SETPOINTS**
Building #1 / Room #1:	**UL 698A**	**MET us, Classified**	
Building #2 / Room #2:	**N/A**	**N/A**	
Site Power Requirements			
Voltage:	**208 Vac**	**3-Phase , 3-Wire**	
Amperage:	**125 Amps**		

Notes:

SECTION B - WALK AROUND	OK / NA	INITIALS
Check That Walk Through Issues Have Been Resolved, Review Shop Aids	OK	KW
Lay Down Electrical Safety Mat and Set Up Testing Cart	OK	KW
Ensure That Testing Tote Is Connected and That Hoses Are Secure	OK	KW
Ensure That Carbon Vessels Are Bypassed	OK	KW
Verify That Exhaust Mufflers and Elbows are Installed (SVE/Sparge/Compressed Air)	OK	KW
Make Sure That Building Fan and Louvre Shipping Braces Have Been Removed	OK	KW

SECTION C - WALK THROUGH	OK / NA	INITIALS
Inspect Valves and Process Lines	OK	KW
Check Transmitter / Magnehelic Lines for Low Lying Spots Where Moisture can Collect	N/A	KW
Check That Floor Vents Have Been Installed	N/A	KW
Record Process Equipment Model and Serial Numbers* and Motor Nameplates	OK	KW
Notify Project Manager and Production Staff of Any Outstanding Issues	OK	KW

* This includes motors, blowers, compressors, oxygen/ozone generators, pumps, etc.

SECTION D - PANEL OFF INSPECTION	OK / NA	INITIALS
Check for Dielectric Test Label	OK	KW
Check for Auto Re-Start Label, Check for Ground, L1, L2, L3 and High Leg Labels	OK	KW
Check for IS Wiring Warning Stickers in Panel and on Lines From Panel	OK	KW
Ensure Neutral Wire is Connected To Terminal Block	OK	KW
Inspect 24Vdc and 120Vac Relays for Proper Connections	OK	KW
Check That Spare IS Input Wires Are Pulled	OK	KW
Cross Check Fuses, Circuit Breakers and Starters with Fuse Schedule	OK	KW
Determine Service Factor Amps and Set Motor Overloads	OK	KW

SECTION E - PANEL ON INSPECTION								OK / NA	INITIALS
Record Test Supply Voltages									
Primary:				**Secondary:**					
L1/L2	**L2/L3**	**L3/L1**		**L1/L2**	**L2/L3**	**L3/L1**			
213	**213**	**213**	**Vac**	**245**			**Vac**		
L1/N	**L2/N**	**L3/N**		**124**	**124**	**L3/N**			
124	**124**	**124**	**Vac**				**Vac**	**OK**	**KW**
Record 24Vdc Supply Voltage			**24 Vdc**					**OK**	**KW**
Test GFI and non GFI Outlets								**OK**	**KW**
Check "Push To Test" Panel Indicators								**N/A**	**KW**

SECTION F - INITIAL SYSTEM SETUP AND TESTING			OK / NA	INITIALS
Archive Pre-Test Program Revisions and Create New Revision			**N/A**	**KW**
Check E-mail Configuration Through ECOM Card on PLC			**N/A**	**KW**
Record H0-ECOM100 Firmware Revision	**v.**		**N/A**	**KW**
Update PLC Firmware and Record Revision:	**v.**		**OK**	**KW**
Initialize Scratch Pad of Automation Direct PLCs			**OK**	**KW**
Upload PLC Program			**OK**	**KW**
Set PLC Clock and Calendar			**OK**	**KW**
Check Functionality of All Discrete Inputs			**OK**	**KW**
Check Functionality of All Discrete Outputs			**OK**	**KW**
Check Functionality of All Analog Inputs and Outputs			**OK**	**KW**
Switch System Outputs to AUTO Mode			**OK**	**KW**
Set and Test All Setpoints			**OK**	**KW**

SECTION G - OPERATOR INTERFACE (PANEL DOOR / TOUCHSCREEN)			OK / NA	INITIALS
Type of Operator Interface:	**-Select One-**			
Update Display Screen Firmware, Record Revision	**v.**		**OK**	**KW**
Upload Panel Program			**OK**	**KW**
Test Panel Menu Hierarchy			**OK**	**KW**
Check PLC to Panel Communication, Remove Ground Jumper if Necessary			**OK**	**KW**
Verify Value, Scale, Significant Digits and Units of Analogue Signals			**N/A**	**KW**
Check Functionality of All Discrete Inputs			**OK**	**KW**
Check Functionality of All Discrete Outputs			**OK**	**KW**
Test All User-Adjustable Setpoints			**OK**	**KW**
Verify Correct Hourmeter Values, Ensure Proper Time is Kept			**OK**	**KW**

SECTION H - VFD / SOFT START DEVICES			OK / NA	INITIALS
Drive Type and Application:	**N/A**	**N/A**		
Verify Drive Parameter Settings Match Electrical Drawings			**N/A**	**KW**
Test Frequency Control			**N/A**	**KW**
Check VFD Noise on Analog Signals / Adjust Carrier Frequency Accordingly			**N/A**	**KW**
Save VFD Set-up Variables From PowerSuite / Record VFD Settings			**N/A**	**KW**
Verify Integrity of RS-485 Communications, Record Settings			**N/A**	**KW**

BAUD: **N/A** PARITY: **N/A** STOP BITS: **N/A** CARRIER: **N/A**

SECTION I - ANALOG SIGNALS		INITIALS
PLC Card Slot #1:	**N/A - Not Installed**	**KW**
PLC Card Slot #2:	**N/A - Not Installed**	**KW**
PLC Card Slot #3:	**N/A - Not Installed**	**KW**
PLC Card Slot #4:	**N/A - Not Installed**	**KW**

Check mA Signals at Different Operating Points for Device Hysterisis and Calibration	**N/A**	**KW**
Check Conversion Math and Square Root Functions in PLC Logic	**N/A**	**KW**

SECTION J - SYSTEM OPERATION	OK / NA	INITIALS
Check Building Fan(s) and/or Heater(s) Operation	OK	KW
Test All Kill Buttons	OK	KW
Bump Motors and Check For Excessive or Abnormal Current Draw	OK	KW
Ensure that LSL Switches are Above Pump Intakes	OK	KW
Set and Test Pressure and Vacuum Relief Valves According to P&ID	N/A	KW
Thoroughly Test Control Logic	OK	KW
Check Functionality of Oxidizer Interlocks	N/A	KW
Run System In Full Automatic	OK	KW
Simulate All Alarms, Check That Non-Critical Alarms Do Not Shut Down System	N/A	KW
Check Magnehelic Gauges for Accuracy, Verify Air Flows Using Hot Wire Anemometer	N/A	KW
Measured CFM: _____ @ _____ PSI/"Hg/"WC		
Measured CFM: _____ @ _____ PSI/"Hg/"WC		
Measured CFM: _____ @ _____ PSI/"Hg/"WC		
Measured CFM: _____ @ _____ PSI/"Hg/"WC		
Verify Logic and Flow For All Solenoid Valves, Including Auto-Oilers	N/A	KW
Run System With Doors Closed and Monitor Ventilation	N/A	KW
Verify Auto Restart Functionality of Whole System (Including VFD)	OK	KW
Check for Water / Compressed Air (Bubble Test) Leaks	OK	KW

SECTION K - PLC FINAL CHECK	OK / NA	INITIALS
Check Hour Meter Variable Memory Locations and Minute Counters	N/A	KW
Force Datalogging	N/A	KW
Update PLC Program Revision(and Operator Interface if Applicable)	OK	KW
Final Program Revision # : v. **2.0**		

SECTION L - TELEMETRY	√OK/ NA	INITIALS
Select Communication Type: _____		
Confirm Remote Access, Record Method _____	N/A	KW
Check Modem Auto-Reboot Feature	N/A	KW
Test System Operation Using Offsite Package, Review Datalog Files	N/A	KW
Test System Email Out	N/A	KW
Configure Autodialer (Set Sensaphone Passwords to "2000" and "s2000")	N/A	KW
Test Autodialer Alarm Dial-out and Report	N/A	KW

SECTION M - FINAL SYSTEM TESTING / AS BUILT	OK/ NA	INITIALS
Record Max Noise Level _____ **dBA** @ _____ **ft.**	N/A	KW
Record Motor Voltages, Currents and Operating Conditions	OK	KW
Add Flow Charts, Piping Labels (Hot******, Directional), Oxygen / Ozone Generator Labels	OK	KW
Pump Water Out Of System	OK	KW
Turn Off All Breakers and HOA Switches	OK	KW
Take System Pictures	OK	KW
Email Project Manager and Production Staff	OK	KW
Update System Approval Data Plates, Fuse Schedule and Startup Procedure	OK	KW
Ensure appropriate approval labels are obtained (GP, Haz). **Rentals require US and CAN.**	OK	KW
Attach System Approval Stickers, Fuse Schedule and Startup Procedure	OK	KW
Take Panel Pictures and Transfer All Pictures to Project Folder	OK	KW
Check Off "Testing" as Being Complete in APES	N/A	KW
Make Changes to the IO and Alarms Tables Are Captured in the Markups	OK	KW
Update Project Software Folder	OK	KW

Copy Completed Test Sheets to Electrical As-Builts Directory with DWG Files and Bill of Materials
Check Off "As-Builts" Box in APES
**** Hot Labels to be Applied to Any Piping >/= 140 DegF as Determined by IR Readings**

MECHANICAL TEST RECORD									
Device Name:	**P-4901**				Manufacturer:	**GOULDS**			
Device Model #:	**4SH2K52COW**				Device Serial #:	**F1200054**			
Motor Manufacturer:	**WEG**				Area Classification Tag Checked:				
Motor Model #:	**JM007402**				Motor Serial #:	**1014500858**			
HP:	**7.50**	Voltage:	**208**		Frame:	**184JM**	RPM:	**3480**	
Phase:	**3**	Current:	**20.70**		SF:	**1.15**	ENCL.:	**TEFC**	
Factory Test:					Field Test:				
L1	L2	L3			L1	L2	L3		
20.9	**20.6**	**21.4**	Amps					Amps	
L1/L2	L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
213	**213**	**213**	Vac					Vac	

Device Name:	**P-4001**				Manufacturer:	**GOULDS**			
Device Model #:	**WS15112BHF**				Device Serial #:	**RC-061**			
Motor Manufacturer:	**GOULDS**				Area Classification Tag Checked:				
Motor Model #:					Motor Serial #:				
HP:	**1.50**	Voltage:	**230**		Frame:		RPM:	**3450**	
Phase:		Current:	**18.00**		SF:		ENCL.:		
Factory Test:					Field Test:				
L1	L2	L3			L1	L2	L3		
17.1			Amps					Amps	
L1/L2	L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
213			Vac					Vac	

Device Name:					Manufacturer:				
Device Model #:					Device Serial #:				
Motor Manufacturer:					Area Classification Tag Checked:				
Motor Model #:					Motor Serial #:				
HP:		Voltage:			Frame:		RPM:		
Phase:		Current:			SF:		ENCL.:		
Factory Test:					Field Test:				
L1	L2	L3			L1	L2	L3		
			Amps					Amps	
L1/L2	L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
			Vac					Vac	

Device Name:					Manufacturer:				
Device Model #:					Device Serial #:				
Motor Manufacturer:					Area Classification Tag Checked:				
Motor Model #:					Motor Serial #:				
HP:		Voltage:			Frame:		RPM:		
Phase:		Current:			SF:		ENCL.:		
Factory Test:					Field Test:				
L1	L2	L3			L1	L2	L3		
			Amps					Amps	
L1/L2	L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
			Vac					Vac	

MECHANICAL TEST RECORD

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:				Area Classification Tag Checked:			
Motor Model #:				Motor Serial #:			
HP:		Voltage:		Frame:		RPM:	
Phase:		Current:		SF:		ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:				Area Classification Tag Checked:			
Motor Model #:				Motor Serial #:			
HP:		Voltage:		Frame:		RPM:	
Phase:		Current:		SF:		ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:				Area Classification Tag Checked:			
Motor Model #:				Motor Serial #:			
HP:		Voltage:		Frame:		RPM:	
Phase:		Current:		SF:		ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:				Area Classification Tag Checked:			
Motor Model #:				Motor Serial #:			
HP:		Voltage:		Frame:		RPM:	
Phase:		Current:		SF:		ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

MECHANICAL TEST RECORD

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:				Area Classification Tag Checked:			
Motor Model #:				Motor Serial #:			
HP:		Voltage:		Frame:		RPM:	
Phase:		Current:		SF:		ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	

			Vac				Vac

	Device Name:				Manufacturer:		
	Device Model #:				Device Serial #:		
	Motor Manufacturer:				Area Classification Tag Checked:		
	Motor Model #:				Motor Serial #:		
	HP:		Voltage:	Frame:		RPM:	
	Phase:		Current:	SF:		ENCL.:	
	Factory Test:				Field Test:		
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

	Device Name:				Manufacturer:		
	Device Model #:				Device Serial #:		
	Motor Manufacturer:				Area Classification Tag Checked:		
	Motor Model #:				Motor Serial #:		
	HP:		Voltage:	Frame:		RPM:	
	Phase:		Current:	SF:		ENCL.:	
	Factory Test:				Field Test:		
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

	Device Name:				Manufacturer:		
	Device Model #:				Device Serial #:		
	Motor Manufacturer:				Area Classification Tag Checked:		
	Motor Model #:				Motor Serial #:		
	HP:		Voltage:	Frame:		RPM:	
	Phase:		Current:	SF:		ENCL.:	
	Factory Test:				Field Test:		
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Project Packing List

PMProjNum **102140**

SOLD - USED RTS151 - Baffinland 150GPM W

PM_ShippingNotes:

Tag	Part Number	Part Description	Req	PO #	EngMemo
			Rec	Line	
2	18661	Hose, Assembly, J300, 3"	2		-
Inlet & Outl	ea	Green Hose	0		
Type: G		-3" x 50' Hose assembly with camlocks		0	
2	10541	Camlock Fitting, Aluminum, 3", Part "F"	4		Male Camlocks
Inlet & Outl	ea	Male Adapter x Male Thread Cam Lock Fitting	4		
Type: F		-	102140-003	2	
2	M1108	Switch, Level, Mech Float, Wide Angle, N.O.,	1		---
LSH-4001	ea	Tilt Float Level Switch 90deg, w 40' cable	1		
Type: I		13A, SPST, N/O ---	102140-011	9	
2	17149	Manual, System, Hard Copy	2		---
Manual	ea		0		
Type: P		---		0	
2	9999	Misc Part, See Details	1		---
OWS VEN	ea	As per detailed specification below	0		
Type: P		2IN. X 4FT. PVC OWS VENT STACK		0	
2	RC061	Pump, Sump, Goulds, 100GPM @ 40'	1		---
P-4001	month	WS1512BHF, w/ switch	0		
Type: R		230V 1 Ph, 1-1/2 HP ---		0	
2	RTS151	WTS, 150 gpm, OWS-24, Carbon, 40' Contair	1		---
System	month	208/120V, 3ph, Cl1 Div 2	0		
Type: R		Max Water 150gpm @ 40psi ---		0	
5200	M1272	Camlock Fitting, Aluminum, 2", Part "F"	1		---
5200-Stack	ea	Male Adapter x Male Thread Cam Lock Fitting	0		
Type: F		---		0	
5200	M1137	Drum, Black, Steel, 45 gal, 2 hole lid, bottom 2	1		-
PST-5201	ea	including palletization	1		
Type: I		-	102140-011	4	
5200	9999	Misc Part, See Details	1		---
PST-5201	ea	As per detailed specification below	0		
Type: P		2IN. X 5 FT. TANK TRUCK HOSE ASSEMBLY WITH CAMLOCK, TYPE C AND TYPE F		0	
5200	9999	Misc Part, See Details	1		---
PST-5201	ea	As per detailed specification below	0		
Type: P		2IN. X 4FT. PVC PST VENT STACK		0	

Tag	Part Number	Part Description	Req	PO #	EngMemo
			Rec	Line	
7900	10908	Lock, Passage, 107188, Taymor	2		---
7900	ea	107188	0		
	Type: I	---		0	
7900	10909	Lock, Deadbolt, 289648, Taymor, 1 cyl, S/S	2		---
7900	ea	keyed alike #289648	0		
	Type: I	---		0	
7900	24662	Hood, Fan, 27" - on use up	2		---
F-7901	ea	Fits 24" Fan	2		
	Type: I	---	102140-011	6	
7900	23989	Hood, 15"	2		---
F-7902	ea	Fits 12" Fan & Louver	2		
	Type: I	---	102140-011	5	

Project Packing List

PMProjNum **102140A**

Baffinland 20' Container for Loose Components

PM_ShippingNotes:

Tag	Part Number	Part Description	Req	PO #	EngMemo
			Rec	Line	
1	11686	Filter, Bag, FOS P2P, 7" x 32"	120	---	
EXTRA	ea	Oil Absorbing Bags, Sub-micron, Plastic Ring	0		
	Type: P	Box Quantity, 20 per box ---		0	
1	25263-T	Melt-Blown Spaghetti Media	15	---	
EXTRA	ea	Filter Bag Insert, Oil-Absorbing, Polypropylene	0		
	Type: I	25 lbs/bag ---		0	
1	11214	Media, Clay, TM100	5000	---	
EXTRA	lb	(stocked and ordered in lbs)	0		
	Type: I	---		0	
1	20220	Media, Carbon, Liquid, Virgin, 8 x 30 Coconut	6000	---	
EXTRA	lb	Sold in 1100 lb (500 Kg) sacks per pound	0		
	Type: I	---		0	
1	9999	Misc Part, See Details	2	---	
EXTRA	ea	As per detailed specification below	0		
	Type: P	O-ringsm 4155-1490-B (V6427)		0	
1	21891	Gasket, Flange, Tetrasolv AF Series	6	---	
EXTRA	ea	18" Hatch Gasket	0		
	Type: P	Fits, AF250, AF500, AF1000, AF2000, AF300 ---		0	
1	22353	Pump, Part, SSH, Mechanical Seal Kit	2	---	
EXTRA	ea	P/N: RPKSSHS	0		
	Type: P	---		0	
1	21605-T	Media, Coal, Anthracite, .9 to .95mm	20	---	
EXTRA	lb	52 lbs/bag; sold in lbs.	0		
	Type: I	---		0	
1	11610	Container, 8' x 20' x 8'6"	1	---	
EXTRA PA	ea	5-8 yr	0		
	Type: P	---		0	

Appendix I

CCME Code Compliance Review

A. Table I.1: Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.

B. Nunavut Water Board Type “A” Water Licence No. 2AM-MRY1325 – Mary River Project, Nunavut; Baffinland Iron Mines Corporation – 12June2013 ***[62 pages]***

Table I.1: Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products

Part	Section	Reference	Requirement	Comment
Part 1: Application and Definitions	Not Applicable.	Not Applicable.	Not Applicable.	Not applicable.
Part 2: Registration and Approval of Storage Tank Systems	2.2 Registration of Existing Storage Tank Systems	2.2.1	The owner of an existing storage tank system shall register all storage tanks of the system with the authority having jurisdiction in a manner and timeframe prescribed by the authority having jurisdiction.	[Milne Port] Details for the existing storage tank system (installed in 2011) were submitted in early 2012 as part of document H337697-4020-00-121-0001Rev01 Milne Inlet Fuel Storage Facility As-Built Documentation. [Mine Site] Not applicable (new system). See 2.4.1 and 2.4.2 below.
Part 2: Registration and Approval of Storage Tank Systems	2.2 Registration of Existing Storage Tank Systems	2.2.2	Registration of an existing storage tank system shall be conducted by completing and filing a registration form in a manner specified by the authority having jurisdiction. (See Appendix C)	Registration with the Fire Marshall following Appendix C of CCME is in-progress by Baffinland for the existing storage tank system. See 2.2.1 above.
Part 2: Registration and Approval of Storage Tank Systems	2.2 Registration of Existing Storage Tank Systems	2.2.3	The owner of an existing storage tank system shall identify registered tanks in a manner and time frame specified by the authority having jurisdiction.	See 2.2.2 above.
Part 2: Registration and Approval of Storage Tank Systems	2.2 Registration of Existing Storage Tank Systems	2.2.4	The authority having jurisdiction may deem the age of an existing storage tank system to be unknown unless the owner provides the authority having jurisdiction with either the date of installation and/or the date of manufacture.	Not applicable; the date of installation have been provided to the authority having jurisdiction.
Part 2: Registration and Approval of Storage Tank Systems	2.3 Approval of Storage Tank Systems	2.3.1	No person shall construct or cause to construct, install, *alter* , or operate a *storage tank system* unless all required permits and approvals have been obtained from the *authority having jurisdiction* .	Complies; permit for the tank construction and containment dyke was obtained from the Nunavut Water Board and the Qikiqtani Inuit Association.
Part 2: Registration and Approval of Storage Tank Systems	2.4 Registration of New Storage Tank Systems	2.4.1	The *owner* of a *new storage tank system* installed after a date specified by the *authority having jurisdiction* shall register the *storage tank system* .	Details for the new storage tank system form part of this report.
Part 2: Registration and Approval of Storage Tank Systems	2.4 Registration of New Storage Tank Systems	2.4.2	The new *storage tank system* shall be registered by completing and filing a registration form as specified by the *authority having jurisdiction.*	Registration with the Fire Marshall following Appendix C of CCME is in-progress by Baffinland for the new storage tank system. See 2.4.1 above.
Part 2: Registration and Approval of Storage Tank Systems	2.4 Registration of New Storage Tank Systems	2.4.3	The *owner* of a new *storage tank system* shall identify registered tanks in a manner specified by the *authority having jurisdiction* .	See 2.4.2 above.
Part 2: Registration and Approval of Storage Tank Systems	2.5 Product Supply and Registration	2.5.1	After a date specified by the *authority having jurisdiction* , no person shall transfer or cause to be transferred *petroleum* or *allied petroleum products* to a *storage tank system* unless the *storage tank system* has been registered with the *authority having jurisdiction* .	See 2.4.1 and 2.4.2 above.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.1	Except as provided in this Part, the design, fabrication and installation of an *aboveground storage tank system* shall be in conformance with the NFCC.	The new tank farm components have been installed in conformance with Section 4 of the NFCC.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.2	Except as provided in this Part, the design and installation of an *aboveground storage tank system* connected to an oil-burning appliance and equipment that comes within the scope of CAN/CSA-B139-00,"Installation Code for Oil Burning Equipment" shall be in conformance with that Code.	Not applicable; the system is not connected to an oil-burning appliance or equipment.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.3	An *aboveground storage tank* , components, and accessories, for which there is a recognized standard, shall be *approved* only for the uses indicated under the standard.	All components, accessories and trim comply to this section.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.4	A company or individual that is authorized by the *authority having jurisdiction* shall verify that the design and installation of an *aboveground storage tank system* meets the requirements of this Code or other requirements as specified by the *authority having jurisdiction* .	Hatch has reviewed the as-builts, as constructed status of the facility and confirms it meets the applicable requirements of this code.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.5	An *aboveground storage tank system* shall be installed by a company or individual that is authorized by the *authority having jurisdiction* .	Hatch is registered to practice engineering in Nunavut and has completed the design, managed the construction and reviewed all as-built documents pertaining to this tank system.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.6	An *aboveground storage tank* shall be equipped to control emissions of volatile organic compounds in conformance with CCME PN 1180, "Environmental Guideline for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks". (See Appendix B, note B.3.2.6)	Not applicable; stored fuel has vapour pressure less than 10kPA. Arctic Grade Diesel vapour pressure is 1kPA@20C per MSDS. Jet-A1 fuel vapour pressure is 1-1.4kPA@37.8C per MSDS.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.7(1)	The *owner* of an *aboveground storage tank system* shall provide an as-built drawing to the *authority having jurisdiction* in the manner and time frame as specified by the *authority having jurisdiction* .	As-built drawings form part of this report.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.7(2)	As-built drawings for an aboveground storage tank system shall include, as a minimum: (a) the outline of all storage tanks; (b) the centerline of all piping or piping groups; (c) the centerline of all underground electrical power and monitor sensor conduit; (d) building foundation outlines; (e) secondary containment systems; and (f) property lines.	As-built drawings forming part of this report meet the minimum requirements as stated in this section.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.8(1)	No person shall install an aboveground storage tank system unless: (a) required permits or approvals have been obtained from the authority having jurisdiction; (b) plans, drawings and specifications of the system or equipment have been examined by the authority having jurisdiction; and (c) the plans, drawings and specifications referred to in Clause (b) bear the stamp and signature of a professional engineer licensed to practice in the province/territory.	(a) Permit for the tank construction and containment dyke was obtained from the Nunavut Water Board and the Qikiqtani Inuit Association. (b) Drawings were submitted to the above authorities. (c) Submitted issued for construction (IFC) drawings to the authorities bear the stamp and signatures of Registered Professional Engineers.

Part	Section	Reference	Requirement	Comment
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.2 General Requirements	3.2.9	An *aboveground storage tank system* shall be designed and installed in accordance with the manufacturer's instructions, the appropriate standards, and this Code.	The above ground tanks have been constructed in conformance with API 650. The aboveground piping has been constructed in accordance with the NFCC and ANSI B31.3 Process Piping. The secondary containment has been constructed in conformance with this code and the NFCC.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.3 Field-erected Storage Tank Systems	3.3.1(1)	A field-erected storage tank system shall: (a) have corrosion protection in conformance with Section 3.8; (b) have a secondary containment system in conformance with Section 3.9; (c) have leak detection in conformance with Part 6; (d) have containment sumps, as applicable; (e) be provided with overfill protection: (i) for pipeline delivery, in the form of an alarm system that will automatically alert pipeline or terminal personnel so that action can be taken to prevent the storage tank from being overfilled; (ii) for truck, rail, ship, or barge delivery, in the form of a visual and audible alarm system for detecting a high level that will activate and alert personnel in enough time to terminate the flow of the product to the storage tank and prevent an overfill (See Appendix B, note B.3.3.1(1)(e)(ii)); or (iii) in conformance with API RP 2350-96, "Overfill Protection for Storage Tanks in Petroleum Facilities"; and (f) have piping in conformance with Part 5, as applicable.	(a) There are no underground steel piping or tanks in this facility. The use of secondary containment liner and low corrosion rates preclude the use of corrosion protection (CP) on the tank floor. (b) Conforms with Section 3.9. (c) Conforms, see Section 6 of this table. (d) Not applicable. (e) i) Not applicable. ii) Not applicable. iii) Conforms. Existing design includes a radar gauge and local display. Facility is classified as Category 1 under API 2350. A Category 1 facility shall be operated as a fully-attended facility for receipts with manual monitoring continuously during receipt. (f) Conforms.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.3 Field-erected Storage Tank Systems	3.3.2	If vapour balancing or vapour recovery systems are required, they shall be designed and built in conformance with CCME PN 1057, "Environmental Code of Practice for Vapour Recovery in Gasoline Distribution Networks".	Not applicable.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.4 Shop-fabricated Storage Tank Systems	3.4.1(1)	A shop-fabricated storage tank system shall: (a) have corrosion protection in conformance with Section 3.8; (b) have a secondary containment system in conformance with Section 3.9; (c) have leak detection in conformance with Part 6; (d) have containment sumps, as applicable; (e) except as specified in Sentence 3.4.1(2), be provided with overfill protection: (i) compatible with the intended method of filling; (ii) designed, built, and approved in conformance with ORD-C58.15- 1992, "Overfill Protection Devices for Flammable Liquid Storage Tanks," which will prevent filling the tank beyond 95% of the tank's capacity or activate an audible or combined audible/visual alarm at a product level of 90% of the tank's capacity; and (iii)where a high-level alarm system is used, with audible and visual alarms located where personnel are constantly on duty during the product transfer operation and can promptly stop or divert delivery to the tank; and (f) have piping in conformance with Part 5, as applicable.	Not applicable; tank systems are field-erected.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.4 Shop-fabricated Storage Tank Systems	3.4.1(2)	A shop-fabricated *storage tank* system having a capacity of less than 5 000 L may be provided with overfill protection in the form of visual monitoring and gauging of the level in the *storage tank system* by trained employees in constant attendance throughout the transfer operation and who are located so as to be able to promptly shut down the flow, or communicate immediately with the person controlling the delivery so that the flow can be shut down promptly.	Not applicable; tank systems are field-erected.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.4 Shop-fabricated Storage Tank Systems	3.4.2	A horizontal *storage tank* shall be supported above grade level.	Not applicable; tank systems do not include horizontal storage tanks.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.4 Shop-fabricated Storage Tank Systems	3.4.3	Where there is a dispenser, *leak detection* for the dispenser and related components shall be in conformance with Part 6.	Conforms; visual leak detection. See 6.7.2(1) Table 4 and Table 6.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.5 Aboveground Storage Tank Systems for Storing Used Oil	Not Applicable.	Not Applicable.	Not applicable.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.1(1)	Based on the design, an aboveground storage tank shall be designed, built, and approved in conformance with the following, as applicable: a) API Std 650-98, "Welded Steel Tanks for Oil Storage"; b) ULC-S601-2000, "Aboveground Horizontal Shop Fabricated Steel Tanks"; c) CAN/ULC-S602-1992, "Aboveground Steel Tanks for Fuel Oil and Lubricating Oil"; d) ULC-S630-2000, "Aboveground Vertical Shop Fabricated Steel Tanks"; e) CAN/ULC-S643-2000, "Aboveground Shop Fabricated Steel Utility Tanks"; f) ULC-S652-1993, "Tank Assemblies for Collection of Used Oil"; g) ULC-S653-1994, "Contained Aboveground Steel Tank Assemblies"; h) ORD-C142.5-1992, "Aboveground Concrete Encased Steel Tank Assemblies"; i) ORD-C142.18-1995, "Aboveground Rectangular Steel Tanks"; j) ORD-C142.21-1995, "Aboveground Used Oil Systems"; k) ORD-C142.22-1995, "Contained Aboveground Vertical Steel Tank Assemblies"; or (l) ORD-C142.23-1991, "Aboveground Waste Oil Tanks".	The tanks have been designed and constructed in conformance with API 650 - 12th Edition. The waste oil (slop tanks) were designed to (b) ULC-S601 2007 edition.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.2	An *overfill protection device* shall be designed, built, and *approved* in conformance with ORD-C58.15-1992, "Overfill Protection Devices for Flammable Liquid Storage Tanks".	Not applicable; see 3.3.1(1)(e)(iii). [Milne Port] All product transfer occurs by marine delivery and pipeline for which there is on-site monitoring during all operations and marine delivery of fuel. [Mine Site] All product transfer occurs by fuel truck delivery.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.3	A *containment sump* shall be designed, built, and *approved* in conformance with ORDC107.21- 1992, "Under-Dispenser Sumps".	Not applicable; tank systems do not include containment sumps.

Part	Section	Reference	Requirement	Comment
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.4	A *liner* shall be designed, built, and *approved* in conformance with ORD-C58.9- 1997, "Secondary Containment Liners for Underground and Aboveground Tanks".	The secondary containment dyke has been constructed with a Layfield Hazguard 535 synthetic liner installed and tested in conformance with this code and in accordance with manufacturers instructions.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.5	An *aboveground storage tank* designed to contain an *allied petroleum product* shall be designed, built, and *approved* for use with that product.	Not applicable.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.6 Design Standards	3.6.6(1)	An aboveground storage tank built in conformance with: (a) API Spec 12B-95, "Bolted Tanks for Storage of Production Liquids"; (b) API Spec 12D-94, "Field Welded Tanks for Storage of Production Liquids"; or (c) API Spec 12F-94, "Shop Welded Tanks for Storage of Production Liquids" shall be used only for the storage of production petroleum and allied petroleum products.	Not applicable.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.7 Repair, Alteration, Reconstruction, and Relocation	3.7.1(1)	The repair, alteration, reconstruction, or relocation of an aboveground storage tank system shall be done in conformance with the technical requirements of, as applicable: (a) ULC-S601(A)-2001, "Shop Refurbishing of Aboveground Horizontal Shop Fabricated Steel Tanks"; (b) ULC-S630(A)-2001, "Shop Refurbishing Aboveground Vertical Shop Fabricated Steel Tanks"; (c) API Std 653-01, "Tank Inspection, Repair, Alteration, and Reconstruction"; (d) STI SP001-00, "Standard for Inspection of In-service Shop Fabricated Aboveground Tanks for the Storage of Flammable and Combustible Liquids"; or (e) the special acceptance procedures of ULC or API.	[Milne Port] Not Applicable. Existing tank (TK-001) was not modified after it was built. The tanks constructed in 2013 were constructed and delivered to their final location prior to initialization and commissioning, and tested prior to initial use. [Mine Site] Not applicable; new system.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.7 Repair, Alteration, Reconstruction, and Relocation	3.7.2	The owner of an aboveground storage tank system shall provide a revised as-built drawing in conformance with Sentence 3.2.7(2) to the authority having jurisdiction in a time frame specified by the authority having jurisdiction whenever new construction, alteration, or site upgrade occurs.	As-built drawings form part of this report.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.8 Corrosion Protection of Aboveground Steel Storage Tank Systems	3.8.1(1)	When cathodic protection is used, it shall be designed by a corrosion expert (See Appendix B, note B.3.8.1(1)) and be in conformance with: (a) API RP 651-97, "Cathodic Protection of Aboveground Petroleum Storage Tanks"; (b) API Std 653-01, "Tank Inspection, Repair, Alteration, and Reconstruction"; (c) NACE RP0193-2001, "External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms"; or (d) STI R893-89, "Recommended Practice for External Corrosion Protection of Shop Fabricated Aboveground Tank Floors."	Not applicable; see 3.3.1(1)(a) above.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.8 Corrosion Protection of Aboveground Steel Storage Tank Systems	3.8.2(1)	Atmospheric corrosion of an aboveground storage tank system shall be controlled by: (a) a protective coating applied in conformance with the coating manufacturer's instructions; (b) a corrosion control program in accordance with API Std 653-01, "Tank Inspection, Repair, Alteration, and Reconstruction"; or (c) the use of a non-corroding material in its construction.	Conforms to (b). Due to there being low corrosion rates in this environment, no corrosion protection was utilized in the design. In the future all testing and repair will be done to API std. 653-01.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.1(1)	Subject to Sentences (2) and (3), a secondary containment system for an aboveground storage tank shall: (1) for a storage tank system that consists of a single storage tank, have a volumetric capacity of not less than 110% of the capacity of the tank; or (2) for a storage tank system that consists of more than one storage tank, have a volumetric capacity of not less than the sum of: (a) the capacity of the largest storage tank located in the contained space; and (b) 10% of the greater of: (i) the capacity specified in Clause (a); or (ii) the aggregate capacity of all other storage tanks located in the contained space.	(1) Not applicable. (2) Conforms.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.1(2)	A secondary containment system for a shop fabricated storage tank shall be designed, built, and approved in conformance with: (a) ULC-S653-1994, "Contained Aboveground Steel Tank Assemblies"; (b) ULC-S655-1998, "Aboveground Protected Tank Assemblies"; (c) ORD-C142.5-1992, "Aboveground Concrete Encased Steel Aboveground Tank Assemblies"; or (d) a recognized standard for double-wall tanks.	Conforms.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.1(3)	A secondary containment system for a field erected aboveground storage tank shall be: (a) a single-wall and single-bottom storage tank placed entirely within a dyked area, with an impermeable barrier in the floor of the containment area and in the dyke walls; (b) a single-wall, double-bottom storage tank placed entirely within a dyked area, with an impermeable barrier in the floor of the containment area and in the dyke walls, sealed to the perimeter of the storage tank or pad when the liner is not installed under the tank; (c) a double-wall storage tank for a storage tank with a capacity of 50 000 L or less; or (d) a double-wall storage tank placed entirely within a dyked area, with an impermeable barrier in the floor of the containment area and in the dyke walls, for a storage tank with a capacity of more than 50 000 L.	Construction conforms to 3.9.1(3)a) A synthetic membrane liner has been installed in the granular construction of the dyke.

Part	Section	Reference	Requirement	Comment
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.2(1)	Except as provided in Sentence (2), a secondary containment impermeable barrier shall be: (a) designed, built, and approved in conformance with: (i) ORD-C58.9-1997, "Secondary Containment Liners for Underground and Aboveground Tanks"; or (ii) ORD-C142.20-1995, "Aboveground Secondary Containment Tanks"; and (b) installed so that: (i) the liner is sealed to the perimeter of the storage tank or pad when the liner is not installed under the tank; (ii) the liner extends to the top of the dyke wall; (iii) the liner is covered with a noncombustible material of such nature and thickness that it will not fail when the secondary containment is exposed to fire; and (iv) liners that are intended to be exposed in service are listed for aboveground (exposed) use.	The liner for this facility is in conformance with ORD-C58.9-1997, the liner extends to the top of the dyke wall and is placed entirely under the tank floor. The liner is covered with a minimum of 450mm of granular material and placed between layers of geotextile and sand protection.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.2(2)	A secondary containment impermeable barrier that does not conform to Sentence (1) shall: (a) use material compatible with the product being stored and acceptable to the authority having jurisdiction (See Appendix B, note 3.9.2(2)(a)); and (b) be designed, constructed, and maintained to ensure a maximum hydraulic conductivity of 1 x 10-6 cm/s.	Not applicable.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.3(1)	*Liner* penetrations shall be located at the high point or in a raised part of the dyke floor. (See Appendix B, note B.3.9.3(1))	No liner penetrations were incorporated into the construction of the dyke.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.3(2)	All *liner* penetrations shall be sealed.	Conforms; see 3.9.3(1) above.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.9 Secondary Containment Requirements	3.9.4	Monitoring of the *interstitial space* of the *secondary containment* system shall be provided in conformance with Part 6 of this Code.	Conforms.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.10 Spill Containment and Runoff Collection	3.10.1	Spills, overfills, and storm water from product transfer areas shall be contained, treated and disposed of in conformance with the applicable provincial or territorial regulations, guidelines or policies.	The fuel transfer area is incorporated in the design of the secondary containment such that all run-off is collected into the containment area.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.10 Spill Containment and Runoff Collection	3.10.2	Containment area floors within dykes shall slope away from the tank base towards a sump at a slope greater than 1%.	Dyke floor slope is a minimum of 1% from the tank to collection sumps.
Part 3: Design and Installation of Aboveground Storage Tank Systems	3.10 Spill Containment and Runoff Collection	3.10.3(1)	An oil-water separator used to treat storm water runoff, overfills, or a spill from the product transfer area shall be sized for a minimum hydraulic flow rate of a ten year return, one hour storm event, with the one hour rainfall intensity data obtained for the nearest weather station, and: (a) be designed, built, and approved in conformance with ULC-S656-2000, "Oil-Water Separators"; or (b) conform to the following: (i) be designed to produce a discharge of water that does not contain more than 15 mg/L of free oil and grease as measured by the partition-gravimetric method or other protocol as defined by the authority having jurisdiction ; (ii) be designed for an insoluble-in-water oil with a specific gravity of 0.875 ±0.025; and (iii) be designed based on the hydraulic retention time required to separate oil with a particle droplet size of 60 microns from storm water.	An OWS was purchased as a mobile unit sized and conforming to this section for the tank farm facility. For more information on the purchased OWS refer to the operating and maintenance manual included in Appendix H of this Construction Summary Report.
Part 4: Design and Installation of Underground Storage Tank Systems	Not Applicable.	Not Applicable.	Not Applicable.	Not applicable.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.1(1)	Piping materials shall, as applicable, be designed, built, and approved in conformance with the following: (a) ASTM A 53, "Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"; (b) CAN/CSA Z245.1-98, "Steel Line Pipe"; (c) CAN/ULC-S633-1999, "Flexible Underground Hose Connectors"; (d) ORD-C107.7-1993, "Glass-Fibre Reinforced Plastic Pipe and Fittings"; (e) ORD-C107.4-1992, "Ducted Flexible Underground Piping Systems"; (f) ORD-C107.14-1992, "Non-Metallic Pipe and Fittings"; or (g)ORD-C536-1998, "Flexible Metallic Hose".	Conforms.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.2	Except as provided in this Part, the design and installation of *piping* shall be in conformance with the NFCC.	Conforms.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.3	Except as provided in this Part, the design and installation of *piping* connected to an oil-burning appliance and equipment that comes within the scope of CSA Standard B139, "Installation Code for Oil Burning Equipment" shall be in conformance with that Code.	Not applicable.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.4	*Piping* material shall be installed and maintained in accordance with an *approved* standard, code, or in a manner acceptable to the *authority having jurisdiction* .	Conforms.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.5	Single-wall *piping* shall not have buried or concealed mechanical joints. (See Appendix B, note B.5.2.5)	No buried piping; not applicable.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.6	*Leak detection* testing and monitoring of *piping* shall be in conformance with Part 6.	Visual leak detection on piping; conforms.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.7	A thermal relief valve shall *discharge* into the low pressure side of the *piping* .	Conforms.

Part	Section	Reference	Requirement	Comment
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.8(1)	*Piping* located below the maximum product level in a tank shall be provided with a means to prevent the release of liquid from the tank by syphon flow.	[Milne Port] Inlet valving to the tank farm from the marine pipeline has check and gate valves installed on the tank inlet nozzle. [Mine Site] Inlet valving to the tank farm has check and gate valves installed on the tank inlet nozzle.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.8(2)	Except as provided in Sentence 5.2.8(3), a manual shut-off valve shall be lockable or have a method of locking.	Conforms.
Part 5: Design and Installation of New Piping Systems	5.2 General Requirements	5.2.8(3)	A manual shut-off valve on the *piping* connecting a *storage tank* and a heating appliance or a stationary combustion engine does not need to be lockable or have a method of locking.	Not applicable.
Part 5: Design and Installation of New Piping Systems	5.3 Product Transfer	5.3.1	The fill pipe on a *storage tank* with a capacity of 5 000 L or more shall be equipped for the attachment of a liquid and vapour-tight connection at the time of filling and shall be sealed with a liquid- and vapour-tight cap when not in use.	All piping systems are sealed on the inlet and outlet connection ends with liquid and vapour tight cap and connections; conforms.
Part 5: Design and Installation of New Piping Systems	5.3 Product Transfer	5.3.2	The suction tube of a *used oil* tank shall be equipped for the attachment of a liquid-tight fitting and shall be sealed with a liquid-tight cap when not in use.	Not applicable.
Part 5: Design and Installation of New Piping Systems	5.4 Design Standard for Underground Piping Systems	Not Applicable.	Not Applicable.	Not applicable.
Part 5: Design and Installation of New Piping Systems	5.5 Installation	5.5.1	Piping shall be installed by a company or individual that is authorized by the authority having jurisdiction.	Piping was installed by Certified Contractor with Certified Welders and procedure for same.
Part 5: Design and Installation of New Piping Systems	5.5 Installation	5.5.2	Piping shall be located and maintained to permit the eventual removal of the piping when the storage tank system is permanently withdrawn from service.	Conforms.
Part 5: Design and Installation of New Piping Systems	5.5 Installation	5.5.3	Piping shall be located in a manner that will prevent allowable design stress from being exceeded.	Piping is designed and constructed in conformance with B31.3 - Process Piping; conforms.
Part 5: Design and Installation of New Piping Systems	5.5 Installation	5.5.4	Piping located aboveground shall be protected from physical damage due to impact.	Conforms.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.1(1)	A storage tank system shall be tested for leaks in conformance with Sections 6.2 and 6.3: (a) at the time of final installation: (i) for an underground storage tank system, final installation shall be when final surface materials have been installed and prior to being put into service; or (ii) for an aboveground storage tank system, final installation shall be before the storage tank system is put into service; and (b) whenever a leak is suspected in the primary or secondary containment of the storage tanks, piping, containment sumps or related components.	Tanks have been tested in conformance with API 650 and 653. Additional Radiographic testing has been performed in lieu of hydrostatic tank testing.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.2	A line-leak detector shall be designed, built, and approved in conformance with ORDC107.12- 1992, "Line Leak Detection Devices for Flammable Liquid Piping."	Not applicable; not a pressure system and all piping is above grade and visible to detect leaks. Visual leak detection; see 6.7.2(1) Table 4 and Table 6.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.3	Manual or electronic dip or inventory reconciliation shall be in conformance with Section 8.3.	Refer to 8.5.3(2). Fuel dipping and inventory reconciliation follows the Baffinland BAF-PH1-310-PRO-0001 Fuel Dipping/ Tank Farm Inspection document in Appendix J of this report.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.4(1)	Statistical inventory reconciliation shall be in conformance with: (a) EPA/530/UST-90/007, "Standard Test Procedures for Evaluating Leak Detection Methods: Statistical Inventory Reconciliation Methods"; and (b) EPA 510-B-95-009, "Statistical Inventory Reconciliation."	Refer to 8.5.3(2). Fuel dipping and inventory reconciliation follows the Baffinland BAF-PH1-310-PRO-0001 Fuel Dipping/ Tank Farm Inspection document in Appendix J of this report.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.5	An automatic tank gauge system with a precision leak detection capability shall be designed, built, and approved in conformance with ORD-C58.12-1992, "Leak Detection Devices (Volumetric Type) for Underground Storage Tanks".	Not applicable; tank systems are aboveground.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.6	A continuous in-tank leak detection system shall conform to good engineering practice and shall meet the requirements of a precision leak detection test. (See Appendix B, Note B6.2.6.)	Not applicable; continuous in-tank leak detection is not required, visual leak detection is used per 6.7.2(1) Table 4 and Table 6. The system includes a fuel management system to collect tank inventory and fuel delivery transaction data to provide an inventory reconciliation, though the fuel management system is not considered to be continuous in-tank leak detection.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.7(1)	High-technology secondary containment monitoring shall continuously monitor the interstitial space and include the use of an automatic device designed, built, and approved in conformance with: (a) ORD-58.12-1992, "Leak Detection Devices (Volumetric Type) for Underground Storage Tanks", or (b) ORD-58.14-1992, "Leak Detection Devices (Non-volumetric Type) for Underground Storage Tanks",.	Not applicable; tank systems are aboveground.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.8	Visual leak detection procedures shall be performed in conformance with Sentence 8.4.1(3).	Conforms. See BAF-PH1-310-PRO-0001 Fuel Dipping/ Tank Farm Inspection (2014) and BAF-PH1-830-P16-0008 Environmental Protection Plan (2014).

Part	Section	Reference	Requirement	Comment
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.9(1)	A pressure liquid media leak detection test shall be in conformance with the requirements of a precision leak detection test and: (a) the test device shall be third-party performance certified; and (b) testing technicians shall be trained in the care and use of the test device	Not applicable as spools were tested prior to construction of piping systems.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.10(1)	A static liquid media leak detection test shall be in conformance with the following requirements: (a) leak rate shall not exceed 0.38 L/h; (b) the duration of the test shall be a minimum of 1 hour; (c) there shall be no visual evidence of a leak; and (d) the test fluid shall exceed the elevation of piping and electrical conduit openings installed in sumps at the time of the leak detection test.	Not applicable as spools were tested prior to construction of piping systems.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.11(1)	A high-pressure inert gas or vacuum leak detection test for piping shall be in conformance with the following procedures, as applicable: (a) a high-pressure decline test using an inert gas or a vacuum test may be used as a leak detection test for piping systems that are in use and that have a volume of less than 1,000 L; (b)whenever permitted by the equipment design and installation, product contained in the piping system shall be drained prior to conducting the high-pressure inert gas or vacuum test procedure; (c) pumps, dispensers or other auxiliary equipment connected to the piping that cannot be subjected to the pressure of the test shall be isolated from the test procedures to prevent equipment damage; (d) a test pressure or vacuum shall, as applicable: (i) be more than 350 kPa (gauge) or 1.5 times the maximum operating pressure, whichever is greater; (ii) not exceed 700 kPa (gauge), except when the piping system is designed for such pressures; and (iii not exceed the equipment manufacturer's design limitations. (e) stabilization is required after pressurization or vacuum is achieved; (f) a piping system with a volume of less than or equal to 500 L shall have the pressure or vacuum maintained for a period of at least 60 min after stabilization; (g) a piping system with a volume of greater than 500 L but less than or equal to 1,000 L shall have the test pressure or vacuum maintained for a period of at least two hours after stabilization; (h) a piping system with a volume greater than 1000 L shall be tested using a procedure acceptable to the authority having jurisdiction (See Appendix B, Note B6.2.11 (1) (h); and (i) a piping system shall be considered to be leaking when pressure variations that occur after stabilization and within the test time period are greater than two percent of the test pressure or vacuum.	All piping has been tested in conformance with B31.3 - Process Piping; conforms.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.12(1)	A low-pressure inert gas or vacuum leak detection test for piping shall be conducted in conformance with the following procedures, as applicable: (a) a low-pressure decline test using an inert gas or a vacuum test may be used to conduct a leak detection test on the secondary containment of double-wall tanks and double-wall pipe; (b) product contained in the secondary containment system shall be drained prior to conducting the low-pressure decline or vacuum test procedure; (c) a test pressure or vacuum shall, as applicable: (i) be between 20 kPa and 35 kPa; and (ii) not exceed the equipment manufacturer's design limitations; (d) stabilization is required after pressurization or vacuum is achieved; (e) secondary containment shall have the test pressure or vacuum maintained for a period of at least two hours after stabilization; and (f) a piping system shall be considered to be leaking when pressure variations that occur after stabilization and within the test time period are greater than two percent of the test pressure or vacuum.	All piping has been tested in conformance with B31.3 - Process Piping; conforms.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.2 General Requirements	6.2.13(1)	A precision leak detection test shall be in conformance with (See Appendix B, note B.6.2.13(1)): (a) ORD-C58.12-1992, "Leak Detection Devices (Volumetric Type) for Underground Storage Tanks;" or (b) ORD-58.14-1992, "Leak Detection Devices (Non-volumetric Type) for Underground Tanks."	Not applicable; tank systems are aboveground.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.3 Leak Detection Interlocks and Alarms	6.3.1(1)	Subject to Sentence (2), an automatic leak detection device, including a high-technology secondary containment monitoring device and precision line leak detection device, shall be electrically interlocked in such a manner that: (a) when the automatic leak detection device is activated, product flow shall be shut off; and (b) except for on-site maintenance activities, when the automatic leak detection device is turned off or bypassed for more than one minute, product flow shall be terminated.	Not applicable; see 6.7.2(1) Table 4 and Table 6.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.3 Leak Detection Interlocks and Alarms	6.3.1(2)	When an electrical interlock as specified in Sentence (1) is not possible, the authority having jurisdiction shall be notified whenever the leak detection device or method indicates a leak. (See Appendix B, note B.6.3.1(2))	Complies.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.3 Leak Detection Interlocks and Alarms	6.3.2	A suction pump shall be equipped with a single check valve installed directly below the suction pump and piping shall slope so the contents of the pipe will drain back to the storage tank if the suction is broken.	Not applicable.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.3 Leak Detection Interlocks and Alarms	6.3.3	A leak detection alarm shall be located where the staff routinely work and in a place where such alarms can be readily heard and seen.	Not applicable; see 6.7.2(1) Table 4 and Table 6.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.4 Monitoring Wells	Not Applicable.	Not Applicable.	Not applicable; systems do not include monitoring wells.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.5 Groundwater Monitoring Wells	Not Applicable.	Not Applicable.	Not applicable; systems do not include groundwater monitoring wells.

Part	Section	Reference	Requirement	Comment
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.6 Vapour Monitoring Wells	Not Applicable.	Not Applicable.	Not applicable; systems do not include vapour monitoring wells.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.7 Frequency and Method	6.7.1	The reference letters in Table 2 represent the leak detection and monitoring methods specified in Tables 3 through 9.	Used to complete answers below for 6.7 Frequency and Method.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.7 Frequency and Method	6.7.2(1)	Tables 3 through 9 specify the frequencies and methods of leak detection and monitoring that shall be used upon installation and, as applicable (See Appendix B, note B.6.7.2(1)): (a) for in-service monitoring; (b) for periodic leak detection testing; or (c) if a leak is suspected.	(a) Conforms; (b) Conforms; (c) Not applicable.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.7 Frequency and Method	Table 4	Aboveground Storage Tanks: (a) Containment type; (b) Final installation leak detection; (c) In-service monitoring; (d) Periodic leak detection; (e) Leak suspected.	(a) API standard 650-98 (within approved secondary containment); (b) API 650 Standard; (c) IR and VLD; (d) API 653; (e) API 653.
Part 6: Monitoring and Leak Detection of Storage Tank Systems	6.7 Frequency and Method	Table 6	Aboveground Piping: (a) Containment type; (b) Final installation leak detection; (c) In-service monitoring; (d) Periodic leak detection; (e) Leak suspected.	(a) All types; (b) HPVLDT; (c) VLD; (d) Not required; (e) HPVLDT.
Part 7: Upgrading of Existing Storage Tank Systems	7.2 General Requirements	7.2.1	No person shall upgrade, or cause to be upgraded, an existing storage tank system unless approval has been obtained from the authority having jurisdiction.	Conforms.
Part 7: Upgrading of Existing Storage Tank Systems	7.2 General Requirements	7.2.2(1)	Where an existing storage tank system is upgraded to be in conformance with this Code, the owner shall provide a revised as-built drawing to the authority having jurisdiction in the manner and time frame as specified by the authority having jurisdiction.	As-built drawings form part of this report.
Part 7: Upgrading of Existing Storage Tank Systems	7.2 General Requirements	7.2.2(2)	A revised as-built drawing shall be in conformance with Sentence 3.2.7(2) or 4.2.8(2), as applicable.	As-built drawings form part of this report.
Part 7: Upgrading of Existing Storage Tank Systems	7.2 General Requirements	7.2.3	A partially buried storage tank is considered neither an aboveground nor underground storage tank and shall be withdrawn from service and removed in conformance with Part 9 within two years of the effective date of this Code.	Not applicable; system does not have a "partially buried storage tank".
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.1	An existing aboveground storage tank system not in conformance with Section 3.6 shall be withdrawn from service and removed in conformance with Part 9 within two years of the effective date of this Code.	Not applicable.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.2(1)	Where underground piping connected to an aboveground storage tank has corrosion protection in conformance with Section 4.5 at the effective date of this Code, the piping may continue in service.	Not applicable; system does not contain underground piping.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.2(2)	Where underground piping connected to an aboveground storage tank does not have corrosion protection in conformance with Section 4.5 at the effective date of this Code: (a) the piping must be withdrawn from service and removed in conformance with Part 9 within two years of the effective date of this Code; or (b) best management practices shall be implemented within two years of the effective date of this Code in conformance with: i) API Std 2610-94, “Design, Construction, Operation, Maintenance and Inspection of Terminal and Tank Facilities”; and ii) API 570-98, “Piping Inspection Code: Inspection, Repair, Alteration, and Rerating of In-Service Piping Systems”.	Not applicable; system does not contain underground piping.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.3(1)	Except as specified in Sentence (2), an aboveground storage tank system shall be upgraded within two years of the effective date of this Code to include, as applicable: (a) liquid and vapour-tight connections, caps and adapters for a storage tank with a capacity of 5 000 L or more; (b) overfill protection in conformance with Article 3.6.2 for a storage tank with a capacity of 5 000 L or more; (c) underground piping in conformance with Section 5.4; (d) dispenser sumps in conformance with Article 3.6.3, where an underground piping run terminates under a dispenser; and (e) secondary containment in conformance with Section 3.9 and Sentences 7.3.4(1) and (2).	(a) Conforms; (b) Conforms; (c) Not applicable; (d) Not applicable; (e) Conforms. As-built drawings show engineered dyke basin, visit showed dyke completed according to plans, membrane of approved type observed, volume confirmed to be within acceptable construction tolerances of design.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.3(2)	Where secondary containment is not upgraded as provided in Clause (1)(e), an annual precision leak detection test shall be performed.	Secondary containment was upgraded as part of the fuel tank farm expansion.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.4(1)	Except as provided in Sentence (2), an existing field-erected aboveground storage tank not upgraded to be in conformance with Section 3.3 shall be withdrawn from service and removed in conformance with Part 9 within five years of the effective date of this Code.	Not applicable.

Part	Section	Reference	Requirement	Comment
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.4(2)	Where authorized by the authority having jurisdiction, an existing field-erected aboveground storage tank may be exempt from adding an impermeable barrier under the tank to meet the secondary containment requirements of Section 3.9 provided that within two years of the effective date of this Code: (a) best management practices are followed in conformance with API Std 653-01, "Tank Inspection, Repair, Alteration, and Reconstruction"; or (b) if inspection requires replacing or lining the tank bottom, then 3.9.2(1)(b) shall apply (See Appendix B, note B.7.3.4(2)(b)).	Not applicable.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.4(3)	In the event that a storage tank owner chooses the exemption provided in Clause 7.3.4(2)(b) and the storage tank bottom or shell becomes perforated, then all other storage tanks with equal or more years of similar service at that site that are being managed under API Std 653-01, "Tank Inspection, Repair, Alteration, and Reconstruction", shall be: (a) inspected within one year; or (b) re-evaluated within the time frame specified by the new corrosion rate.	Not applicable.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.5	An existing aboveground storage tank not upgraded with spill containment and runoff collection in conformance with Section 3.10 shall be withdrawn from service and removed in conformance with Part 9 within five years of the effective date of this Code.	Not applicable.
Part 7: Upgrading of Existing Storage Tank Systems	7.3 Aboveground Storage Tank Systems	7.3.6	An existing shop fabricated aboveground storage tank system not upgraded to be in conformance with Sections 3.4, 3.5, and this Section shall be withdrawn from service and removed in conformance with Part 9 within two years of the effective date of this Code.	Not applicable.
Part 7: Upgrading of Existing Storage Tank Systems	7.4 Underground Storage Tank Systems	Not Applicable.	Not Applicable.	Not applicable.
Part 8: Operation and Maintenance	Not applicable for Construction.	Not applicable for Construction.	Not applicable for Construction.	Current operational control documents and SOPs for Baffinland relating to the fuel tank system equipment are listed in Appendix J of this report. Operator checklists are found in Section 3 of document BAF-PH1-830-P16-0008 Environmental Protection Plan (2014) for fuel handling activities. These documents are referenced to address Baffinland's requirements relating to Part 8 of the CCME code compliance. In an effort to address requirements relating to additional fuel tank system equipment and requirements associated with the CCME code not currently captured within these referenced documents, operational control documents are currently undergoing revision and development as deemed required and can be provided once available.
Part 9: Withdrawal from Service of Storage Tank Systems	Not Applicable.	Not Applicable.	Not Applicable.	Not applicable.

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No: 2AM-MRY1325

June 12, 2013 By Courier, Email and Regular Mail

Honourable Bernard Valcourt, PC, QC, MP
Minister of Aboriginal Affairs and Northern Development Canada
21st Floor, 10 Wellington
Gatineau, Quebec K1A 0H4
Email: Bernard.valcourt@parl.gc.ca

Subject: NWB Type "A" Water Licence No. 2AM-MRY1325 – Mary River Project, Nunavut; Baffinland Iron Mines Corporation

Dear Honourable Minister Valcourt:

Please find enclosed the Type "A" Water Licence No. 2AM-MRY1325 duly issued by the Nunavut Water Board (NWB). The Licence is for a Mining and Milling Undertaking in accordance with the *Nunavut Waters Regulations* and authorizes Baffinland Iron Mines Corporation to use Water and deposit Waste in relation to the construction, operation, closure and reclamation of an iron-ore mine, proposed under the Mary River Project for which a Project Certificate (Project Certificate Number 005) had been issued on December 28, 2012. Also attached for your information, are the Records of Proceedings including Reasons for Decision.

In accordance with section 56 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, the Licence requires your approval and, as such, the NWB submits the attached Decision and Licence for your consideration.

Should you have any questions and/or require clarification on the above or wish to discuss further, please contact the undersigned in writing.

Sincerely,

Thomas Kabloona
Nunavut Water Board, Chair

cc: Mary River Project Distribution List
NWB Public Registry

NUNAVUT WATER BOARD

WATER LICENCE NO: 2AM-MRY1325

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TABLES

Licence No. 2AM-MRY1325

Pursuant to the Nunavut Waters and Nunavut Surface Rights Tribunal Act and the Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

BAFFINLAND IRON MINES CORPORATION
(Licensee)

SUITE 1016 – 120 ADELAIDE STREET WEST, TORONTO, ONTARIO M5H 1T1
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water or deposit waste for a period subject to restrictions and conditions contained within this Licence:

Licence Number/Type:	2AM-MRY1325 TYPE "A"
Water Management Area:	GIFFORD (21) & ECLIPSE SOUND (48) WATERSHEDS
Location:	MARY RIVER PROJECT QIKIQTANI REGION, NUNAVUT
Purpose:	WATER USE AND THE DEPOSIT OF WASTE
Description:	MINING AND MILLING UNDERTAKING
Quantity of Water not to be Exceeded:	580,000 CUBIC METRES *PER ANNUM* DURING THE PROJECT CONSTRUCTION PHASE; 230,000 CUBIC METRES *PER ANNUM* DURING THE PROJECT OPERATION PHASE
Date Licence Issuance:	JUNE 10, 2013
Expiry of Licence:	JUNE 10, 2025

This Licence issued **(Motion Number 2013-10-P4-05)** and recorded at Gjoa Haven, Nunavut includes and is subject to the annexed conditions.

Thomas Kabloona
Nunavut Water Board
Chair

APPROVED BY:

Minister of Aboriginal Affairs and Northern Development Canada

DATE LICENCE APPROVED: _____

PART A SCOPE, DEFINITIONS AND ENFORCEMENT

1. SCOPE

a. This Licence authorizes Baffinland Iron Mines Corporation ("BIMC" or "Licensee") to use Water and deposit Waste in support of a Mining and Milling Undertaking at the Mary River Project (Project) as outlined in the Type "A" Water Licence Application (Application) submitted to the Nunavut Water Board (NWB) on February 17, 2012 and as reviewed throughout the regulatory process.

The Mary River Project is located at the following general geographical coordinates:

	Latitude	**Longitude**
Project Extents	72° 05' 00" N	77° 45' 00" W
	72° 05' 00" N	81° 00' 00" W
	69° 49' 00" N	81° 00' 00" W
	69° 49' 00" N	77° 45' 00" W
Camp	**Latitude**	**Longitude**
Milne Port Camp	71° 52' 53.06" N	80° 54' 4.36" W
Mine Site Exploration Camp	71° 19' 30" N	79° 22' 40" W
Mine Site Construction Camp	71° 18' 50.39" N	79° 17' 11.35 W
Mine Site Permanent Camp	71° 18' 50.39" N	79° 17' 11.35 W
Ravn River Camp	71° 07' 49.25" N	78° 22' 2.76" W
Mid-Rail Camp	70° 58' 20" N	78° 22' 15" W
North Cockburn Camp	70° 34' 58.11" N	78° 21' 28.80" W
South Cockburn Camp	70° 27' 52.47" N	78° 22' 24.13" W
Steensby New Camp	70° 19' 1.42" N	78° 25' 48.6" W
Steensby (Existing Camp)	70° 17' 40.55" N	78° 29' 21.88" W
Steensby (46 Person Camp)	70° 19' 36.92" N	78° 29' 9.30" W

The Licensee is allowed to undertake construction, operations, and closure including reclamation, of an open-pit iron ore mine and related infrastructure and facilities at the Mary River Project (Project), located within the Qikiqtani Region of Nunavut. The activities and facilities under the scope of the Project include the following:

- Water supply for domestic uses and industrial purposes at the Milne Port (Milne Inlet) Site, Mine (Mary River) Site, Steensby Port (Steensby Inlet) Site and the railway camps;
- Site drainage and surface water management for the Milne Port Site, Mine Site, Steensby Port Site, and relevant minor project sites;
- Sewage Treatment Facilities for the Milne Port camp, the Mine Site exploration, construction and permanent camps; the Steensby Port construction and permanent camps and the railway camps;

- Oily water treatment facilities for wastewater and oily storm water treatment for maintenance facilities and fuel storage berms at the Milne Port Site, the Mine Site and Steesnby Port Site;
- Storage and management of hazardous materials at the Milne Port Site and Mine Site;
- Landfarm Facilities for the deposition and treatment of hydrocarbon contaminated snow and soil at the Milne Port Site, the Mine Site and Steensby Port Site;
- Fuel tanks, dispensing storage facilities and associated secondary containment areas or berms for the Bulk Fuel Storage Facilities and day tanks at the Milne Port Site, the Mine Site, and the Steensby Port Site;
- Containment areas for temporary storage of hazardous/nonhazardous was (waste transfer areas) and new product storage for drums and totes at Milne Port Site, the Mine Site and Steensby Port Site;
- Ongoing decommissioning of existing and historic camp infrastructure (Fuel bladder farm and ancillary facilities, etc.) at the Milne Port Site;
- Explosives storage and explosives manufacturing facilities at the Mine Site and Steensby Port Site;
- Waste sorting facilities and temporary storage facilities for hazardous wastes at the Mine site;
- Landfills for disposition of solid waste at the Mine Site and Steensby Port Site
- Incinerator Systems for camp and combustible wastes at the Milne Port Site, the Mine Site, Steensby Port Site and railway construction camps;
- Waste rock stockpile and waste rock pile runoff management at the Mine Site;
- Ore Stock pile runoff management at the Mine Site & the Steensby Port Site;
- Secondary Containment for fuel storage and hazardous materials (if any) at each rail camp location;
- Waste Disposal Facilities for each proposed camp along the railway corridor;
- Water course crossings including pipelines, jetties, bridges; roads associated with channel; and bank alterations, culverts, spurs, erosion control, and, artificial accretion;
- Flood control, diversions, alteration of flow or storage by means of dykes or dams;
- Ongoing inspection and maintenance of all water course crossings and associated infrastructure;
- Tote Road (approximately 100 km all-weather road), which extend from the Mine Site to Milne Port Site in its current form except for routine maintenance and minor upgrades for the transportation of equipment during the Construction Phase of the project;
- Ongoing activities in support of engineering and scientific studies for the Project;
- Ongoing maintenance to existing project infrastructure;

b. This Licence is issued subject to conditions contained herein with respect to the taking of Water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Act, or other statutes imposing more stringent conditions relating to the quantity, type or manner under which any such Waste may be so deposited, this Licence shall be deemed to be subject to such requirements.

c. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with all applicable legislation, guidelines and directives.

2. DEFINITIONS

a. The Licensee shall refer to Schedule A for definitions of terms used in this Licence.

3. ENFORCEMENT

a. Failure to comply with this Licence will be a violation of the Act, subjecting the Licensee to the enforcement measures and the penalties provided for in the Act.

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the Act.

c. For the purpose of enforcing this Licence and with respect to the use of Water and deposit of Waste by the Licensee, Inspectors appointed under the Act, hold all powers, privileges and protections that are conferred upon them by the Act or by other applicable laws.

PART B GENERAL CONDITIONS

1. This Licence incorporates the entire scope of the Type "B" Licence 8BC-MRY1314 issued for the Mary River Site Preparation Project and the scope of Type "B" Licence 2BB-MRY1114 issued for the Mary River Project exploration and bulk sampling programs, excluding the activities and facilities outlined in the Application. To the extent that any reports, studies or plans that have not yet been received and/or approved by the Board, the requirements associated with these reports, studies and/or plans are now brought forward as requirements under this Licence.

2. In the event of a conflict between the previously issued Type "B" licences and this Type "A" Licence, the terms and conditions of this Type "A" Licence prevail.

3. The amount of Water use fees shall be determined and payment of those fees shall be made in accordance with section 12 of the "Regulations".

4. The Licensee shall file an Annual Report with the Board no later than March 31st in the year following the calendar year being reported. The Annual Report shall be developed in accordance with Schedule B.

5. The Licensee shall maintain a copy of this Licence at the sites of operation at all times in English, Inuktitut and French.

6. Any communication with respect to this Licence shall be made in writing to the attention of:

   Manager of Licensing
   Nunavut Water Board
   P. O. Box 119
   Gjoa Haven, NU X0B 1J0
   Telephone: (867) 360-6338
   Fax: (867) 360-6369
   Email: licensing@nunavutwaterboard.org

7. Any notice made to an Inspector shall be made in writing to the attention of:

   Water Resources Officer
   Nunavut District, Nunavut Region
   P.O. Box 100
   Iqaluit, NU X0A 0H0
   Telephone: (867) 975-4295
   Fax: (867) 979-6445

8. The Licensee shall submit one (1) paper copy and one (1) electronic copy of all reports, studies, and plans to the Board or as otherwise requested by the Board. Reports or

studies submitted to the Board by the Licensee shall include an executive summary in English, Inuktitut and French.

9. This Licence is assignable as provided in section 44 of the Act.

10. The Licensee shall notify the NWB of any changes in development plans or conditions associated with this project, including the intent to begin the Operations Phase, at least sixty (60) days prior to any such change.

11. The Licensee shall post signs in the appropriate areas to inform the public of the location of infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste. All signs must be in English, Inuktitut and French.

12. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans required to be submitted for Board approval, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a Plan if necessary to achieve the objectives of the Licence or other regulatory instruments. For plans submitted for Board approval, the Board will notify the Licensee in writing of the Board's approval, rejection or alteration of the Plan. Plans or drawings submitted to the Board for review and/or comment do not require Board approval prior to implementation, but the Board may request revisions to those Plans.

13. In the event that a Plan submitted for approval is not approved by the Board, the Licensee shall provide a revised version of the Plan to the Board for review within thirty (30) days of notification by the Board.

14. The Licensee shall, for all Plans submitted for approval under this Licence, implement the Plan as approved by the Board in writing. The Board has approved the following Plans for implementation under the relevant sections in the Licence:

- Baffinland Iron Mines Corporation Mary River Project Emergency Response & Spill Contingency Plan, dated March 28, 2013;
- Baffinland Iron Mines Corporation Mary River Project Surface Water and Aquatic Ecosystems Management Plan, dated March 2013;
- Baffinland Iron Mines Corporation Mary River Project Attachment 5: Fresh Water Supply, Sewage and Wastewater Management Plan Appendix 10D-3, dated January 2012;
- Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and Closure, dated April 19, 2013;
- Baffinland Iron Mines Corporation Mary River Project Attachment 5: Waste Rock Management Plan, dated January 2012;
- Baffinland Iron Mines Corporation Mary River Project Attachment 5: Environmental Monitoring Plan (EMP) Appendix 10D-12, dated January 2012;

- Baffinland Iron Mines Corporation Mary River Project Attachment: 5 Environmental Protection Plan Appendix 10B, dated January 2012;
- Baffinland Iron Mines Corporation Mary River Project Borrow Pit and Quarry Management Plan Appendix 10D-6, dated February 2012;
- Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Milne Inlet Quarry (Q1), dated January 12, 2012;
- Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Mary River Mine Site Quarry (QMR2) dated January 12, 2012;
- Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Steensby Inlet Quarry (QS2), dated January 12, 2012;
- Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Mange Plan: Quarry Q7 + 500, dated January 11, 2012;
- Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Management Plan: Quarry Q133 +500, dated January 11, 2012;
- Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Management Plan: Quarry Q77 +200, dated February 2012;
- Preliminary Mine Closure and Reclamation Plan Appendix 10G, dated February 2012;
- Baffinland Iron Mines Corporation Mary River Project Hazardous Materials and Hazardous Waste Management Plan, dated April 22, 2013;
- Aquatic Effects Monitoring Program Framework, dated February 2013.

15. The Licensee shall update and revise, for submission to the Board for review, within sixty (60) days of issuance of this Licence, the following management plans. The updates are to take into account commitments made with respect to submissions received during the preliminary and technical review of the Application documents, as well as final submissions and issues raised during the Public Hearing Process, where applicable.

    a. Baffinland Iron Mines Corporation Mary River Project Surface Water and Aquatic Ecosystems Management Plan, dated March 2013;
    b. Baffinland Iron Mines Corporation Mary River Project Emergency Response & Spill Contingency Plan, dated March 28, 2013;
    c. Baffinland Iron Mines Corporation Mary River Project Attachment 5: Fresh Water Supply, Sewage and Wastewater Management Plan Appendix 10D-3, dated January 2012;
    d. Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and Closure, dated April 19, 2013; and
    e. Baffinland Iron Mines Corporation Mary River Project Hazardous Materials and Hazardous Waste Management Plan, dated April 22, 2013.

16. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and condition imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

17. The Schedules attached to this Licence provide instructive details regarding the requirements associated with specific terms and conditions in the main body of the Licence and are provided in the Schedule to provide greater clarity and as an aid to interpretation for the Licensee. If the Board subsequently determines that an item in the Schedule requires revision in order to better reflect the intent and objectives of the Licence, the Board may, in its discretion, and upon providing written notice to the Licensee of the revision, revise the item in the Schedule. Unless the Board directs otherwise, such a revision to an Item in the Schedule will not be considered to be an "amendment" to the Licence.

18. The Licensee shall review the Plans or Manuals referred to in this Licence as required by changes in operation and/or technology and modify the Plans or Manuals accordingly. Revisions to the Plans or Manuals are to be submitted in the form of an Addendum to be included with the Annual Report required by Part B, Item 4, complete with a revisions list detailing where significant content changes are made.

19. The Licensee shall confirm that all document(s) or correspondence submitted by the Licensee to the Board is received and acknowledged by the Manager of Licensing.

20. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.

PART C CONDITIONS APPLYING TO SECURITY

1. Subject to the conditions set out in Part C, Items 2 and 3, the Licensee shall furnish and maintain security with the Minister in the form that is satisfactory to the Minister or that is in accordance with the applicable regulations, in the following amounts:

   a. within thirty (30) days from the approval of this licence, post additional security in the amount of a further $4,311,784 so that an initial total security amount of thirty six million dollars ($36,000,000), representing the 2013 year estimate of anticipated mine closure and reclamation costs is posted with the Minister and the Qikiqtani Inuit Association as outlined in the Board's Reasons for Decision; and
   b. for each subsequent year, the amount of security to be held under this Part shall be reviewed by the Board in accordance with the requirements of Schedule C and adjusted to reflect the results of the Annual Security Review conducted in accordance with Schedule C.

2. Where the Licensee files evidence, in writing with the Board and with notice to the Minister and the Qikiqtani Inuit Association that the Licensee has furnished and maintained security with the Qikiqtani Inuit Association in an amount that the Qikiqtani Inuit Association confirms is sufficient to secure the mine closure and reclamation costs (including cumulative and legacy liabilities) estimated for the upcoming year to be required for the portion of the Project located on Inuit-owned lands, the Board may reduce the amount of security required to be held under Part C, Item 1. The Board shall ensure that the reduced amount of security furnished under Part C, Item1 is equal to the estimated anticipated mine closure and reclamation costs (including cumulative and legacy liabilities) for the portion of the Project located on Crown-owned lands for the upcoming year.

3. In addition to the Annual Security Review set out in Schedule C, the Licensee may, at any time, submit to the Board for consideration and approval, a request to change the amount of security outlined in Part C, Item 1. The submission shall include supporting evidence to justify the request and the Minister and the Qikiqtani Inuit Association will be consulted by the Board during the Board’s consideration of this request.

4. The security furnished and maintained with the Minister in Part C, Item 1 shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to section 76(5) of the Act. This clause shall survive the expiry of this Licence or renewals thereof and until full and final reclamation has been completed to the satisfaction of the Minister.

5. If the Board determines it to be necessary, or upon the request of the Licensee, the Minister or the Qikiqtani Inuit Association, the Board may issue further directions under this Part with respect to the amount of security to be furnished and maintained under the Licence.

PART D CONDITIONS APPLYING TO CONSTRUCTION AND OPERATIONS

1. All final design and construction drawings shall be stamped and signed by a Professional Engineer.

2. The Licensee shall submit to the Board for review and acceptance, at least sixty (60) days prior to construction or in a timeframe otherwise approved by the Board in writing, final design and for-construction drawings, stamped and signed by a Professional Engineer, for all infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste including the following:

   - Bulk Fuel Storage Facilities;
   - Explosives Facilities;
   - Incineration Systems;
   - Landfarm Facilities;
   - Landfill Facilities;
   - Oily Water and/or Wastewater Treatment Facilities;
   - Sewage Treatment Facilities;
   - Site Drainage and Surface Water Management Systems;
   - Waste Management Facilities (including temporary and permanent structure for hazardous and non-hazardous waste);
   - Water Supply Facilities;
   - Water crossings including, pipelines, bridges and roads; and
   - Watercourse training, flood control; diversions.

3. The Licensee shall submit to the Board for approval, at least sixty (60) days prior to completion of construction, an addendum to the Fresh Water Supply, Sewage and Wastewater Management Plan that addresses operational aspects of the Sewage Treatment Facilities and Wastewater Treatment Facilities, prepared in accordance with the *"Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, 1996"*, where applicable. This Manual shall include contingency measures in the event of facility malfunction, disposal of sludge and any other operational and maintenance procedures for those facilities.

4. Quarrying activities shall be conducted in accordance with all applicable legislation, guidelines and industry standards including the *Northern Land Use Guidelines, Pits and Quarries* (INAC, 2009).

5. The Licensee shall implement sediment and erosion control measures, as required, prior to and during the Construction and Operations Phases of the Mary River Project to prevent and/or minimize sediment loading into Water.

6. The Board has approved, with the issuance of the Licence, the following plans:

   a. Baffinland Iron Mines Corporation Mary River Project Borrow Pit and Quarry Management Plan Appendix 10D-6, dated February 2012;
   b. Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Milne Inlet Quarry (Q1), dated January 12, 2012;
   c. Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Mary River Mine Site Quarry (QMR2) dated January 12, 2012;
   d. Baffinland Iron Mines Corporation Mary River Project Operations and Management Plan Steensby Inlet Quarry (QS2), dated January 12, 2012;
   e. Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Mange Plan: Quarry Q7 + 500, dated January 11, 2012;
   f. Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Management Plan: Quarry Q133 +500, dated January 11, 2012; and
   g. Baffinland Iron Mines Corporation Mary River Project Quarry Operations and Management Plan: Quarry Q77 +200, dated February 2012.

7. The License shall submit to the Board for review, an addendum to the Plan referred to in Part D, Item 6a for any quarry site selected for future development that the plan does not adequately address. If the content of the existing quarry plan referred to under Part D, Item 6a, does not adequately address the proposed activities for the management requirements of the selected Quarry site, the Licensee shall submit to the Board for approval, a site-specific Quarry management plan.

8. The Licensee shall inspect daily, the Mary River Project areas affected by construction activities for signs of erosion.

9. The Licensee shall implement preventive and mitigation measures to prevent any Wastes associated with the undertaking from entering any Water bodies.

10. The Licensee shall locate equipment storage areas on gravel, sand or other durable land, at a distance of at least thirty-one (31) metres above the ordinary High Water Mark of any Water body in order to minimize impacts on surface drainage and Water quality.

11. The Licensee shall minimize disturbance to terrain, permafrost and drainage during movement of contractor's equipment and personnel around the site, including the railway corridor, during Construction, Operations and Closure Phases of the Project.

12. The Licensee shall not store material on the surface of frozen streams or lakes except what is required for immediate use.

13. The Licensee shall use fill material for construction from approved sources that been demonstrated by appropriate geochemical analyses to not produce Acid Rock Drainage and to be Metal Leaching properties.

14. The Licensee shall maintain a minimum of thirty-one (31) metre undisturbed buffer zone between the periphery of Quarry sites and the ordinary High Water Mark of any water body unless otherwise approved by the Board in writing. The Licensee shall not excavate and/or remove material from any Quarry beyond a depth of one (1) meter above the ordinary High Water Mark or above the groundwater table, to prevent the potential contamination of groundwater unless otherwise approved by the Board in writing. The Licensee shall construct and operate the Mine Site and associated infrastructure and facilities in accordance with all applicable legislation and industry standards.

15. All surface runoff from Quarry activities for the Project, where flow may directly or indirectly enter a Water body, shall be sampled Weekly and not exceed the Effluent quality limits under Part F, Item 16.

16. All surface runoff during the Construction Phase of the Project, where flow may directly or indirectly enter a Water body, shall be sampled Weekly and not exceed the following Effluent quality limits:

Table 1: Effluent quality limits for surface runoff during construction

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)
Total Suspended Solids	50	100
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

17. The Licensee shall supervise and field check through an appropriately qualified Engineer, all construction of Engineered Structures in such a manner that the project specification can be enforced, and where required, the quality control measures are followed.

18. The Licensee shall submit a construction summary report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes. The construction summary report shall be prepared by an Engineer(s) in accordance with Schedule D, Item 1.

19. The Licensee shall conduct inspections of the earthwork, geological regime, and the hydrological regime of the Project Biannually during the summer or as otherwise approved by the Board in writing. The inspection shall be conducted by a Geotechnical Engineer and the inspection report shall be submitted to the Board within sixty (60) days of the inspection, with a covering letter from the Licensee outlining an implementation plan to respond to the Engineer's recommendations.

20. The Licensee shall prevent any chemicals, fuel or wastes associated with the undertaking from entering any Water body.

21. The Licensee shall not erect camps or store material on the surface of frozen streams or lakes including the immediate banks except what is for immediate use. Camps shall be located such that impacts on surface drainage is minimized.

22. The Licensee shall undertake necessary corrective measures to mitigate impacts on surface drainage resulting from the Licensee's activities.

23. For the purposes of culvert and bridge installations, the Licensee shall not encroach on the natural channel width by the placement of abutments, footings or armoring below the ordinary High Water Mark.

24. The Licensee shall construct and operate all infrastructure and Facilities designed to contain, withhold, divert or retain Water and/or Waste in accordance with all applicable legislations and industry standards.

25. The Licensee shall construct and operate the Bulk Fuel Storage Facilities in accordance with all applicable legislation and industry standards, including:

    a. Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003)
    b. CCME; and
    c. National Fire Code of Canada (2010).

26. The Licensee shall prevent the deposition of debris or sediment from entering into or onto any water body, with respect to the construction of access roads, site laydown pads and areas or other earthworks. These materials shall be disposed of at a distance of at least thirty-one (31) metres from the ordinary High Water Mark in such a manner that they do not enter the water.

27. The Licensee shall prevent chemicals or waste associated with undertakings from entering any water body.

PART E CONDITIONS APPLYING TO WATER USE AND MANAGEMENT

1. The Board has approved with the issuance of the Licence, the Plan entitled "Baffinland Iron Mines Corporation Mary River Project Attachment 5: Fresh Water Supply, Sewage and Wastewater Management Plan Appendix 10D-3", dated January 2012 that was submitted as additional information with the Application.

2. The Board has approved with the issuance of the Licence, the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Surface Water and Aquatic Ecosystems Management Plan,*" dated March 2013 that was initially submitted as additional information with the Application and subsequently updated in 2013.

3. The Licensee shall obtain all fresh Water for domestic camp use and industrial purposes, during the Construction Phase of the Project, in the amount and from the site and sources as listed in following table, or from sources otherwise approved by the Board in writing. In addition to the source-specific limits prescribed in the table, the Licensee shall not exceed one thousand five hundred and eighty-nine (1,589) cubic metres per day or five hundred and eighty thousand (580,000) cubic metres per year total water use from all sources during the Construction Phase of the Project.

Table 2: Water Use for Domestic and Industrial Purposes during the Construction Phase

Site	Source	Volume	Combined Volume
Milne Port (Milne Inlet)	Phillips Creek (summer) Km 32 Lake (winter)	68.5 m^3/day	25,000 m^3/year
Mine Site (Mary River)	Camp Lake	657.5 m^3/day	240,000 m^3/year
Steensby Port (Steensby Inlet	ST 347 Km Lake 3 km Lake	435.8 m^3/day	155,400 m^3/year
Ravn River	Camp Lake	145.2 m^3/day	
Mid-Rail	Nivek Lake (summer) Ravn Camp Lake (winter)	79.5 m^3/day	
Cockburn North (Tunnels Camp)	Cockburn Lake	101.4 m^3/day	

Cockburn South Camp	Cockburn Lake	111.1 m^3/day	
	TOTAL	**1,589 m^3/day**	**580,000 m^3/year**

4. The Licensee shall provide notice to the Board, as required under Part B, Item 10, in advance of using fresh Water for domestic camp use and industrial purposes during the Operations Phase of the Project in the amount and from the sources listed in following table or from sources otherwise approved by the Board in writing. In addition to the source-specific limits prescribed in the table that follows, the Licensee shall not exceed six hundred and thirty (630) cubic metres per day or two hundred and thirty thousand (230,000) cubic metres per year for total domestic camp and industrial water use during the Operations Phase of the Project from all water sources.

Table 3: Water Use for Domestic and Industrial Purposes during the Operations Phase

Site	Source	Monitoring Program Station	Volume (m^3/day)		Combined Volume (m^3/day)
			Domestic	Industrial	
Milne Port (Milne Inlet)	Phillips Creek (summer)	MP-MRY-2	14.8	16.2	31
	Km 32 Lake (winter)	MP-MRY-3			
Mine Site (Mary River)	Camp Lake	MS-MRY-1	203.8	151.6	355.4
Steensby Port (Steensby Inlet)	ST 347 Lake permanent camp)	SP-01	101	142.6	243.6
	3 Km Lake)				

5. The Licensee may recycle water and use reclaimed water from the various Treatment Facilities, surface water management ponds and embankment dams and approved discharge locations under the licence if such waters meet appropriate discharge criteria for those facilities.

6. The Licensee shall equip all Water intake hoses with screens of an appropriate mesh size, consistent with the requirements of Fisheries and Ocean Canada's (DFO) *Freshwater Intake End-of-Pipe Fish Screen Guidelines* (1995), to prevent the entrainment of fish are and shall withdraw Water at a rate such that fish do not become impinged on the screen.

7. The Licensee shall document separately the use of Waters on, in or flowing through Inuit-owned lands and Crown Lands as required under Part I, Item 15 in the Licence.

8. Streams cannot be used as a water source unless authorized and approved by the Board in writing.

9. The Licensee shall notify the Inspector and the Board at least ten (10) days in advance of using water from any sources not identified in the Application as required approval as per Part E, Item 8.

10. The Licensee shall update or revise annually following the commencement of the Operations Phase, the Project Blockflow Diagram Water Supply Balance information for the various Project sites, provided with the Application and submit for review of the Board. The submission shall be included with the Annual Report under Part B, Item 4.

11. The Licensee shall carry out weekly inspections of all structures designed to contain, withhold, divert or retain Waters or Wastes during periods of flow and maintain records of the inspections and findings, for review upon the request by the Board or an Inspector.

12. The Licensee shall not remove any material from below the ordinary High Water Mark of any water body unless authorized.

13. The Licensee shall not cause erosion to the banks of any body of Water and shall provide necessary controls to prevent such erosion.

14. The Licensee shall, where the use of water of a sufficient volume would likely result in the drawdown of the source Water body involved or dewatering of the specific Water body is anticipated, submit the following for the approval of the Board in writing:

    a. the volume of water required;
    b. a hydrological overview of the water body;
    c. details of impacts; and
    d. proposed mitigation measures.

15. The Licensee shall, for winter lake and stream crossings, including ice bridges, construct entirely of water, ice or snow and minimize disturbance by locating ice bridges in an area that requires the minimum approach grading and the shortest crossing route. Stream crossings shall be removed or the ice notched prior to spring break-up.

16. The Licensee shall not utilize any equipment or vehicles in the course of this undertaking unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of equipment or vehicles shall cease if rutting occurs.

17. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty-one (31) metres above the ordinary High Water Mark of any water body.

18. The Licensee shall not cut any stream bank or remove any material from below the ordinary High Water Mark of any water body.

19. The Licensee shall undertake appropriate corrective measures to mitigate impacts on surface drainage resulting from the Licensee's operations.

20. The Licensee shall limit any in-stream activity, as much as possible, to low water periods. In-stream activity is prohibited during fish migration.

21. The Licensee shall locate stream crossings to minimize approach grades. Approaches shall be stabilized during construction and upon completion of the project, to control runoff, erosion and subsequent siltation to any water body.

22. The Licensee shall not permit machinery to travel up the stream bed and fording of any water body is to be kept to a minimum and limited to one area. Equipment used should be well cleaned and free of oil and grease and maintained free of fluid leaks.

23. The Licensee shall designate an area for the deposition of excavated and stockpiled materials that is at least thirty-one (31) metres above the ordinary High Water Mark of any water body.

24. The Licensee shall provide to the Board for review, for-construction design drawings for stream culverts and bridges designed using DFO's guidelines and to facilitate the passage of fish, thirty (30) days prior to construction.

25. The Licensee shall submit to the Board for review, at least thirty (30) days prior to implementation, copies of separate Blasting Management Plans developed for the mining operation, tunnelling of the railway and blasting near water bodies as committed to during the Public Hearing.

PART F CONDITIONS APPLYING TO WASTE DISPOSAL AND MANAGEMENT

1. The Board has approved with the issuance of the licence, the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction Operation, and Closure*", dated April 2013.

2. The Board has approved with the issuance of the licence, the Plan entitled *"Baffinland Iron Mines Corporation Mary River Project Attachment 5: Waste Rock Management Plan,"* dated January 2012.

3. The Licensee shall provide a revised Waste Rock Management Plan, as required under Part B, Item 15, that takes into consideration for this and future revisions under this Licence, the following:

    a. Updates to the on-going Waste Rock Characterization Program (including the further refinement of acid rock drainage and metal leaching aspects of the foot wall and hanging wall;
    b. Any additional details on the segregation of potentially acid generating waste rock;
    c. Update to the geochemical modeling;
    d. Update on pit water quality predictions;
    e. Results of ongoing humidity cell kinetic testwork;
    f. The incorporation of on-site test pile program results with respect to ARD/ML and impacts to modeling results; and
    g. Waste Rock Storage Facilities with consideration for climate change.

4. The Licensee shall provide a revised Waste Management Plan, as required under Part B, Item 15(f), that takes into consideration for this and future revisions under this Licence, the following:

    a. A Quality Assurance and Quality Control Plan for open burning procedures under this Licence;
    b. Provide a section and information on the proposed land disposal of dredging waste for the purposes of construction at Milne Port Site and Steensby Port Site, with information on location, amount of materials, method of disposal and any mitigation measures required for the protection of water.

5. The Board has approved with the issuance of the licence, the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Hazardous Materials and Hazardous Waste Management Plan*", dated April 22, 2013.

6. The Licensee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that

the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.

7. The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an Incinerator System;

8. The Licensee shall test the bottom ash generated by all Incinerator Systems, by using the acceptable test procedures for analyzing residuals, prior to being disposed of at any Landfill Facility. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the Licensee shall direct the Waste to an appropriate facility for disposal. The records of analysis results and volumes of ash shall be maintained and provided to an Inspector upon request.

9. The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood, to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.

10. The Licensee shall treat oily water and wastewater generated by the Project at the Oily Water/Wastewater Treatment Facilities allowed under the scope of the Licence.

11. The Licensee shall submit to the Board and the Inspector, thirty (30) days prior to the removal and transfer of waste, a declaration of authorization from any community receiving waste from the project, which clearly states that authorization has been granted for the deposit by the Licensee at the Hamlet's appropriately licensed facilities.

12. The Licensee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.

13. The Licensee shall, unless otherwise approved by the Board in writing, discharge effluent at a distance of least thirty-one (31) metres above the Ordinary High Water Mark of any Water body, where direct flow into the Water body is not possible, such that surface erosion is minimize and no additional impacts are created.

14. The Licensee shall remove any waste generated from temporary and permanent shelters along the tote road and along the railway corridor for treatment at appropriately licenced Waste Management Facilities.

15. The Licensee shall direct all Sewage generated from the relevant Project sites to the Sewage Treatment Facilities or as otherwise approved by the Board in writing.

16. The Licensee shall treat all Sewage waste generated at the Ravn River and Mid-Rail camps and Sewage generated at the Cockburn North and Cockburn South camps at either the Mine Site Sewage Treatment Facility or the Steensby Port Sewage Treatment Facility, unless otherwise approved by the Board in writing.

17. The Licensee shall provide to the Board for review, at least sixty (60) days prior to installation, detailed specifications and operational requirements for the Sewage storage tanks proposed for the Railway camps.

18. All discharge from the Sewage Treatment Facilities including the Polishing Waste Stabilization Ponds directly into fresh Water bodies at Monitoring Stations MP-01, MP-01a, MP-MRY-04, MP-MRY-04a, MS-01, MS-01a, MS-MRY-04, MS-MRY-04a, must not exceed the following Effluent quality limits:

Table 4: Effluent discharge quality limits for Sewage Treatment Facilities to freshwater

Parameter	Maximum Concentration of Any Grab Sample
BOD_5	30 mg/L
Total Suspended Solids	35
Faecal Coliform	1000 CFU/100 mL
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5
Ammonia (NH3-N)	4.0 mg/L
Total Phosphorous (MS-01)	4.0 mg/L
Total Phosphorous (MS-01a)	1.0 mg/L
Toxicity	Not acutely toxic

19. All discharge from the Sewage Treatment Facilities including Polishing Waste Stabilization Ponds at Monitoring Stations SP-01, SP-01a directly into the ocean or to ditches flowing into the ocean shall not exceed the following Effluent quality limits:

Table 5: Effluent discharge quality limits for Sewage Treatment Facilities to the ocean

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
BOD_5	100 mg/L
Total Suspended Solids	120 mg/L
Faecal Coliform	10,000 CFU/100 mL
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5
Toxicity	Not acutely toxic

20. Sludge generated from the Sewage Treatment Facilities or any other facilities shall be confirmed to be non-hazardous and the results provided to the Board for review prior to disposal at any Landfill Facility or as otherwise approved by the Board in writing.

21. All discharge from the Oily Water/Wastewater Treatment Facilities at Monitoring Stations MP-02, MS-02, SP-02 must not exceed the following Effluent quality limits:

Table 6: Effluent discharge quality limits for Oily Water Treatment Facilities

Parameter	Maximum Average Concentration (mg/L)
pH range	6 – 9.5
TSS	35
Ammonia	4
Phosphorous	4
Benzene	0.370
Ethylbenzene	0.090
Toluene	0.002
Oil and Grease	15 and no visible sheen
Arsenic	0.50
Copper	0.30
Lead	0.20
Nickel	0.50
Zinc	0.50

22. All discharge from the Landfill Facilities at Monitoring Stations MS-MRY-13a, MS-MRY-13b and SP-08 must not exceed the following Effluent quality limits:

Table 7: Effluent discharge quality limits for the Landfill Facilities

Parameter	Maximum Average Concentration (mg/L)
pH	6.0-9.5
Total As	0.5
Total Cu	0.3
Total Pb	0.2
Total Ni	0.5
Total Zn	0.5
Total Suspended Solids	15
Oil and Grease	No

23. All discharge from the Bulk Fuel Storage Facilities at Monitoring Stations MP-03, MP-MRY-7, MS-03, MS-04, MS-MRY-6, SP-04 and SP-05 must not exceed the following Effluent quality limits:

Table 8: Effluent discharge quality limits for the Bulk Fuel Storage Facilities

Parameter	Maximum Concentration of Any Grab Sample (ug/L)
Benzene	370
Toluene	2
Ethylbenzene	90
Lead	1
Oil and Grease	15,000 and no visible sheen

24. All discharge from the Landfarm Facilities at Monitoring Stations MP-04, MS-05 and SP-06 must not exceed the following Effluent quality limits:

Table 9: Effluent discharge quality limits for the Landfarm Facilities

Parameters	Maximum Average Concentration (mg/L)
pH	6.0-9.0
Total Suspended Solids	15
Oil and Grease	15 and no sheen
Total Lead	0.001
Benzene	0.370
Toluene	0.002
Ethylebenzene	0.090

25. All Discharge from the Bulk Sample Open Pit, Bulk Sample Weathered Ore Stockpile, Bulk Sample Processing Stockpile Area and Bulk Sample Stockpile Area Seepage at Monitoring Stations MS-MRY-09, MS-MRY-10, MS-MRY-11, MP-MRY-12 shall not exceed the following Effluent quality limits:

Table 10: Open Pit, Stockpile and Sedimentation Ponds Effluent discharge quality limits

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.50
Total Copper	0.30
Total Lead	0.20
Total Nickel	0.50
Total Zinc	0.50
Total Suspended Solids	15.0
Oil and Grease	No visible sheen
Toxicity	Not acutely toxic
The waste discharge shall have a pH of between 6.0 and 9.5	

26. All discharge from the Ponds associated with the Run of Mine Ore Stockpile, Ore Stockpile, West and East Sediment Ponds at Monitoring stations MS-06+, MS-07, MS-08 MS-09 and SP-07 shall not exceed the following Effluent quality limits of Part F, Item 25

27. All Contact Water and surface runoff from the site Drainage and Surface Water Management Systems where flow may directly or indirectly enter a water body, shall be sampled Weekly during the Operations Phase of the Project and must not exceed the following Effluent quality limits:

Table 11: Effluent quality limits for Contact Water during the Operations Phase of the Mary River Project

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)
Total Suspended Solids	15	30
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

28. The Licensee shall incorporate best management practices including ditches, diversions, sumps and berms where necessary to minimize or prevent surface runoff from entering nearby water bodies from Quarry and borrow pit sites.

29. The Licensee shall remove from the project site, all hazardous wastes generated through the course of the Construction and Operations Phases, for disposal at an approved Waste Disposal Facility.

30. The Licensee shall maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records shall be made available upon request, to an Inspector or the Board.

PART G CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written consent from the Board, carry out Modifications provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

    a. The Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications;
    b. Such Modifications do not place the Licensee in contravention of the Licence or the Act;
    c. Such Modifications are consistent with the NIRB Project Certificate;
    d. The Board has not, within sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
    e. The Board has not rejected the proposed Modifications.

2. Modifications for which any of the conditions referred to in Part G, Item 1 have not been met can be carried out only with written approval from the Board.

3. Applications for modifications shall contain:

    a. A description of the facilities and/or works to be constructed;
    b. The proposed location of the structure(s);
    c. Identification of any potential impacts to the receiving environment;
    d. A description of any monitoring required, including sampling locations, parameters measured and frequencies of sampling;
    e. Schedule for construction;
    f. Drawings of engineered structures stamped by a Professional Engineer; and
    g. Proposed sediment and erosion control measures.

6. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modification. These plans and drawings shall be stamped by an Engineer.

PART H CONDITIONS APPLYING TO EMERGENCY RESPONSE AND CONTINGENCY PLANNING

1. The Board has approved the Plan entitled "B*affinland Iron Mines Corporation Mary River Project Emergency and Spill Contingency Plan"* dated March 2013. The Licensee shall submit a revised plan at least sixty (60) days prior to the commencement of Operations that reflect the change in the scope of activities with respect to the Project.

2. The Licensee shall prevent any chemicals, petroleum products or wastes associated with the project from entering water. All sumps and fuel caches shall be located at a distance of at least thirty one (31) metres from the ordinary High Water Mark of any adjacent water body and inspected on a regular basis.

3. The Licensee shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice.

4. The Licensee shall perform weekly inspections of fuel containment facilities for leaks and settlement and shall keep a written log of inspections to be made available to an Inspector upon request.

5. The Licensee shall maintain and service any equipment in designated areas and shall implement special procedures (such as the use of drip pans) to manage waste and contain potential spills.

6. If the Licensee provides notification under Part J, Item 7, the Licensee shall submit to the Board, an Addendum to the Emergency Response Plan and the Spill Contingency Plan, detailing the changes in operations, personnel, responsibilities, availability of equipment and access to the site for assistance.

7. The Licensee shall keep a copy of the Emergency Response Plan and the Spill Contingency Plan at each site of operations.

8. The Licensee shall conduct emergency maintenance and servicing on equipment, in designated areas, and shall implement measures to collect motor fluids and other Waste and prevent and contain spills.

9. If, during the period of this Licence, an unauthorized Discharge of Waste and/or Effluent occurs, or if such Discharge is foreseeable, the Licensee shall:

    a. Employ as required, the Emergency Response Plan and the Spill Contingency Plan;
    b. Report the incident immediately via the 24-Hour Spill Reporting Line (867) 920-8130 and to the Inspector at (867) 975-4295; and

c. For each spill occurrence, submit a detailed report to the Inspector, no later than thirty (30) days after initially reporting the event, which includes the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, clean up and restore the spill site.

10. The Licensee shall, in addition to Part H, Item 9, regardless of the quantity of release of a harmful substance, report to the NWT/NU Spill Line if the release is near or into a Water body.

11. The Licensee shall implement measures to prevent or minimize any chemicals, petroleum products or wastes associated with the project from entering Water. All sumps and fuel caches shall be located at a distance of at least thirty-one (31) meters from the ordinary High Water Mark of any adjacent water body and inspected on a regular basis.

PART I CONDITIONS APPLYING TO GENERAL AND AQUATIC EFFECTS MONITORING

1. The Board has approved with the issuance of the Licence, for the Construction Phase of the Project, the plan entitled "*Aquatic Effects Monitoring Program (AEMP) Framework*", dated February 2013, applicable during the Construction Phase of the Project. The Licensee shall, upon further consultation, submit a revised AEMP Framework for review of the Board, prior to December 1, 2013, and take into consideration the recommendations received during the final technical review of the Application and submissions received at the public hearing.

2. The Licensee shall submit to the Board, for approval in writing, at least sixty (60) days prior to commencing the Operations Phase of the Project, an Aquatic Effects Management Plan (AEMP) prepared in consultation with interested parties.

3. The Board has approved with the issuance of the licence, the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment: 5 Environmental Protection Plan Appendix 10B*", dated January 2012.

4. The Board has approved with the issuance of the licence, the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment: 5 Environmental Monitoring Plan Appendix 10D-12*", dated January 2012.

5. The Licensee shall undertake the Monitoring Program as provided in Schedule I.

6. The Licensee shall confirm the locations and GPS coordinates for all Monitoring stations referred to in Schedule I, and any additional monitoring stations that may be required, with an Inspector.

7. The Licensee shall provide the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations where sources of water are utilized for all purposes. The Licensee shall report these coordinates to the Inspector prior to the use of Water.

8. The Licensee shall determine the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations of temporary and permanent storage and/or deposit of Wastes associated with the Mary River Project. The Licensee shall report these coordinates to the Inspector prior to depositing waste.

9. The Licensee shall install and maintain flow meters or other such devices, or implement suitable methods required for the measuring of water and waste volumes, to be operated and maintained to the satisfaction of an Inspector.

10. The Licensee shall install and maintain signs that identify the Monitoring Stations, posted in English, Inuktitut and French.

11. The Licensee shall measure and record the following in cubic metres or as otherwise stated:

    a. The volume of fresh Water obtained from all water sources associated with the Project. Water quantities from sources in, on or flowing through Crown Lands and those through Inuit-owned lands are to be provided separately;
    b. The volume, the source and end use of reclaim or recycled water used for any purposes under this licence;
    c. The volume of Sewage sludge removed from the Sewage Treatment Facilities;
    d. Tonnes of mineralized and un-mineralized waste rock stored at the end of the calendar year being reported; and
    e. Tonnes of ore stored at the Project sites at the end of the calendar year and the tonnes of ore shipped annually in relationship to the Project.

12. The Licensee shall undertake a geotechnical inspection on all engineered facilities designed to contain Water or Waste, to be carried out bi-annually by a Geotechnical Engineer, between the months of July and September. The inspection shall be conducted in accordance with the *Canadian Dam Safety Guidelines* where applicable, to include:

    - Pit walls
    - Quarries
    - Landfills
    - Landfarms
    - Bulk Fuel Storage Facilities
    - Sediment Ponds
    - Collection ponds
    - Polishing Waste Stabilization Ponds

13. The Licensee shall submit to the Board, within sixty (60) days of completion of the geotechnical inspection referred to in Part G, Item 12, a Geotechnical Engineer's Report that shall include a cover letter from the Licensee outlining an implementation plan to address the recommendations of the Geotechnical Engineer.

14. The Licensee shall monitor and report to an Inspector, Seepage from all facilities designed to contain, withhold, divert or retain Water or Wastes and submit the results and an interpretation of the Seepage monitoring carried out, in the Annual Report required under Part B, Item 4.

15. The Licensee shall obtain a digital photographic record of all the watercourse crossings before, during, and after the completion of construction as required under Schedule D, Item 1.

16. The Licensee shall submit to an Analyst for approval, within six (6) months of the Licence issuance, an updated Quality Assurance/ Quality Control Plan that includes requirements for sampling and analysis. This Plan shall be developed in accordance with the *1996 Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A"Licences (INAC).*

17. If the Analyst does not approve the Plan referred to in Part I, Item 16, the Licensee shall revise the Plan and resubmit to the Analyst for approval.

18. The Licensee shall annually review the approved Quality Assurance/Quality Control plan and modify it as necessary. Proposed modifications shall be submitted to an Analyst for approval.

19. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the most current edition of "*Standard Methods for the Examination of Water and Wastewater*" or by other such methods approved by an Analyst.

20. All compliance analyses shall be performed in a Canadian Association for Environmental Analytical Laboratories (CAEAL) accredited laboratory according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

21. The Licensee shall submit to the Board, within thirty (30) days following the month being reported, a Monthly Monitoring Report. The Report shall include:

    a. All data and information required by this Part and generated by the Monitoring Program in the tables of Schedule I;
    b. An assessment of data to identify areas of non-compliance with regulated discharge parameters referred to in Part F;

22. The License shall establish additional Monitoring Stations, as may be required, to effectively and adequately monitor surface runoff from the Mary River Project site(s) or discharge from Site Drainage and Surface Water Management System water associated with the Mary River Project. Within thirty (30) days of establishment of additional Monitoring Stations, the Licensee shall inform the Board and the Inspector.

23. The Licensee shall monitor runoff and/or discharge from borrow pits and rock Quarry sites, on a monthly basis, for the following parameters:

    - Total Suspend Solid (TSS)
    - Oil and Grease
    - Ammonia (total NH_3-N)
    - Nitrate (total NO_3-N)
    - pH

- Conductivity; and
- Demonstrate to be non-acutely toxic.

24. The Licensee shall, in addition to Part I, Item 23, during periods of flow and following a major precipitation event, conduct opportunistic monitoring, on a monthly basis, on any observed flows related to Effluent quality limits under Part D, Item 16 and the monitoring requirements as established under Part I, Item 23, for any flows originating from borrow pits or rock quarries.

25. The Licensee shall monitor surface runoff and/or discharge of the monitoring stations downstream of construction areas at Milne Port Site and the Mary River Mine Site as indicted in Table 2 and 3 of Schedule I, to comply with Effluent quality limits under Part D, Item 16.

26. An Inspector may impose additional monitoring requirements.

27. A monthly Monitoring Program summary report shall be submitted to the Board for review within thirty (30) days following the month being reported. This summary shall include, at a minimum, all the monitoring requirements under this Part

28. The Licensee shall include in the Annual Report, required under Part B, Item 4, all monitoring results and information required by this Part.

29. The NWB can modify the Monitoring Program as set out in Schedule I without a public hearing. Requests for changes to the Program should be forwarded to the NWB in writing, and should include the justification for the change.

PART J CONDITIONS APPLYING TO ABANDONMENT, RECLAMATION AND CLOSURE

1. The Board has approved, with the issuance of the Licence, the Plan entitled *"Baffinland Iron Mines Corporation Mary River Project Preliminary Mine Closure and Reclamation Plan Appendix 10G"*dated February 2012 as part of the Application.

2. The Licensee shall to submit to the Board, for approval in writing, within sixty (60) days prior to the commencement of the Operations Phase of the Project, an Interim Closure and Reclamation Plan prepared in accordance with the *Mine Site Reclamation Guidelines for the Northwest Territories* (2007, INAC) and consistent with the *Mine Site Reclamation Policy for Nunavut* (2002, INAC) and the *Abandonment and Reclamation Policy for Inuit Owned Lands* (the Qikiqtani Inuit Association-Version 2.0). The Plan shall cover mine related components and include the following:

    a. Detailed description, including maps and other visual representations, of the pre-construction conditions for each site, accompanied by a detailed description of the proposed final landscape, with emphasis on the reclamation of surface drainage over the restored area;
    b. A description of how progressive reclamation will be employed and monitored throughout the life of the mine, plus reclamation scheduling and coordination of activities with the overall sequence of the project; details of reclamation scheduling and procedures for coordinating reclamation activities within the overall mining sequence and materials balance;
    c. Implications of any updated water balance and water quality model prediction results and any adaptive management measures that may be required;
    d. An evaluation of closure and reclamation measures for each mine component, including the goals, objectives, closure criteria and the rationale for selection of the preferred measures;
    e. A comprehensive assessment of materials suitability, including geochemical and physical characterization and a schedule of availability for reclamation needs. Particular attention shall be given to cover materials, including maps showing sources and stockpile locations of all reclamation construction materials;
    f. An assessment and description of any required post-closure treatment for pit water that is not acceptable for discharge, taking into consideration further studies completed and updated modeling information;
    g. Contingency measures for all reclamation components including action thresholds that are linked to the monitoring programs;
    h. Monitoring programs to assess reclamation performance and environmental conditions including monitoring locations for surface water and Ground Water, parameters;
    i. Monitoring schedules and overall timeframes;

j. QA/QC procedures for managing the demolition landfill and other waste disposal areas;
k. A list of non-salvageable materials and disposal locations;
l. Rock storage facility closure design plans and sections including the types of material placed and volumes;
m. Protocol for the disposal of any contaminated soil;
n. An assessment of the long-term physical stability of all remaining project components;
o. A revised closure and reclamation cost estimate; and
p. A detailed implementation schedule for completion of reclamation work

3. The Licensee shall, on an annual basis, provide an annual work plan and updated estimate of anticipated mine closure and reclamation costs for the upcoming year shall in accordance with the requirements of Schedule J.

4. The Licensee shall submit to the Board, for approval in writing, at least twelve (12) months prior to the expected end of mining, a Final Closure and Reclamation Plan. The plan shall incorporate revisions, which reflect the pending closed status of the mine, and include:

a. Soil Quality Remediation Objectives along with CCME Guidelines and the Government of Nunavut *Environmental Guideline for Site Remediation*;
b. Environmental Site Assessment plans in accordance Canadian Standards Association (CSA) criteria; and
c. An evaluation of the Human Health and Ecological Risk Assessment required for the associated closure options.

5. The Licensee shall remediate hydrocarbon contaminated soils associated with the project bladder tank farms and treat to meet the appropriate remedial objectives consistent with the use of the remediated soil as well as the requirements of the Government of Nunavut Guidelines, or as otherwise approved by the Board in writing.

6. The Licensee shall provide to the Board, for approval in writing, at least sixty (60) days prior to commencing reclamation activities at any bulk (fuel bladder) storage facility impacted by hydrocarbon contamination, a remediation action plan that meets at minimum, the objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, 2010. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

7. The Licensee shall backfill and restore, to the satisfaction of an Inspector, all sumps to the pre-existing natural contours of the land.

8. The Licensee shall, unless otherwise identified within the approved Plan under Part J, Item 1, remove all Culverts and open the natural drainage channel. In carrying out this activity, measures shall be implemented to minimize erosion and sedimentation.

9. The Licensee shall contour and stabilize all disturbed areas to a pre-disturbed state upon completion of work.

10. In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading, or scarifying the surface to conform to the natural topography.

11. The Licensee shall implement progressive reclamation including re-vegetation as soon as practically possible and shall update all Plans to reflect such measures.

12. Areas that have been contaminated by hydrocarbons from normal fuel transfer procedures shall be reclaimed to meet objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, 2010. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

13. The Licensee shall notify the Board in writing, at least sixty (60) days prior to entering into a Care and Maintenance Phase.

14. Within thirty (30) days of the Licensee providing the Board with notification of the Licensee's intention to enter into Care and Maintenance, the Licensee shall provide the Board with a Care and Maintenance Plan that details the Licensee's plans for maintaining compliance with the Terms and Conditions of the Licence.

15. The Licensee shall remove from the site, all infrastructure and site materials, including but not limited to, all fuel caches, drums, barrels, buildings and contents, docks, water pumps and lines, material and equipment prior to the expiry of this Licence.

16. The Licensee shall notify the Board in writing, at least sixty (60) days prior to any intent to achieve Recognized Closed Mine status.

PART K SCHEDULES

Schedule A. Scope, Definitions, and Enforcement

Definitions
In this Licence: 2AM-MRY1325

"**Abandonment**" means the permanent dismantlement of a facility with the intent of making the facility permanently incapable of its intended use. This includes the removal of associated equipment and structures;

"**Acid Rock Drainage (ARD)**" means the production of acidic leachate, seepage or drainage from underground workings, open pits, ore stockpiles, waste rock stockpiles, construction rock and other rocks used for other purposes associated with the Project that can lead to the release acidic substances into ground Water or surface Water;

"**Act**" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*;

"**Acutely Lethal Effluent**" means effluent as defined in the *Metal Mining Effluent Regulations* SOR/2002-222 (2002);

"**Adaptive Management**" means a management strategy that describes a way of minimizing risks associated with uncertainty and provides a flexible framework for mitigation measures to be implemented and actions to be taken when specified thresholds are exceeded;

"**Addendum**" means the supplemental text that is added to a full plan or report usually included at the end of the document and is not intended to require a full resubmission of the revised report. It is also considered as an appendix or supplement;

"**Aggregates Sources**" mean existing and/or proposed borrow pits and quarries for use in the construction of facilities and infrastructure for the Mary River Project as identified in the Application.

"**Amendment**" means a change to any terms and conditions of this Licence through application to the NWB, requiring a change, addition, or deletion of specific terms and conditions of the Licence;

"**Analyst**" means an Analyst designated by the Minister under section 85 (1) of the *Act*;

"**Annually**" means, in the context of monitoring frequency, one sampling event occurring every 365 days with a minimum of 200 days between sampling events;

"**Application**" means the final Type "A" Water Licence Application submitted to the NWB by Baffinland Iron Mines Corporation (BIMC) on February 17, 2012 as part of the Final Environmental Impact Statement (FEIS) for the Mary River Project;

"**Aquatic Effects Monitoring Plan (AEMP)**" means a monitoring program designed to determine the short-term and long-term effects of the Project's activities on the aquatic environment resulting from the Project, to evaluate the accuracy of impact predictions, to assess the effectiveness of planned impact mitigation measures and to identify additional impact mitigation measures to avert or reduce environmental effects;

"**Batch Concrete Plant**" means mobile or stationary plants used to mix cement, aggregate, and water to produce concrete for footings, foundations, floors and other project facilities and infrastructure described in the Application;

"**Biannual**" means, in the context of monitoring frequency, one sampling event occurring every six (6) months with a minimum of one hundred eighty days between sampling events;

"**Board**" means the Nunavut Water Board (NWB) established under Article 13 of the *Nunavut Land Claims Agreement* and under section 14 of the Act;

"**Borrow Pits**" means sites for which materials, such as gravel or sand, are excavated for the purposes of constructing site infrastructure and facilities for the Mary River Project as described in the Plan entitled Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Borrow Pit and Quarry Management Plan Appendix 10D-6*", dated February 2012;

"**Bulk Fuel Storage Facilities**" means the permanent fuel storage tanks, containment area and associated appurtenance constructed at the various major project sites, Milne Port, the Mine Site, and Steensby Port, associated with the Mary River Project, for the purposes of offloading, storing and distribution of fuel;

"**Bulk Sample Open Pit**" means the excavated area formed as a result of the Bulk Sampling Program undertaken in 2007-2008 at the Mary River Site;

"**Bulk Sampling Program**" means the activities associated with the ore sample extracted from deposit No.1 during 2007-2008 for the purpose of analysing the ore constituent. The Bulk Sampling Program was allowed under Amendment No. 1 to Licence 2BB-MRY0710 issued by the NWB on July 16, 2007.

"**Bulk Sample Weathered Ore Stockpile**" means the ore stockpile located adjacent to the Bulk Sample Open Pit at the Mary River Site;

"**Canadian Council of the Minister of Environment (CCME)**" means the organizations of Canadian Ministers of Environment that sets guidelines for environmental protection across

Canada such as the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life;

"**Care and Maintenance**" in respect of a mine, means the status of the facility when the Licensee ceases production or commercial operation temporarily for an undefined period of time;

"**Closure Phase**" means when an Operator ceases operations at a facility without the intent to resume mining activities in the future;

"**Construction Phase**" means any activities undertaken for the purposes of establishing or constructing components, infrastructure, and facilities required for the development of the Mary River Project open-pit mine, as described in the Application;

"**Contact Water**" means surface water or runoff that is physically or chemically affected by the Mary River Project mine development areas and activities;

"**Dams**" means engineered structures including surface water management ponds and embankment dams as described in the document entitled "Baffinland Iron Mines Corporation Mary River Project Attachment 5: Waste Rock Management Plan Appendix 10D-5, dated January 2012.

"**Dam Safety Guidelines**" means the *Canadian Dam Association (CDA) Dam Safety Guidelines (DSG), January 1999* or subsequent approved editions;

"**Deleterious Substances**" means a substance as defined in section 34(1) of the *Fisheries Act;*

"**Deposit**" means the placement of waste rock or other solids materials on land or in water;

"**Discharge**" means the release of any water or waste to the receiving environment;

"**Domestic Waste**" means all solid waste generated from the accommodations, kitchen facilities and all other site facilities, excluding any hazardous wastes generated by facilities associated with the Mary River Project;

"**Drainage and Surface Water Management System**" means the network of ditches, drains, and channels, including storm water and ore stockpile runoff system, designed and constructed to collect and manage surface runoff from project site infrastructure and facilities associated with the Project;

"**Effluent**" means the liquid discharge from all site water management facilities;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2* and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

"**Engineering Geologist**" means a professional geologist registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization is the investigation and interpretation of geological conditions for civil engineering purposes;

"**Engineered Structure**" means any facility, which was designed and approved by a Professional Engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Nunavut;

"**Environmental Assessment**" means, for the purpose of this licence, the totality of the Nunavut Impact Review Board (NIRB) Public Registry as established under the authority of Article 12 of the NLCA, including all documents associated with the NIRB's assessment process for Baffinland Iron Mines Corporation Mary River Project;

"**Explosives Facility**" means facilities and equipment designed for the storage of Ammonium Nitrate, detonators, and explosives as well as for the mixing and storage of Ammonium Nitrate Fuel Oil (ANFO) as described in the Plan entitled "*Baffinland Iron Mines: Mary River Project Explosives Management Plan*" January 2012;

"**Final Discharge Point**" in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent (Metal Mining Effluent Regulations, SOR/2002-222, 6 June, 2002);

"**Freeboard"** means the vertical distance between the water level and the top of the containment element (i.e. a liner), within a dam or any other channel or pond used for containment of site runoff;

"**Fuel Bladder Farm**" means bulk-fuel storage facility and associated infrastructure initially established at the Milne Port Site, the Mine site and Steensby Port Site under Type "B" Licence 2BB-MRY1114 and which have been transferred to the scope of activities under this Licence;

"**Geotechnical Engineer**" means a professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments;

"**Grab Sample**" means an undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected;

"**Greywater**" means the component of effluent produced from domestic use (i.e. washing, bathing, food preparation and laundering), excluding sewage;

"**Ground Water**" means water that occupies pores and fractures in rock and soil below the ground surface in a liquid or frozen state;

"**Hazardous Materials**" means a contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage;

"**High Water Mark**" means the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities);

"**ICP Metals Scan**" means, for the purpose of the Licence, elements detected using an inductively coupled plasma (ICP) mass spectrometer. Metal parameters should be consistent with baseline data previously collected and include any other metals of concern or interest;

"**Incinerator System**" means the dual chamber high temperature system, or similar facility, designed for the purposes of combusting acceptable types of Waste generated by the Project as described in the Application including the document entitled "*Waste Management Plan for Construction, Operation and Closure,*" dated April 2013;

"**Inspector**" means an Inspector designated by the Minister under section 85 (1) of the Act;

"**Interim Closure and Reclamation Plan**" means a conceptual detailed plan on the reclamation of mine components which will not be closed until the end of the mining operations, and operational detail for components which are to be progressively reclaimed throughout the mine life;

"**Landfarm Facilities**" means engineered facilities and associated appurtenance designed and constructed for the treatment and storage of hydrocarbon impacted soil and/or water at the Milne Port, the Mine Site and Steensby Port Site as described in the Plan entitled "*Mary River Project Attachment 5: Waste Management Plan for Construction, Operation, and Closure Appendix 10D-4*", dated April 2013;

"**Landfill Facilities**" means engineered facilities and associated appurtenance designed and constructed for the treatment and storage non-hazardous, inert Waste at the Mine Site and Steensby Port Site as described in the Plan entitled "*Mary River Project Attachment 5: Waste Management Plan for Construction, Operation, and Closure Appendix 10D-4*", dated April 2013

"**Licence**" means this Type "A" Water Licence, 2AM-MRY1325, issued by the Nunavut Water Board in accordance with the *Act*, to Baffinland Iron Mines Corporation (BIMC) for the Mary River Project;

"**Licensee**" means the entity to which Licence 2AM-MRY1325 is issued or assigned;

"**Maximum Average Concentration**" means the average concentration of any four consecutively collected samples taken from the identical sampling location and taken during any given timeframe;

"**Maximum Monthly Mean**" means the average concentration of all samples collected over a thirty-day period from the identical sampling location;

"**Metal Leaching**" means the mobilization of metals into solution under neutral, acidic or alkaline conditions;

"**Milne Port Bulk Fuel Storage Facility**" means the permanent fuel storage tanks, containment area and associated appurtenance for the offloading, storing and distribution of fuel at the Milne Port Site as depicted in drawings submitted by the Licensee as described in the Application documents received by the Board on February 17, 2012 ;

"**Milne Port Bulk Sample ore Stockpile**" means the ore stockpile located at Milne Inlet (Milne Port), which is connected with the Bulk Sampling Program carried out during the 2007-2008 period;

"**Milne Port Landfarm Facility**" means the engineered structure or facility and appurtenance designed and constructed at the Milne Port Site for the storage and biological treatment of hydrocarbon impacted soil and water as described in the Plan entitled "*Baffinland Iron Mines Corporation Waste Management Plan for Construction, Operation, and Closure*" dated April 2013;

"**Milne Port Oily Water/Wastewater Treatment Facility**" means the engineered facility and equipment designed and constructed to treat oily water and/or wastewater generated at the Milne Port Site as described in the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" January 2012;

"**Milne Port Potable Water Treatment Facility**" means the packaged media-filtration system and associated equipment designed and installed or constructed to treat water for domestic purposes as indicated in the Application documents including the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" dated January 2012;

"**Milne Port Sewage Treatment Facility**" means the Rotating Biological Contactor (RBC) type treatment Plant, all polishing waste stabilization ponds and other relevant equipment designed and installed to treat Sewage generated by the camp facilities at Milne Inlet as described in the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" dated January 2012;

"**Milne Port Storm Water Drainage Systems**" means the engineered infrastructures and equipment designed and constructed to collect site or surface runoff water from the Milne Port site as depicted in the drawings provided by the Applicant in its Application;

"**Mine Site Bulk Fuel Storage Facility**" means the permanent fuel storage tanks, containment area and associated appurtenance for the offloading, storing, and distribution of fuel at the Mine Site as described in the Application documents received by the Board on February 17, 2012;

"**Mine Site Bulk Sample Ore Stockpile**" means the ore stockpile located at the processing area at the Mary River Site that is associated with the Bulk Sampling Program undertaken in 2007-2008 period;

"**Mine Site Drainage System**" refers to the storm water manage systems designed and constructed to capture surface runoff from Ponds No. 1, 2, and 3, waste rock stockpile, airstrip, and other areas at the Mine site as described in the Application documents received by the Board on February 17, 2012;

"**Mine Site Landfarm Facility**" means the engineered structure or facility and appurtenance designed and constructed at the Mine Site for the storage and biological treatment of hydrocarbon impacted soil and water as described in the Plan entitled "*Baffinland Iron Mines Corporation Waste Management Plan for Construction, Operation, and Closure*" dated April 2013;

"**Mine Site Landfill Facility**" means engineered structure or facility and associated appurtenance designed and constructed at the Mine Site for the storage and treatment of non-hazardous, inert Waste as described in the Plan entitled "*Baffinland Iron Mines Corporation Waste Management Plan for Construction, Operation, and Closure*" dated April 2013;

"**Mine Site Oily Water/Wastewater Treatment Facility**" means the engineered facilities and equipment designed and constructed to treat oily water and/or wastewater generated at the Mine Site as described in the Plan entitled *"Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" January 2012;

"**Mine Site Potable Water Treatment Facilities**" means the packaged media-filtration system and equipment designed and installed or constructed to treat water for domestic purposes at the Mine Site as described in the document entitled *"Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" January 2012;

"**Mine Site Sewage Treatment Facilities**" means the Rotating Biological Contactor type treatment Plants, all polishing waste stabilizations ponds and other relevant equipment designed and installed to treat Sewage generated by the camp facilities at the Mine site as described in the

document entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" January 2012;

"**Minister**" means the Minister of Indian and Northern Affairs Canada (AANDC) also referred to as Aboriginal Affairs and Northern Development Canada (AANDC);

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work;

"**Monitoring Program**" means the program to collect data on surface water and Ground Water quality to assess impacts to the environment of an appurtenant undertaking;

"**Monthly**" means, in the context of monitoring frequency, one sampling event occurring every thirty (30) days with a minimum of twenty one (21) days between sampling events;

"**Non-Contact Water**" means the runoff originating from areas unaffected by mining activity that does not come into contact with developed areas;

"**Nunavut Land Claims Agreement**" **(**NLCA) means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*," including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"**Oily Water/Wastewater Treatment Facility**" means the engineered facilities and equipment designed and constructed to treat oily water and/or wastewater generated at the Relevant Project sites as described in the Plan entitled *"Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3*" January 2012;

"**Operations Phase**" means the set of activities associated with mining, crushing, screening and transportation of the ore generated by the Mary River Project excluding the construction and decommissioning phases;

"**Operator**" means the person who operates, has control or custody of, or is in charge of a mine or recognized closed mine;

"**Polishing Waste Stabilization Pond (PWSP)**" means the engineered structures designed and constructed for storing and/or carrying out additional treatment of Sewage effluent as described in the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Fresh Water Supply, Sewage, and Wastewater Management Plan Appendix 10D*" dated January 2012;

"**Potable Water Supply Facilities**" means the engineered facilities designed and constructed for the treatment and supply of fresh Water for domestic purposes at the Milne Port Site, the Mine Site, Steensby Port Site and the Railway camp as described in the Plan entitled **"***Baffinland Iron*

*Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3***"** January 2012;

"**Progressive Reclamation**" means actions that can be taken during mining operations before permanent closure, to take advantage of cost and operating efficiencies by using the resources available from mine operations to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the reclamation objectives and goals;

"**Project**" means the Mary River Project as outlined in the Final Environmental Impact Statement (FEIS) and supplemental information submitted to the Board by Baffin Land Iron Mines Corporation (BIMC) for the Mary River Project. The FEIS included a Water Licence Application and supporting technical documents for an open-pit mine on northern Baffin Island;

"Quality Assurance/Quality Control (QA/QC)" Quality Assurance means the system of activities designed to better ensure that quality control is done effectively; Quality Control means the use of established procedures to achieve standards of measurement for the three principle components of quality: precision, accuracy and reliability;

"**Quarry or Quarries**" means the areas of surface excavation for extracting rock material for use as construction materials in the development of infrastructure and facilities for the Project as outlined in the Plan entitled "*Baffinland Iron Mines Corporation Mary River Project Borrow Pit and Quarry Management Plan Appendix 10D-6*", dated February 2012;

"**Quarterly**" means, in the context of monitoring frequency, one sampling event occurring every three months with a minimum of ninety days between sampling events;

"**Railway**" means the locomotive system, including the approximately 150 km track and other infrastructure, proposed for hauling mostly iron ore from the Mine site to the Steensby Port for shipment to markets abroad.

"**Receiving Environment**" means both the aquatic and terrestrial environments that receive any discharge resulting from the Project;

"**Reclamation**" means the process of returning the mine sites and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities;

"**Recognized Closed Mine**" means a recognized closed mine as defined by section (1) of the *Metal Mining Effluent Regulations* SOR/2002-222 dated 6 June 2002;

"**Regulations**" means the *Nunavut Waters Regulations sor 2013/669 18th April, 2013*;

"**Seepage**" means any water that drains through or escapes from any site structure designed to contain, withhold, divert or retain water or waste. Seepage also includes any flows that have emerged through open pits, runoff from waste rock and ore stockpile areas, quarries, Landfill, Landfarm and other facilities;

"**Sewage**" means all toilet wastes and greywater;

"**Sewage Treatment Facilities**" means the Rotary Biological Contactor (RBC) type sewage treatment plant and infrastructure including the polishing waste stabilization ponds situated at the Milne Port Site, the Mine Site and the Steensby Port Site, as described in the Water Licence Application document entitled "*Baffinland Iron Mines Corporation Mary River Project Attachment 5: Fresh Water Supply, Sewage, and Wastewater Management Plan Appendix 10D-3*", dated January 2012;

"**Short Term Maximum**" means the maximum concentration of all samples collected over a 24 hour period or less, taken from the identical sampling location;

"**Sludge**" means biosolids or residual solids generated from the treatment of Sewage generated by the Project;

"**Steensby Port Bulk Fuel Storage Facility**" means the permanent fuel storage tanks, containment area and appurtenance designed and constructed for the purpose of offloading, storing and distribution of fuel at the Steensby Port Site as described in the Application documents received by the Board on February 17, 2012;

"**Steensby Port Landfarm Facility**" means the engineered structure or facility and appurtenance designed and constructed at the Steensby Port Site for the storage and biological treatment of hydrocarbon impacted soil and water as described in the Plan entitled "*Baffinland Iron Mines Corporation Waste Management Plan for Construction, Operation, and Closure*" dated April 2013;

"**Steensby Port Landfill Facility**" means the engineered structure or facility and appurtenance designed and constructed at the Steensby Port Site for the storage and treatment of non-hazardous, inert Waste as described in the Plan entitled "*Baffinland Iron Mines Corporation Waste Management Plan for Construction, Operation, and Closure*" dated April 2013;

"**Steensby Port Oily Water/Wastewater Treatment Facility**" means the engineered facilities and associated equipment designed and constructed to treat oily and/or wastewater generated at the Steensby Port Site as described in the Plan entitled **"***Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3***"** January 2012;

"**Steensby Port Potable Water Treatment Facility**" means the packaged media-filtration system and associated equipment designed and installed or constructed to treat water for

domestic purposes as described in the Plan entitled **"***Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3***"** January 2012;

"Steensby Port Sewage Treatment Facility" means the Rotating Biological Contactor type treatment Plant, all polishing waste stabilizations ponds and other relevant equipment designed and installed to treat Sewage generated by the camp facilities at Steensby Port as described in the Plan entitled **"***Baffinland Iron Mines Corporation Mary River Project Attachment 5: Freshwater Supply Sewage and Wastewater Management Plan Appendix 10-D-3***"** January 2012;

"**Sump**" means an excavation in impermeable soil for the purpose of catching or storing water or waste;

"**Traditional Knowledge**" means the practical knowledge that has been gathered through the experience of living in close contact with nature and has been passed along or communicated orally, and handed down from generation to generation;

"**Use**" means use as defined in section 4 of the Act;

"**Waste**" means waste as defined in section 4 of the Act;

"Waste Management Facilities" means all facilities designated for the disposal of waste including: temporary and permanent storage and sorting areas, Sewage Treatment Plant, Landfills, Landfarms, waste rock, collection ponds and others as described in the Plan entitled " Mary River Project Attachment 5: "*Waste Management Plan for Construction, Operation, and Closure Appendix 10D-4*", dated April 2013;

"**Waste Rock**" means all unprocessed rock materials that are or were produced as a result of mining operations and have no current economic value;

"**Waste Water**" means the water generated by site activities or originates on-site that requires treatment or any other water management activity;

"**Water**" means water as defined in section 4 of the Act;

"**Water Crossings**" means engineered structures, such as bridges, causeway, etc, designed and constructed for the purposes of traversing water ways without significantly impeding the flow of Water as described in the Application documents received February 17, 2012;

"**Weekly**" means, in the context of monitoring frequency, one sampling event occurring every 7 days with a minimum of 5 days between sampling events.

Schedule B. General Conditions

The Annual Report referred to in Part B, Item 4 shall include:

1. The Licensee shall file with the Board, no later than March 31st of the year following the calendar year being reported, an Annual Report on the appurtenant undertaking which shall contain the following information:

   a. **WATER**

      i. the monthly and annual volumes, in cubic metres, of all fresh Water withdrawn for domestic and industrial purposes from each source in, on, or flowing through Inuit-owned land in accordance with Part E, Items 3 and 4 of the Licence;
      ii. the monthly and annual volumes, in cubic metres, of all freshwater obtained for domestic and industrial purposes from each source in, on, or flowing through Crown Lands in accordance with Part E, Items 3 and 4 of the Licence;
      iii. the combined monthly and annual volumes in cubic metres of all fresh Water withdrawn for domestic and industrial purposes from sources in, on, or flowing through both Inuit-Owned Land and Crown Lands;
      iv. the monthly and annual volumes of reclaimed or recycled Water used and the purposes for which it is used;

   b. **WASTE**

      i. the monthly and annual volume in cubic meters of treated Sewage effluent discharged from each Sewage Treatment Facility including each Polishing Waste Stabilization Pond;
      ii. the monthly and annual volume in cubic meters of treated wastewater discharged from each Oily Water/Wastewater Treatment Facility;
      iii. monthly and annual quantities of all Effluent discharged from each Surface Water Management (SWM) Pond;
      iv. the monthly and annual volumes in cubic metres of Sludge removed from each Sewage Treatment Facility and disposed of at each Landfill Facility or any approved alternative disposal facility;
      v. the monthly and annual volume in cubic metres of hazardous waste generated and transported from the Project sites to Licensed facility outside of Nunavut for treatment;
      vi. the monthly and annual volume in cubic metres of any wastes backhauled to communities in Nunavut for treatment;
      vii. the monthly and annual volume in cubic metres of waste deposited at each Landfill Facility;
      viii. monthly and annual volume in cubic metres of hydrocarbon impacted soil and water deposited at each Landfarm Facility;

ix. the monthly and annual volume in cubic metres of Sewage transported for treatment from the Railway camps to the Mine Site and Steensby Port Site Sewage Treatment Facilities;
x. the monthly and annual quantities of waste rock generated and used or disposed of;
xi. summary of quantities and analysis of seepage and runoff monitoring from the Landfill Facilities, Landfarm facilities, and any other relevant facilities including ponds embankment dam;
xii. a summary report of solid waste disposal activities including monthly and annual quantities in cubic metres of waste generated and location of disposal;

c. **SPILLS**

i. a list and description of all unauthorized discharges, including volumes and spill report line identification number and summaries of follow-up action taken;
ii. a list of unauthorized discharges and a summary of follow-up action(s) taken;
iii. a summary of any updates or revisions to the Spill Contingency Plan;

d. **MODIFICATIONS**

i. a summary of modifications and/or major maintenance work carried out on all water and waste related structures and facilities;

e. **MONITORING**

i. the results of monitoring under the AEMP framework and other monitoring requirements;
ii. results of thermal monitoring and/or research carried out in conjunction with the Waste Rock Management Plan and disposal of potentially acid generating and metal leaching materials, permafrost integrity along the railway alignment and other project sites;
iii. tabular summaries of the results and interpretation of all data generated under the Monitoring Program in Part I and Schedule I

f. **CLOSURE**

i. a summary of any progressive closure and reclamation work undertaken including photographic records of site conditions before and after completion of operations, and an outline of any work anticipated for the next year, including any changes to implementation and scheduling;
ii. an updated estimate of the current restoration liability required under part C, Item, 1b, based upon the results of progressive restoration, restoration research, project development monitoring, and any changes or modifications to the project;

g. **PLANS/ REPORTS/ STUDIES**

i. a summary of any studies requested by the Board that relate to Waste disposal, Water use or Reclamation, and a brief description of any future studies planned
ii. where applicable, revisions provided as Addendums with an indication of where changes have been made for Plans, Reports, and Manuals.
iii. an executive summary in English, Inuktitut and French of all plans, reports, or studies conducted under this Licence;
iv. a summary, including photographic records before, during and after construction activities, of any modifications and/or major maintenance work carried out on facilities and Infrastructure designed to contain, withhold, divert or retain Water or Wastes, and an outline of any work anticipated for the next year;
v. a summary of the results of any geochemical analyses conducted on materials used to construct facilities and infrastructure under Part D, Item 13;
vi. a detailed discussion on the performance, installation, and evaluation, including the use of photographic records, of the primary and secondary containment structure used in fuel storage to safeguard impacts to freshwaters;
vii. the results of chemical analyses conducted on residue generated from each incinerator system prior to disposing of in any landfill;
viii. a brief description of follow-up action(s) taken to address concerns presented within any inspection and compliance reports prepared by the Inspector;
ix. an update, where required under Part B, Item, 18, in the form of an addendum or revision to the Plans approved under the relevant sections of this Licence;
x. monthly and annual quantities of aggregates excavated and used from Quarries and Borrow Pits associated with the Licence;
xi. the results of any further acid/base accounting conducted on potential acid generating and non-potential acid generated waste rock(PAG and NPAG);
xii. a summary of any specific studies or reports requested by the Board, and a brief description of any future studies planned or proposed;
xiii. all monitoring data with respect to geochemical analyses conducted on material used to construct roads, quarries, and other infrastructure;

h. **GENERAL**

i. a summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector.
ii. a summary of public consultation and participation with local organizations and the residents of the nearby communities, including a schedule of upcoming community events and information sessions;
iii. monthly and annual volume of iron ore generated by the project; and

i. **OTHER**

i. any other details on Water use or Waste Disposal requested by the Board by November 1st of the year being reported.

Schedule C. Conditions Applying to Security

The Annual Security Review (ASR) referred to in Part C shall be conducted as follows:

TIMING, EVIDENCE AND PROCESS FOR ASR

1. Unless otherwise directed by the Board, the ASR shall be conducted annually on the first Thursday of December, in the form of a teleconference meeting, with representatives from the Licensee, the Minister, the Qikiqtani Inuit Association and the Nunavut Water Board. The ASR may be conducted in the form of an in person meeting if the Board considers it necessary, or if the Board grants the special request of the Licensee, the Minister or the Qikiqtani Inuit Association, for an in person meeting.

2. Unless otherwise directed by the Board, on the first Thursday of November, the Licensee, the Minister and/or the Qikiqtani Inuit Association shall file with the Board any information they intend to rely upon for the ASR, including but not limited to:

    a. an updated Preliminary, Interim or Final Mine Closure and Reclamation Plan;
    b. the total financial security amount calculated for the highest level of reclamation liability for land and water combined for the upcoming year as calculated in accordance with Item 1 of this Schedule;
    c. the total of any equivalent financial security being held by the Minister and/or the Qikiqtani Inuit Association outside the Licence;
    d. information that supports the increase, maintenance or reduction of the total financial security under the Licence; and
    e. any other information necessary to support the request of the parties for the Board to issue further directions under Part C with respect to the amount of security to be furnished and maintained under the Licence.

3. Unless otherwise directed by the Board, within 45 days following the ASR, the Board will advise the Licensee, the Minister and the Qikiqtani Inuit Association of the total financial security for the upcoming year to be filed as required under Part C, Item 1 of the Licence.

4. Unless otherwise directed by the Board, within thirty (30) days from the date the Board releases its determination of the total financial security amount required for the upcoming year, as set out in Item 3 above, the Licensee is required to furnish and maintain security with the Minister in the amount and form that is satisfactory to the Minister or that is in accordance with the applicable regulations.

5. In any event, if the Licensee fails to file the total financial security amount required for the upcoming year as determined by the Board under the Licence on or before March 1, the Licensee is not authorized to proceed with any planned activities that could increase the

total financial security amount required to be held under the Licence until they have filed the total financial security amount required to be held under Part C for the upcoming year.

TOTAL FINANCIAL SECURITY CALCULATION

1. The basis for calculating the total financial security required for final reclamation under the ASR is as follows:

    a. the total financial security amount must be calculated on the basis of a holistic approach to reclamation that includes outstanding reclamation liability for land and water combined;
    b. the total financial security amount must include consideration of cumulative and legacy liabilities; and
    c. the total financial security amount must be calculated at the beginning of the work year and must be sufficient to meet the highest reclamation liability in the upcoming year.

EVIDENCE TO REDUCE TOTAL FINANCIAL SECURITY UNDER THE LICENCE

1. Upon receiving written evidence from the Licensee, the Minister and/or the Qikiqtani Inuit Association that adequate security, equivalent to that held under Part C of the Licence is secured by another mechanism acceptable to the Licensee, the Minister and the Qikiqtani Inuit Association, including, but not limited to the parties entering into a security management agreement or similar instrument, the Board may reduce the total financial security amount required to be held under the Licence.

2. In assessing the extent of any reduction to the total financial security amount held under the Licence as set out in Item 1 of this Schedule, the Board must ensure that when taken together, the equivalent security and the total financial security amount held under Part C of the Licence are sufficient to meet the total financial security amount for reclamation as calculated under Item 1 of this Schedule.

3. Further, in assessing the extent of any reduction to the total financial security amount held under the Licence, the Board may consider a split between the portion of financial security required for reclamation on Inuit Owned Lands and the portion of financial security required for reclamation on Crown lands and may direct that the reductions in the total financial security amount be discounted from the financial security amount applicable to only Inuit Owned Lands or Crown lands as may be appropriate.

Schedule D. Conditions Applying to Construction

1. The Construction Monitoring Report referred to in Part D, Item 17 shall include:

    a. description of all infrastructure and facilities designed and constructed to contain, withhold, divert or retain Water and/or Waste;

    b. a summary of construction activities including photographic records before, during and after construction of the facilities and infrastructure designed to contain, withhold, divert or retain Water and/or Waste;

    c. as-built drawings and design for facilities and infrastructure, in Item 1(a) of this schedule, designed and constructed to contain, withhold, divert or retain Water and/or Waste;

    d. documentation of field decisions that deviate from the original plans and any data used to support or developed facilities and infrastructure to withhold, divert or retain Water and/or Waste;

    e. a comparison of measured versus predicted performance of infrastructure and facilities;

    f. any blast vibration monitoring and control for quarrying activity carried out in close proximity to fish bearing waters;

    g. monitoring conducted for sediment and explosives residue release from construction areas;

    h. monitoring undertaken in accordance with Part D of the during the Construction Phase of the Project;

    i. details confirming that the requirements of the CCME guidance document entitled “Aboveground Storage Tank Systems for Petroleum and Allied Petroleum Products (2003)” have been met by the Licensee;

    j. data collected from instrumentation used to monitor earthworks and the interpretation of that data;

    k. a discussion of any unanticipated observations including changes in risk and mitigation measures implemented to reduce risk during construction;

    l. an overview of any method including frequency used to monitor deformations, seepage and geothermal responses;

m. a summary of maintenance work undertaken as a result of settlement or deformation of dikes and dams;

n. a summary of adaptive management principles and practices applied during the relevant phases of the Project and their overall effectiveness;

Schedule E. Conditions Applying to Water Use and Management

There is no Schedule for PART E – Conditions Applying to Water Use and Management

Schedule F. Conditions Applying to Waste Disposal and Management

There is no Schedule for PART F – Conditions Applying to Waste Disposal and Management

Schedule G. Conditions Applying to Modifications

There is no Schedule for PART G – Conditions Applying to Modifications

Schedule H. Conditions Applying to Emergency Response and Contingency Planning

There is no Schedule for PART H – Conditions Applying to Emergency Response and Contingency Planning

Schedule I. Conditions Applying to General and Aquatics Effects Monitoring

Table 12: Monitoring Group Parameters

Group	Parameters
1	Water withdrawal volume in cubic metres, or Water Discharge volume in cubic metres
2	Biological Oxygen Demand (BOD_5), pH, Total Suspended Solids (TSS), Faecal Coliform, Oil and Grease, ammonia-Nitrogen, Total kjeldahl Nitrogen(TKN), total phosphorous,
3	a. Acute lethality to Rainbow Trout, Oncorhynchus mykiss (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and b. Acute lethality to Daphnia magna (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).
4	pH, Total Suspended Solids (TSS), Ammonia, Total Phosphorous Benzene, Ethylbenzene, Toluene, Oil and Grease, **total metals:** Arsenic, Copper, Lead, Nickel, Zinc
5	pH, Total Suspended Solids (TSS) Benzene, Ethylbenzene, Toluene, Total Lead, Oil and Grease, Total Petroleum Hydrocarbons (TPH),
6	pH, Alkalinity, Conductivity, Total Suspended Solids (TSS), Total Dissolved Solids (TDS) Oil and Grease, Phenols total petroleum hydrocarbons Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC) Total Trace metals as determined by a standard ICP Scan (to include at a minimum, the following elements: Al, Sb, Ba, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sn, Sr, Tl, Ti, U, V, Zn): and Trace Arsenic and Mercury
7	pH, total suspended solids, total dissolved solids, alkalinity, hardness, turbidity, total Kjeldahl nitrogen, ammonia nitrogen, nitrate nitrogen, dissolved organic carbon, total organic carbon, total phosphorus, sulphate, fluoride, chloride. **total and dissolved metals**: Aluminum,

	arsenic, cadmium, calcium, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, sodium, thallium, uranium, zinc, **field parameters:** pH, temperature, turbidity, specific conductance.
8	Ammonia (total NH_3-N), Nitrate (total NO_3-N), pH, Conductivity Total Suspended Solids, Oil and Grease

Table 13: Monitoring Program: Milne Port Site

Station	Description	Project Phases	Monitoring Parameters	Frequency
Milne Port Site				
MP-MRY-2	Freshwater Intake at Phillips Creek (Summer)	Construction Operations Closure	Group 1	Record Daily Report Monthly
MP-MRY-3	Freshwater Intake from Km 32 Lake (Winter)	Construction Operations Closure	Group 1	Record Daily Report Monthly
MP-01	Milne Port Sewage Treatment Facilities (discharge into ditch prior to ocean)	Construction Operations	Groups 1, 2	Monthly
			Group 3	Annually
MP-01a	Milne Port Polishing Waste Stabilization Pond (PWSP)	Construction Operations	Groups 1, 2	Once prior to discharge and Monthly thereafter
			Group 3	Annually
MP-02	Milne Port Maintenance Shop Oily water/WWTF	Construction Operations	Groups 1 and 4	Monthly
MP-MRY-04	Milne Exploration Phase Sewage Treatment Facilities (to become inactive after transition period)	Construction Operations Closure	Groups 1, 2	Monthly
			Group 3	Annually
MP-MRY-04a	Milne Exploration Phase Sewage PWSP (to become inactive after transition period)	Construction Operations Closure	Groups 1, 2	Once prior to discharge and Monthly thereafter
			Group 3	Annually
MP-03	Milne Port Bulk Fuel Storage Facility Stormwater	Construction Operations	Groups 1 and 4 5	Daily Flow Monthly

MP-04	Milne Port Landfarm Facility Storm water	Construction Operations Closure	Group 1 Group 5 Plus TSS	Daily Flow Monthly
MP-MRY-7	Milne Exploration Phase Bladder Fuel Storage Facility Storm water (to become inactive after transition period)	Construction Operations Closure	Groups 1 and 5	Daily Flow Monthly
MP-MRY-12	Bulk Sample Stockpile Area Seepage	Construction Operations Closure	Groups 1 and 7	Monthly
			Group 3	Annually
MP-C-A MP-C-B MP-C-C MP-C-D MP-C-E MP-C-F MP-C-G MP-C-H	Surface discharge downstream of construction area at Milne Port	Construction	Groups 1 and 8	during periods of flow and following significant precipitation events, on a monthly basis

Table 14: Monitoring Program : Mary River Mine Site

Station	Description	Phases	Monitoring Parameters	Frequency
Mary River Mine Site				
MS-MRY-1	Freshwater Intake from Camp Lake	Construction Operations Closure	Group 1	Record Daily
MS-01	Mine Site Sewage Treatment Facilities	Construction Operations	Groups 1, 2,	Monthly
			Group 3	Annually
MS-01a	Mine Site Polishing/Waste Stabilization Pond (PWSP)	Construction Operations	Groups 1, 2	Once prior to discharge and Monthly thereafter
			Group 3	Annually
MS-02	Mine Site Maintenance Shop Oily Water WWTF	Construction Operations	Groups 1 and 4	Monthly
MS-MRY-04	Exploration Camp Sewage Treatment Facility	Construction Operations Closure	Groups 1, 2,	Monthly
			Group 3	Annually
MS-MRY-04a	Exploration Camp Polishing Waste Stabilization Ponds (PWSP)	Construction Operations	Groups 1, 2,	Once prior to discharge and Monthly thereafter
			Group 3	Annually

MS-03	Mine Site Bulk Fuel Storage Facility Stormwater	Construction Operations	Group 1 Group 5	Daily Flow Monthly
MS-04	Mine Site Fuel Unloading Station Stormwater	Construction Operations	Groups 1 and 5	Daily Flow Monthly
MS-05	Mine Site Landfarm Facility Stormwater	Construction Operations	Group 1 Group 5 Plus TSS	Daily Flow Monthly
MS-MRY-6	Exploration Camp Bulk Fuel Storage Facility (Bladder Farm) Stormwater	Construction Operations	Group 1 Group 5	Daily Flow Monthly
MS-06+	Ore Stockpile Pond Stormwater	Operations Closure	Groups 1 and 7	Monthly during summer
			Group 3	Annually
MS-07	Run of Mine Ore Stockpile Pond Stormwater	Operations Closure	Groups 1 and 7	Monthly during summer
			Group 3	Annually
MS-08	Waste Rock Stockpile West pond	Operations Closure	Groups 1 and 7	Monthly during summer
			Group 3	Annually
MS-09	Waste Rock Stockpile East pond	Operations Closure	Groups 1 and 7	Monthly during summer
			Group 3	Annually
MS-MRY-09	Bulk Sample Open Pit – Surface water drainage (to become inactive in future)	Construction Operations	Groups 1 and 7	Monthly (during summer)
			Group 3	Annually
MS-MRY-10	Bulk Sample Weathered Ore Stockpile – Downstream surface water drainage (to become inactive in future)	Construction Operations Closure	Groups 1 and 7	Monthly during summer
			Group 3	Annually
MS-MRY-11	Bulk Sample Processing Stockpile Area – Downstream surface water discharge (to become inactive in future)	Construction Operations Closure	Groups 1 and 7	-Monthly during summer
			Group 3	Annually
MS-MRY-13a & MS-MRY-13b	Non-Hazardous Waste Landfill – Downstream surface water drainage	Construction Operations Closure	Groups 1, and 6	Daily Monthly
MS-C-A	Surface discharge downstream		Groups 1 and 8	during periods of flow and following
MS-C-B				

MS-C-C	of construction area at Mine Site	Construction		significant precipitation events, on a monthly basis
MS-C-D				
MS-C-E				
MS-C-F				

Table 15: Monitoring Program : Steensby Port Site

Station	Description	Phases	Monitoring Parameters	Frequency
Steensby Port				
SP-08	Freshwater Intake at ST 347 Lake (permanent camp	Construction Operations Closures	Group 1	Record Daily Report Monthly
SP-09	Freshwater Intake at 3 Km lake	Construction Operations Closure	Group 1	Record Daily Report Monthly
SP-01	Steensby Port Sewage Treatment Facilities	Construction Operations	Groups 1, 2	Monthly
			Group 3	Annually
SP-01a	Steensby Polishing/Waste Stabilization Pond (PWSP)	Construction Operations	Groups 1, 2	Once prior to discharge and Monthly thereafter
			Group 3	Annually
SP-02	Steensby Maintenance Shop Oily Water WWTF	Construction Operations	Groups 1 and 4	Monthly
SP-03	Floating Construction Camp Sewage WWTF	Construction	Groups 1, 2, and 3	
SP-04	Steensby Bulk Fuel Storage Facility Stormwater	Construction Operations	Groups 1 and 5	Daily Flow Monthly
SP-05	Steensby Marine Fuel Storage Facility Stormwater	Construction Operations	Groups 1 and 5	Daily Flow Monthly
SP-06	Steensby Landfarm Facility Stormwater	Operations	Group 1 Group 5 Plus TSS	Daily Monthly
SP-07	Steensby Ore Stockpile Stormwater	Operations	Groups 1 and 7 Group 3	-Monthly during summer -Annually
SP-08	Steensby Landfill Seepage	Construction Operations Closure	Groups 1, and 6	Monthly/observed flow

Rail Camps				
TBD Ravn River Camp	Fresh Water Intake Ravn Camp Lake	Construction	Group 1	Record Daily Report Monthly
TBD Mid-Rail Camp	Freshwater Intake at Nivek Lake (summer) Ravn Camp Lake (winter)	Construction	Group 1	Record Daily Report Monthly
TBD Cockburn North	Freshwater Intake at Cockburn Lake	Construction	Group 1	Record Daily Report Monthly
TBD Cockburn South	Freshwater Intake at Cockburn Lake	Construction	Group 1	Record Daily Report Monthly

Schedule J. Conditions Applying to Abandonment, Reclamation and Closure

The annual work plan and updated estimate of anticipated mine closure and reclamation process referred to in Part J shall be conducted as follows:

1. Unless otherwise directed by the Board, on an annual basis on or before November 1, the Licensee shall submit to the Board an annual work plan and updated estimate of the anticipated mine closure and reclamation costs for the upcoming year.

2. The anticipated mine closure and reclamation costs will include the highest reclamation liability in the upcoming year and the liability will be assessed separately for:

    a. the proportion of the Project activities taking place on Inuit Owned Lands; and
    b. the proportion of the Project activities taking place on Crown lands.

3. As part of the Annual Security Review conducted under Schedule C, the Licensee, the Minister and the Qikiqtani Inuit Association will review and provide comment to the Board on the annual work plan and updated estimate of the anticipated mine closure and reclamation costs for the upcoming year.

4. If the parties are unable to reach agreement regarding the updated estimate of the anticipated mine closure and reclamation costs for the upcoming year, the Board, as part of the Annual Security Review determination under Schedule C, shall provide direction regarding the acceptable estimate of anticipate mine closure and reclamation costs for the upcoming year.

Appendix J

Emergency Plans and Procedures

Note the page count for each document below. These reports will be provided upon request.

A. BAF-PH1-310-PRO-0001 Fuel Dipping/ Tank Farm Inspection (2014) ***[9 pages]***

B. BAF-PH1-830-P16-0007 Emergency Response Plan (2014) ***[58 pages]***

C. BAF-PH1-830-P16-0013 Oil Pollution Emergency Plan – Milne Inlet (OPEP) (2014) ***[196 pages]***

D. BAF-PH1-830-P16-0036 Spill Contingency Plan (2014) ***[582 pages]***