POWER GENERATION AND INFRASTRUCTURE PRODUCT TRAINING CATALOG

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Overview

This guide was designed to help new and current sales personnel obtain a better knowledge and understanding of the equipment that Power Generation and Infrastructure offers. It should provide the needed information to more prepared to answer questions regarding our business. By being better educated, we should have more confidence in making sales calls and generate a more favorable impression on current and potential clients. This guide is designed to be used in conjunction with hands-on training. A walk-around and demonstration about how each piece of equipment works should be performed by a knowledgeable and skilled segment employee. The trainee should be given a thorough explanation of what purpose the equipment serves and how it operates.

After completion of the training, all sales personnel should:

- Be able to identify each type of equipment that we offer
- Have a general knowledge of how the equipment or service works and its specific purpose
- Be able to describe what sets segment equipment apart from competitors
- Have a general understanding of the equipment or service requirement
- Be better equipped to determine a possible issue with our equipment

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Header Section 1 - Rig Lighting	
Product Section:	1.1 Light Towers
Product Sub-Section:	N/A

Sales personnel should be familiar with the basic operations of light tower. This includes the following:

- Proper setup of units (grounding unit, extending outriggers, lowering jacks, setting light fixture direction, unlocking and raising mast, ensuring that safety locks engage when vertical, and turning on lights)
- Proper take down of units (lowering mast, ensuring that safety pin engages, unlocking and lowering mast to horizontal position, raising jacks and retracting outriggers)

Always make certain that there are no obstructions overhead before raising a light tower.

Directional

Balloon

Globe

Directional Light Towers

- 4 - 1000 watt Metal Halide bulbs
- 8KW and 20KW units
- Manufactured by Allmand Brothers
- Diesel powered
- Operational in winds up to 65 MPH
- Lights attached to 30' mast

Fuel Capacity/ unit sizes –

- Small Light Towers 8 kW available in some areas) – 30 gallon fuel capacity with approximately 65 hr run time
- 8 kW Light Towers (Full Size units) – 50 Gallons
- 20KW Light Towers – 40 gallons

Balloon Light Towers

- 360° glare-free illumination featuring two 1,000 watt metal halide lamps
- Rapid bulb restrike time of only 6 to 10 minutes
- Balloon inflates automatically and quickly – less than thirty seconds – after activating light
- Ties directly into the light tower electrical system
- Excellent visibility with coverage of up to 300 fee
- Transport and storage is facilitated by its self-contained design

Globe Light Towers

MQ MLT 25 Light Tower/ Generator Combo

- Value-added Light Tower/Generator that is specifically designed to support large rigorous jobs
- feature packed unit that is supported by a trusted MQ Power DCA25SSIU3C Generator
- (6) 1000W Metal Halide Lamp assemblies
- a DOT Certified dual-axle trailer
- internal 100 gallon fuel cell
- heavy-duty mast structure

What will a 20 kW run?

20 kW @ 100% load
- 120 volts (single phase) = 208 amps
- 240 volts (3 phase) = 60.14 amps
- 480 volts (3 phase) = 24.1 amps

What will an 8 kW run?

8 kW @ 100% load
- 120 volts (single phase) = 83.3 amps
- 240 volts (3 phase) = 41.6 amps

Typical uses include

- Provide additional light to rigs and locations in potentially hazardous areas
- Use of multiple light towers to provide lighting to frac sites, rig moves, etc. when working at night
- 20 kW Light towers typically used to provide light to sites while also powering a guard shack or travel trailer. (equipped with a 50 amp RV receptacle)

Allmand Brothers Directional Light Towers - All power rental offices

Balloon Light Towers – Limited quantity (Check with Local Branch Manager)

Globe Light Towers – Limited quantity – Oklahoma City , OK; Oakdale, PA
(Check with local Branch Manager)

MQ MLT 25 Light Tower – Limited quantity – Oklahoma City, OK
(Check with local Branch Manager)

Trouble shooting:	
Problem	**Possible Issues or Solutions**
Unit stops/lights go out	Fuel: Out of fuel or bad fuel put in unit
Shutting lights off and then immediately trying to turn them back on	Lights must cool down for approximately 10 minutes or so before they will turn on again
Not releasing or engaging safety latches on tower	Tower will not go up if the safety latches are not released Tower can fall if latch is not secure when lowering Tower can extend out vertically if safety latch is not secure when raising • Not having the 120v or 240v switch activated when raising or lowering the tower

Non-Gravity personnel have tampered with, moved or run into the equipment with a vehicle and caused damage.	Any damage caused by a non-Gravity employee must be reported to the consultant or rig site supervisor immediately to ensure that Gravity is reimbursed any repair costs.

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Header Section 2 - Heating	
Product Section:	**2.1 Flameless Heaters**
Product Sub-Section:	**N/A**

Features/Specs:	**MAC 550** • 550,000 BTU/HR • Diesel powered • Fuel consumption: 3 GPH • Up to 180 degree temperature rise • 1,400 – 3,500 Output Air Vol. CFM @ 5.0" SP **MAC 750** • 750,000 BTU/HR • Diesel Powered • Fuel Consumption: 3.55 GPH • Up to 180 degree temperature rise • 2,650 to 5,500 Output Air Vol. CFM @ 5.0" SP • All units Include two 12"x25' Ducting
Advantages/Benefits:	• Safe & Efficient Flameless Technology • Provides Clean Dry Heat
Current Availability:	North Dakota - Rockies On demand – Check with local branch manager if you have interested customers
Trouble shooting	
Problem	**Possible Issues or Solutions**
Before starting equipment	• Make certain the two hose ports are not blocked by tape, buckets, etc • Check fuel, oil and coolant level • Check air filter • Check Safety shutoff switch (must be reset inside compartment by the air cleaner)
Motor will not start	• Check battery voltage • Make certain fuel pump is working properly • Replace air filter • Replace fuel filter MAC 750 – the two fuel filters must be primed in order to start the unit. Outside filter will prime itself but back filter has a bleeder knob that unscrews and acts as a pump to prime the filter. • In extreme cold, it may be necessary to use another heater to warm up the motor in order to start the unit

Heater dies after fan kicks in	• When Flameless MACs start up, it will rev up and down constantly. This is the actuator catching up to the speed of the motor and will smooth out as the unit continues to run. • If an Error Code with "fan coil break" or "Heat coil break" comes up, check and clean the connections to both the fan coil and/or the heat coil. Also, make certain both are tight to the manifold. Make sure the connections are away from the plates that the manifold bolts on to because this may cause the coils to trip and trigger a false message to the heater.

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Header Section 2 - Heating	
Product Section:	**2.2 Indirect Flame Heaters (Big MAC)**
Product Sub-Section:	**N/A**

Features/Specs:	MAC 800 • Temperature rise up to 180°F • 800,000 BTU/HR (235kW) • Output Air Volume: 3900 cfm @ 3" of static pressure w.g. (6,626 m³/hour) • Normal Operating Fuel Rate: 5.7 gph MAC 1.2 • Temperature rise up to 180°F • 1,200,000 BTU/HR (352 kW) • Output Air Volume: 6500 cfm @ 3" of static pressure • Normal operating fuel rate: 8.6 gph
Advantages/Benefits:	• Indirect diesel fired heater (no combustible gases in the airflow) • provides clean, safe, and reliable air flow • capable of ducting long distances with minimal loss of air pressure or outlet temperature.
Current Availability:	North Dakota On Demand in other areas (check with Branch Manager)

Troubleshooting:	
Problem:	**Possible issues and solutions**
No crank	Check Battery Voltage • Bad Battery • Faulty alternator Check Wiring Check Voltage to starter
Cranks will not start	• Check oil, fuel and coolant levels • Check for hole in primer bulb • Check fuel pump for flow • Open bleeder screw on injector rail • Remove shut-off solenoid (If the engine starts, check the solenoid by grounding to the block and turning key on. If the solenoid retracts, it is good. If it does not retract, then check oil & coolant sensors, check wiring and replace the solenoid.)

Header Section 3 - Power Generation	
Product Section:	**3.1 Air Compressors**
Product Sub-Section:	**N/A**

Features/Specs:	Models: Airman PDS 185s Kaeser M 57 • Diesel Powered • Free Air Delivery: Airman (185 CFM) & Kaeser (210 CFM) • Working Pressure: 100 PSI • Air Outlets : ¾" x 2 • 55 HP motor
Advantages/Benefits:	• Supply air to rigs during operation • Can be used to back-up rig air compressor • Run cleaning pig through pipe to remove
Current Availability:	On Demand (Check with local Branch Manager)

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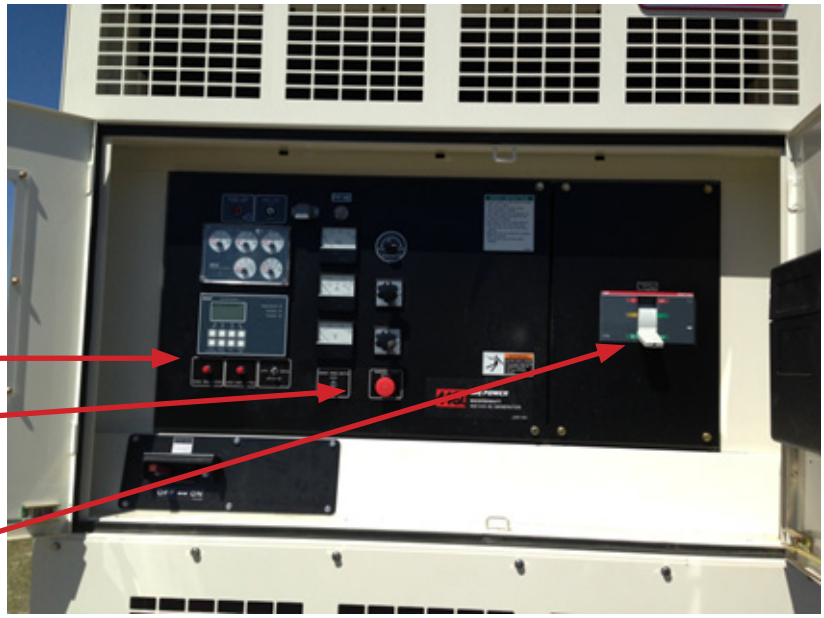
Header Section 3 - Power Generation	
Product Section:	**3.2 Diesel Generators**
Product Sub-Section:	**N/A**

Features/Specs:

- Sizes range from 25 kVA to 400 kVA
- All MQ generators are sized by kVA
- Manufactured by MQ Power and Shindaiwa
- Trailer mounted
- Sound attenuated for quiet operation
- Diesel powered
- Extended run-time fuel tanks
- 3-phase 240/480v output
- Single phase 120/240v output

Fuel Consumption Rate @ Rated Load

45 kVA - 2.8 gals/hr
70 kVA - 4.3 gals/hr
125 kVA - 7.3 gals/hr
150 kVA - 8.9 gals/hr
180 kVA - 10.6 gal/hr
220 kVA - 12.4 gals/hr
250 kVA - 14.7 gals/hr
300 kVA - 19.0 gals/hr
350 kVA - 19.8 gals/hr
400 kVA - 23.4 gals/hr
600 kVA - 32.0 gals/hr



Advantages/Benefits:	• All our generators are equipped with sound attenuating enclosures that reduce engine noise significantly • Equipped with large external fuel tanks for longer running times (optional)
Current Availability:	All locations On-demand – Check with local branch manager for available sizes in the area

Troubleshooting:	
Problem:	**Possible issues and solutions**
Motor running but not producing electricity or not powering properly	Check Breaker Check Wiring • Make certain equipment is wired correctly (3 phase/single phase) • Make certain wires are on proper lug (always double check wiring before turning breaker on or serious damage or injury can occur) • Check voltage – Make certain voltage is correct (adjust with voltage regulator control or voltage selector switch) • Grounding issue – always ensure that Gravity equipment is grounded properly
Generator will not start or remain running **The majority of problems with generators in the field are due to fuel issues**	• Check fuel level – the unit may have run out of fuel (the fuel filter may need to be changed after re-fueling because of trash picked up off the bottom of the tank) • Bad or dirty fuel being put into unit (always make certain that the fuel being put in our equipment is from a good source and filtered whenever possible) • Fuel filter needs to be changed (trash or water may be present in fuel and cause the filter to clog and fail to allow sufficient fuel to reach to motor) • Check battery voltage – if the battery is not holding a charge, it may need to be re placed or the alternator may need to be repaired or replaced
Tier 4 Generator Issues	With the newer generators, it is essential that they be running at optimum output. They cannot be oversized for the job because the generator will fail to cycle and shut down.
Non Gravity personnel have tampered with, moved or run into the equipment with a vehicle and caused damage.	Any damage caused by a non-Gravity employee must be report immediately to ensure that Gravity is reimbursed any repair costs.

Always check the hours on service, fluid levels and fuel level whenever possible. Relay the information to the coordinator or manager in your area.

- *Always check for proper installation of grounding rod when on location*
- *Always look at the fuel gauge on the tank and not the control panel to determine the fuel level*

Header Section 3 - Power Generation	
Product Section:	**3.3 Natural Gas Generators**
Product Sub-Section:	**N/A**

Features/Specs:

Available Sizes:

Size	kW	Load	MCF	Period
NG-45	35	@ 100%	12.35	24 hrs
NG-60	65	@ 100%	18.96	24 hrs
NG-100	80	@ 100%	29.76	24 hrs
NG-200	175	@ 100%	50.76	24 hrs
NG-250	235	@ 100%	66.7	24 hrs
NG-400	400	@ 100%	101.55	24 hrs

Advantages/Benefits:

- Can run off well-head gas (field gas) or pipeline gas*
- Significant savings on fuel when compared to diesel powered generators
- Less road impact because no refueling is required
- Cleaner emissions than fossil fuels
- Dual fuel, propane and natural Gas

Set-up Requirements:

- Size variation depends on the load as well as the gas analysis.
- Three Steps to determining generator requirements

1. Obtaining a gas analysis
2. Determine the load

* *Please contact NG support for NG Gen. sizes*

	3. Generator size selection - Site testing with load and computer analysis is the only way to confirm generator size - With poor gas quality, de-rating might be an option - Factors such as temperature, altitude, and gas quality can all de-rate generator output • The customer is responsible for providing a flow line to deliver sufficient gas flow and pressure to the specific area the machine will be placed At the end of the flow line there should be a shut off valve with NPT threads 2" minimum 100 PSI maximum.
Current Availability:	All Areas On Demand (Check with Local Branch Manager)

Troubleshooting:	
Problem:	**Possible issues and solutions**
Cold weather freezing	Condensation builds up in the lines and freezes causing generator to malfunction NG support group is working to find solutions to this and hopefully will remedy the problem by next winter
Factory issues	Because there has been limited production of the generators we utilize, we have had some minor factory related issues on certain models

Header Section 3- Power Generation	
Product Section:	**3.4 Useful Information**
Product Sub-Section:	**N/A**

DIESEL GENERATOR RATING

Model	DCA255SIT3	DCA455SIT3	DCA705SIT3	DCA1255SIT3	DCA1505SIT3	DCA1805SIT3	DCA2205SVT2	DCA2505SVT3	DCA3005SCT3	DCA4005SCT3	DCA6005SVT2	CUMM180	CUMM250	CUMM350	TD560
Prime Output	20 kW (27 kVA)	36 kW (45 kVA)	56 kW (70 kVA)	100 kW (125 kVA)	120 kW (150 kVA)	144 kW (180 kVA)	176 kW (220 kVA)	200 kW (250 kVA)	240 kW (300 kVA)	320 kW (400 kVA)	480 kW (600 kVA)	150 kW (180 kVA)	200 kW (250 kVA)	300 kW (350 kVA)	450 kW (560 kVA)
Gross Engine Power Output (HP)	34.3 HP	67.1 HP	107 HP	166 HP	256 HP	314 HP	314 HP	348 HP	433 HP	532 HP	809 HP	253.5 HP	337.5 HP	405 HP	762 HP
Maximum AMP Rating															
Three Phase 240V	60 A	108 A	168 A	301 A	361A	433 A	529 A	601 A	722 A	962 A	1443 A	451 A	601 A	903A	1354 A
Three Phase 480V	30 A	54 A	84 A	150 A	180 A	216 A	265 A	301 A	361 A	481 A	721 A	266 A	301 A	451 A	677 A
Fuel Consumption															
Full Load gph	1.66	2.8	4.3	7.3	8.8	10.3	12.4	14.7	16.3	23.6	33.1	10.1	13	19.8	32
3/4 Load gph	1.21	1.5	3.4	5.6	7	8	9.5	10.9	14.1	19	24.2	8	10.9	15	25.4
1/2 Load gph	0.85	0.9	2.7	4	5.3	5.9	6.9	7.5	12	13.7	17.3	5.9	7.8	10.8	20.3
1/4 Load gph	0.58	0.9	2	2.5	3.6	4	4.4	4.4	7.05	8.2	10.5	3.1	4.5	6.5	19

NATURAL GAS GENERATOR RATING

Model	TGR 30	TGR 60	TGR 100	TGR 200	TGR 250	TGR 350	TGR 400		TGR 30	TGR 60	TGR 100	TGR 200	TGR 250	TGR 350	TGR 400
Prime Output	N/A	kW 64 kVA 80	kW 80 kVA 100	kW 176 kVA 220	kW 235 kVA 294	kW 315 kVA394	kW 350 kVA 450								
Gross Engine Power Output (HP)	N/A	105	259	302	367	530	530								
Maximum AMP Rating															
Three Phase 480V	N/A	90A	120A	300A	391A	525A	601A								
Fuel Consumption MCF per Day & Propane Gallon per Day															
100 % Load MCF NG	10.32	18.96	28.44	50.76	33.77	10.3	101.54	100 % Load Gal Propane /DAY	116.36	219.43		467.45	615.73	857.1	936.9
75 % Load MCF NG	8.16	16.44	23.54	39.58	52.03	73.27	79.15	75 % Load Gal Propane /DAY	95.75	166.23		398.96	524.63	650.97	798.59
50 % Load MCF NG	6.12	12.48	18.65	27.79	36.5	50.61	55.61	50 % Load Gal Propane /DAY	71.81	126.34		269.96	353.75	466.12	537.93
25 % Load MCF NG	4.3	8.4	13.75	16.94	22.27	30.07	33.91	25 % Load Gal Propane /DAY	49.2	89.77		168.89	222.75	296.56	340.44

1 bbl (Barrel) = 42 US gallons

Definitions:
KVA & KW
KVA (Kilovolt-ampere) = 1000VA (volt-ampere)

A volt-ampere (VA) is the unit used for the apparent power in an electrical circuit, equal to the product of root-mean-square (RMS) voltage and RMS current.[1] In direct current (DC) circuits, this product is equal to the real power (active power) [2] in watts. Volt-amperes are useful only in the context of alternating current (AC) circuits (sinusoidal voltages and currents of the same frequency).

Only a fraction of KVA is accessible to do work, and the rest is excess in the current.

Amperes (amps) - the ampere is a measure of the amount of electric charge passing a point in an electric circuit per unit time
Amps = KVA x 1000/(volts x 1.73)

Kilowatt (KW)

The kilowatt is equal to one thousand (103) watts, or one sthene-metre per second. This unit is typically used to express the output power of engines and the power of electric motors, tools, machines, and heaters. It is also a common unit used to express the electromagnetic power output of broadcast radio and television transmitters.

One kilowatt is approximately equal to 1.34 horsepower. A small electric heater with one heating element can use 1.0 kilowatt, which is equivalent to the power of a household in the United States averaged over the entire year. Also, kilowatts of light power can be measured in the output pulses of some lasers.

A surface area of one square meter on Earth receives typically one kilowatt of sunlight from the sun (on a clear day at mid-day).

Power Factor

Power Factor = True Power / Apparent Power

Power Factor = kW/ kVA

The **power factor** of an AC electrical power system is defined as the ratio of the real power flowing to the load, to the apparent power in the circuit,[1][2] and is a dimensionless number between -1 and 1. Real power is the capacity of the circuit for performing work in a particular time. Apparent power is the product of the current and voltage of the circuit. Due to energy stored in the load and returned to the source, or due to a non-linear load that distorts the wave shape of the current drawn from the source, the apparent power will be greater than the real power.

Submersible pump:
A submersible pump (or sub pump, electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps.

Electrical Formulas

Converting kW to kVA

kW / 0.8 = kVA

Converting kVA to kW

kVA x 0.8 = KW

Amps to kVA

kVA = (volts x amps x 1.732)/ 1000

Generator Sizing

Direct on line (DOL) – 3 phase electric motor

HP x 2.34 = kVA of generator needed

Soft Start –
Motors will draw more current during the starting phase. We are able to reduce the size of generator needed by implementing a form of soft start on the motor.

Variable Frequency Drive (VFD) or Variable Speed Drive (VSD) will reduce the amount of kVA needed to run motor.

Induced **hydraulic fracturing (also hydrofracturing, fracking, and fracing**) is a mining technique in which a high-pressure liquid fluid (usually water mixed with sand and chemicals) is injected to a wellbore in order to create small fractures (usually less than 1.0 mm. wide) in the deep-rock formations in order to allow natural gas, petroleum, and brine to migrate to the well. When the hydraulic pressure is removed from the well, small grains of hydraulic fracturing proppants (either sand or aluminum oxide) hold open the small fractures once the deep rock achieves geologic equilibrium.

The fracing technique is commonly applied to wells for shale gas, tight gas, tight oil, and coal seam gas. Such well-stimulation usually is done once during the productive life of the well, and greatly assists in removing fluids (gas, petroleum), and thus increases the productivity of the well; yet, the business trend is the multiple application of induced hydraulic fracturing as the well's production declines.

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Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.1 Catch Tanks**

Features/Specs:	3 Sided Catch Tanks Available in sizes • 10'W x 40'L x 4'H • 10"W x 40'L x 8"H
Advantages/Benefits:	• Heavy duty fabrication holds up to mud, rocks, debris and sludge tailings • Designed to stand up to harsh elements and conditions when capturing drill site cuttings
Current Availability:	On Demand (Check with Local Branch manager) Not available in North Dakota

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Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.2 Diesel Fuel Tank with Pump**

Features/Specs:	• 12 volt transfer pump • 300 gallon and 100 gallon sizes
Advantages/Benefits:	• Provides portable and readily available supply of fuel for use on location • Helps to ensure that there is a clean fuel supply going into equipment.
Set-up Requirements:	• 12 volt power source • Fork lift to move the larger tanks
Current Availability:	On Demand (Check with Local Branch manager)
Troubleshooting:	
Problem:	Possible issues and solutions
Pump running but not pumping fuel	Fuel Filter clogged (Replace fuel filter)\Fuel tank empty
Pump not turning on	Check power source Check wiring and connection

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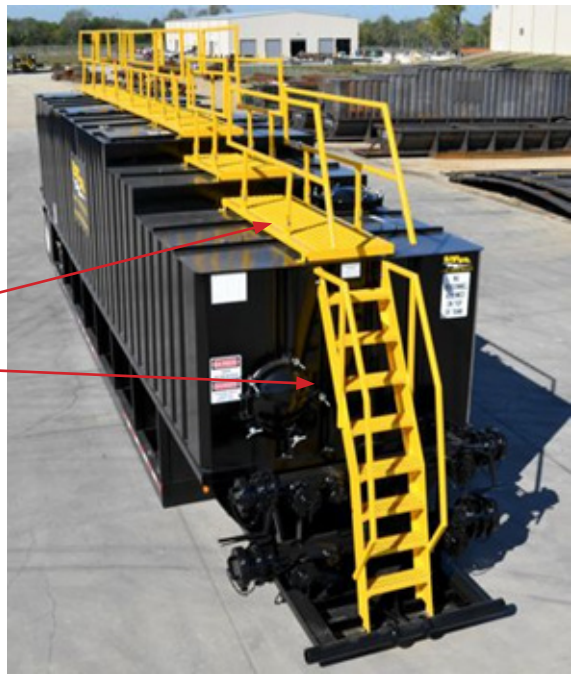
Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.3 Easy Clean-out Round Bottom Mud Tanks**

Stairs and walkway with rails



Cleanout hatches

Features/Specs:	• Same specifications as typical Gravity mud tanks with exceptions of: - Five 32" cleanout hatches on top of tank - Stair and Full-length walkway with hand rails across top of tank
Advantages/Benefits:	Tanks were designed for easy cleanout without having to enter the tank. • Full length walkway allows access to all 5 cleanout hatches • Operator can remain inside confines of handrails while performing the required cleaning operations. • Numerous tie-off points to ensure safety if the operator must step outside the handrails.
Current Availability:	Check with branch manager

Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.4 4-sided Flock Tanks**

Features/Specs:	• 4 Compartments of 100 bbl each • 52' long • 12' wide • with or without manifold
Advantages/Benefits:	Flock tanks are used in the separation, storage and disposal of solids from drilling fluid on location.
Current Availability:	On Demand (Check with Local Branch manager)

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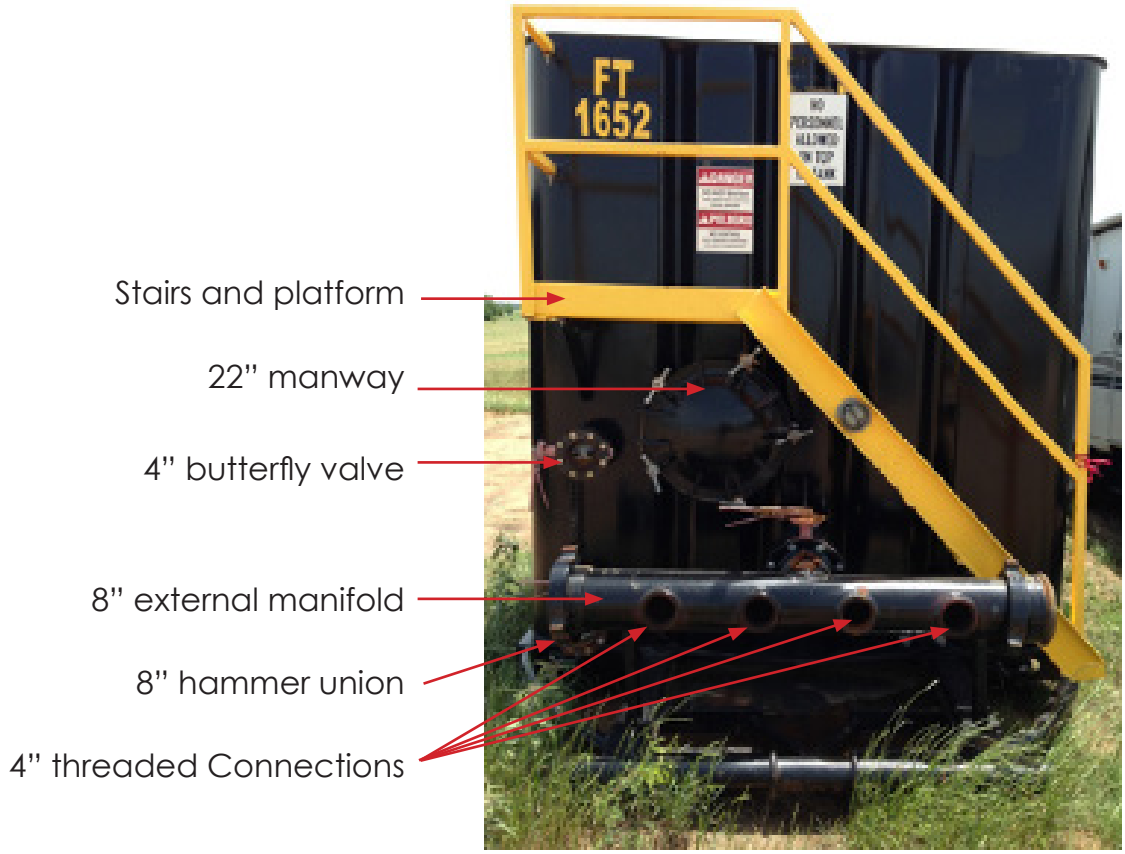
Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.5 Frac Tanks**

Features/Specs:	3 Styles of Tanks: • 500 bbl square • 400 bbl upright skid mounted Internal or External manifold • 8" external manifold with four 4" threaded connections and two 8" hammer unions with steel caps • Cold weather tanks have 8" internal manifold with four front-wall penetrations, flanged with 4" butterfly valves • Front 4" butterfly valve – used for filling and re moving fluid from the tank

	• Front 4" gel line with 4" butterfly valve – Used as a recirculation line • One 3" rear fill line • One 4" rear drain with butterfly valve and remote handle – used to drain tank for cleanout • Side / Front entry stairs with platform or walkway – used to check fluid level • Two 22" manways – one front and one side – used for cleanout



3" rear fill line

Remote handle for rear drain

4" Rear drain with butterfly valve

22" Side manway (hatch)

Purpose:	The manifolds on the tanks are used to connect multiple frac tanks together in order to store a large volume of water. The water is typically taken from one point in the series of tanks and used for fracking wells. 8" hoses are used to connect the manifolds on tanks together. The hammer unions are used to secure the hose to the manifold. The hammer unions can also be used to hold 8" steel caps in place to close off the manifold.
Definitions:	**Manifold (def.) – a chamber or pipe with a number of inlets and outlets used to collect or distribute a fluid.**
Trouble shooting	
Problem	**Possible Issues or Solutions**
Leaks	• Hammer unions not tightened enough on steel caps or 8" hose when connecting tanks together. Use sledge hammer to tighten connections until the leak stops. *Use pipe dope on all connections to ensure a good seal and easy removal.* • 4" plugs not tightened enough Check all plugs and hammer unions for leaks after filling of tanks have begun. Use pipe wrench to tighten connections. *Use pipe dope on all connections to ensure a good seal and easy removal.* • Faulty or worn valve not closing properly Check and replace worn/ faulty valves on tanks before sending them out. Ensure that all valves have a plug in them when not in use. • Manways not tightened properly or gasket is worn or misaligned . Check manways and gaskets before sending tanks out. Always line them up properly and tighten them securely.
Spills:	• Rear drain valve not closed and plugged prior to fillingtank. Always close and plug the rear drain valve before setting tanks. • Worn or faulty hoses Check hoses and banding before sending on a job. Replace when showing signs of significant wear or banding failure

Dirty Tanks	• Always make certain tanks are clean before sending out on a job. We do not want to contaminate frac water or have other issues because of dirty tanks. • When tanks are released, always check to be certain they are drained and clean before sending trucks to pick them up. • Whenever possible, clean tanks prior to picking up and have cleaning company bill directly to the customer.

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Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.6 Half Pits (Open Tops) & Small Open Tops**

Photos: Half Pit

Photos: Small Open Top

Features/Specs:	Half Pit: 240 bbl open top, skid mounted tank Small Open Top: 116 bbl
Advantages/Benefits:	Typical placement of tanks is under the shakers on the back side of rig. Used to catch cuttings and fluid Half Pits are used to hold drilling mud, solids or other by-products of the drilling process.

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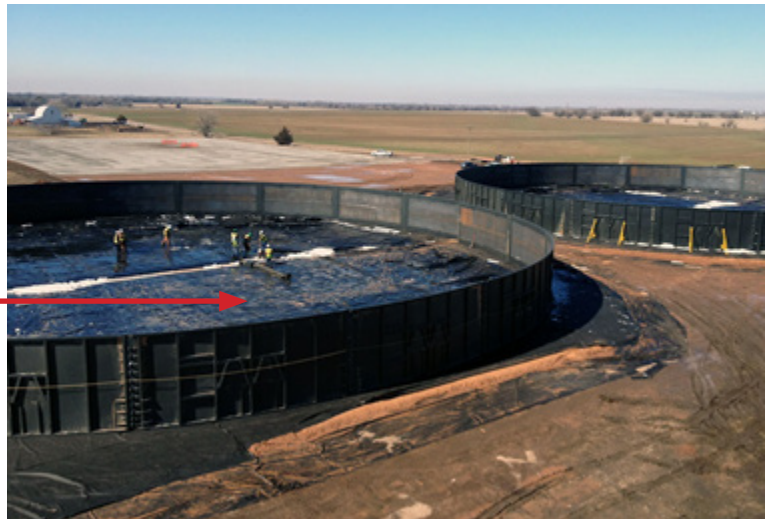
Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.7 Mobile Ponds**

Features/Specs:	• 40,000 barrel capacity • 10 – 20 modular panels (12' x ~ 27' : weighs 6400 lbs • Engineered, overlapping connection plates • Six 3" bolt down panel mating clamps • Aluminum liner connection clamps • 4" recirculation lines with three tier nozzles • 4" fill pipes • 12" external suction line assembly • 2 OSHA – compliant egress ladders • One observation ladder and platform MobAssist – Permits easy movement of panels from truck to tank installation site Patented design easily connects to 8-12K telehandler with a 12.5" max boom width and auxiliary hydraulics

MobAssist

Panel

Liner



Advantages/Benefits:

- 30% smaller site footprint than frac tanks of equal volume
- Easier mobilization and de-mobilization (less than 20 passes for 40K bbl Mobilepond vs 140 passes for frac tanks)
- MobilePond saves time and manpower when compared to setting up mobile frac tanks
- Can be set and ready for use in less than 48 hours(this includes laying liner, setting panels and securing and trimming the liner) Other preparatory work such as leveling location or other dirt work is not included in this time frame
- Save money with minimal permitting, less road impact (93% fewer trucks than comparable mobile steel tanks), heating in only the most extreme temperatures and potential fines associated with leaking tank connections.

	MobAssist is the key selling point to our Mobile Ponds. It allows the pond to be set quicker, safer, and in a smaller blueprint than if a crane is used to set the panels.
Set-up Requirements:	To complete a proper setup of the MobilePond, Gravity will do an analysis of your water storage needs and create a proposal containing: • All parts & components of the tank • MobilePond MobAssist • Man Lift • Skytrak • Crew totally 10-12 individuals including 1-2 supervisors • Liner & Pad • Sand Bags Partial Trucking
Current Availability:	Pecos (Check with Branch manager)
Troubleshooting:	
Problem:	**Possible issues and solutions**
Leaks	***Any Problems or issues should be communicated to someone within our Water Management department. Proper measures will then be taken to come up with a solution***
Tears in the liner	Locate, drain and repair (if possible)

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Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.8 Mud Buckets**

Features/Specs:	• Air operated • Clamps around drill pipe when making a connection • When joints are separated, drilling fluid goes into the Mud Bucket and flows through connected hoses back into the pits
Advantages/Benefits:	• Captures and reuses drilling fluids • Creates safer environment on the rig floor – no fluid (mud) dumped on floor creating a slip hazard • Saves operational cost and time
Current Availability:	Oklahoma and Louisiana On Demand (Check with local Branch Manager)

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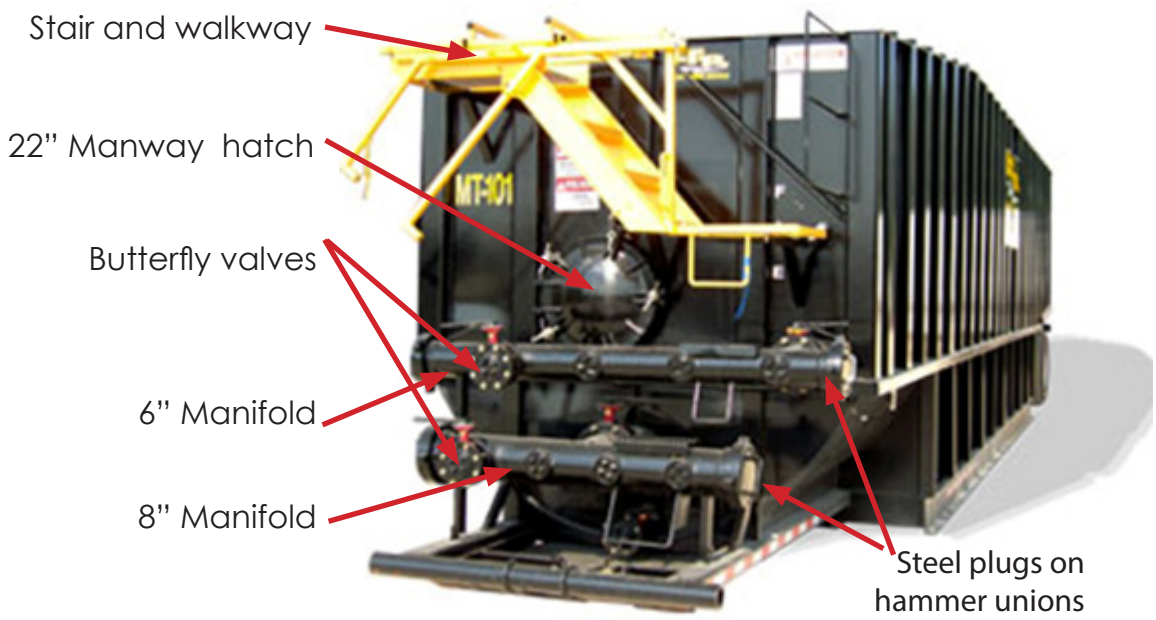
Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.9 Mud Tanks**



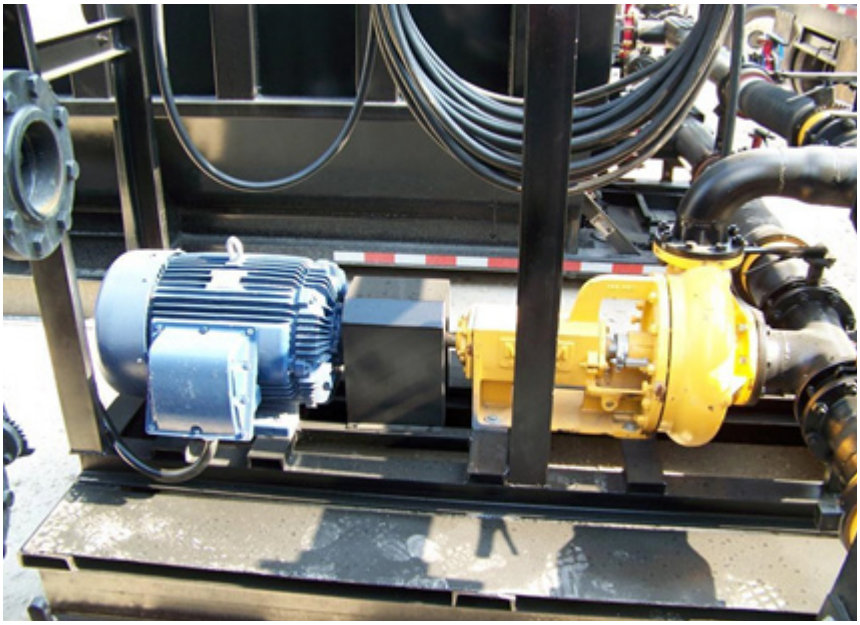
Features/Specs:	• 500-bbl capacity • Round Bottom or V bottom • 6" (mixing) line with five or more 2" jet/mixing/stirring nozzles run to the bottom of the tank • Stair and walkway assembly with folding hand rails • 8" external manifold with 8" hammer unions and three to four 4" threaded connections. • 6" external manifold with 6" hammer unions and three to four threaded connections • One 4" rear drain with butterfly valve and remote handle • Two 22" manways (hatches) – one front and one side
Advantages/Benefits:	The 6" mixing line allows the customer to roll/ mix mud in the tank more efficiently than other tanks. Our 6x8 pumps are set up to connect to the manifolds on mud tanks and roll the mud within. The pump pulls fluid through the 8" line and pushes it back into the tank through the 6" line thus circulating the fluid throughout the entire tank.
Current Availability:	All areas except Pennsylvania and North Dakota

Trouble shooting	
Problem	**Possible Issues or Solutions**
Leaks	• Hammer unions not tightened enough on steel caps or 8" hose when connecting tanks together. • 4" plugs not tightened enough Check all plugs and hammer unions for leaks after filling of tanks have begun. • Faulty or worn valve not closing properly Check and replace worn/ faulty valves on tanks before sending them out. Ensure that all valves have a plug in them when not in use. • Manways not tightened properly or gasket is worn or misaligned Check manways and gaskets before sending tanks out. Always line them up properly and tighten them securely
Spills:	• Rear drain valve not closed and plugged prior to filling tank. Always close and plug the rear drain valve before setting tanks. • Worn or faulty hoses Check hoses and banding before sending on a job. Replace when showing signs of significant wear or banding ailure

Header Section 4 - Fluid Handling	
Product Section:	**4.1 Tanks**
Product Sub-Section:	**4.1.10 Mud Pre-Mix Tanks**

Features/Specs:	• 500-bbl capacity • Fully enclosed top deck with foldable handrails • Skid-mounted with 4' pipe nose bar front and rear • Pump suction from tank via 6" pipe and 4" suction lines • 8" external manifold with 8" hammer unions and three to four 4" threaded connections. • 4" and 6" discharge points
Advantages/Benefits:	The Gravity Mud Pre-mix Tank has the ability to add dry and liquid additives through a 6" mud mixing hopper, allowing the additives to continue through three 10-HP agitators, each with a 38" impeller. The unit also has the ability to recirculate the blended product via a MCM 8 x 6 x 14 centrifugal pump. The pumping system also allows transfer of the finished product from the pre-mix tank to production. As a value-added option, the pre-mix tank includes a redundant pump system to ensure continuous operation or fluid transfer in case of pump or motor failure.

Header Section 4 - Fluid Handling	
Product Section:	**4.2 Pumps**
Product Sub-Section:	**4.2.1 6" X 8" Electric Mud Pump**



Features/Specs:	• 480 volt • 75 HP motor • Hooks directly to manifolds on our mud tanks via 6" and 8" hoses.
Advantages/Benefits:	• Purpose - Stir and circulate the mud within the mud tanks making certain that it does not settle and/or harden - Transfer mud to and from the trucks, tanks, the rig or pits - Keeps mud conditioned - Helps to roll mud before sucking out of tank to reduce cleanout costs
Set-up Requirements:	• Skid mounted – must be delivered on a trailer • 480 volt electric supply • Must be set beside or in front of tanks to hook up hoses to the manifolds (extended hoses or 90s can be used to connect the pump to the tanks in certain situations)
Current Availability:	Available where mud tanks are being rented Check with local branch manager

Trouble shooting	
Problem	**Possible Issues or Solutions**
Power source is not adequate of clean	Check voltage from power source to ensure it is 480 volts
Attempting to roll a large number of tanks at one time	The pump will roll only one tank at a time
Valves on pump (and/ or tanks) are not properly opened or closed	• Without being allowed to circulate fluid, the pump can possibly • Burn up • Trip a breaker • Cause a hose to rupture or burst (thereby causing a spill on location) • Overfill a tank or containment (causing a spill)
Valves or hammer union connections leaking	• Always plug valves when not in use • Check connections for leaks after initial setup
Obstruction in the impeller	• Large rocks or chunks of dry mud may cause damage to impeller or motor • Always make certain pump is cleaned out after every job so that no mud or solids remain inside the system

Never run the pump dry because of possible damage to motor.
Never roll mud in more than one tank at a time. The fluid will tank the path of least resistance and could overfill a tank if there is any obstruction or thicker fluid in one tank vs another.

Header Section 4 - Fluid Handling	
Product Section:	**4.2 Pumps**
Product Sub-Section:	**4.2.2 Diesel Transfer Pumps**

Photos: 4 x 4 Diesel Transfer Pump

Features/Specs:	8 x 8 Diesel Transfer Pump • Designed to move water from water source (pond, river, lake, etc) to tanks or Mobile pond. • Used also as a pump for fire prevention setup in cities and locations where it is mandated • Not designed to move mud or heavy liquid 6 x 6 Diesel Pump 4 x 6 Diesel Pump • Self-Priming 4 x 4 Diesel Pumps • Self- Priming

Advantages/Benefits:	• Also known as a trash pump because it is capable of moving most fluids on a site without damaging the pump. • Transfer mud and/ or other fluids on location • Pump out the reserve pit
Set-up Requirements:	Available in trailer mounted or skid mounted design. Make certain to know how much hose will be required to per form the job.
Current Availability:	On Demand (Check with local Branch Manager)

Trouble shooting	
Problem	**Possible Issues or Solutions**
Not using pump for what it was designed	Water transfer pumps should only be used to move water • Moving heavier fluid can damage the impeller and/or motor Trash pumps can be used to move a variety of liquids • Take care not to suck up rocks or other hard solid materials as they may damage the impellor or pump

Header Section 4 - Fluid Handling	
Product Section:	**4.2 Pumps**
Product Sub-Section:	**4.2.4 Peanut Pumps**
	
Features/Specs:	• Double diaphragm air powered pump • Viton seals • 3" connections • ½ " air line
Advantages/Benefits:	• Cage surrounding pump for added protection • Viton seals help prevent damage from sucking up large items
Set-up Requirements:	• ½ " air line • 3 " rubber hose
Current Availability:	On demand (Check with Branch Manager)

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Header Section 4 - Fluid Handling	
Product Section:	**4.2 Pumps**
Product Sub-Section:	**4.2.3 3" & 4" Floating Pit Pumps**

Features/Specs:	• 240 volt
Advantages/Benefits:	• Used for water transfer from reserve pits
Set-up Requirements:	240 volt power supply Enough sections of hose to reach destination
Current Availability:	Barnett, Athens On demand (Check with Branch Manager)

Trouble shooting	
Problem	**Possible Issues or Solutions**
Pump not starting or remaining on	Check power supply
Pump not sucking properly	Check hoses for obstruction or bend • Not intended to suck up solid materials or trash

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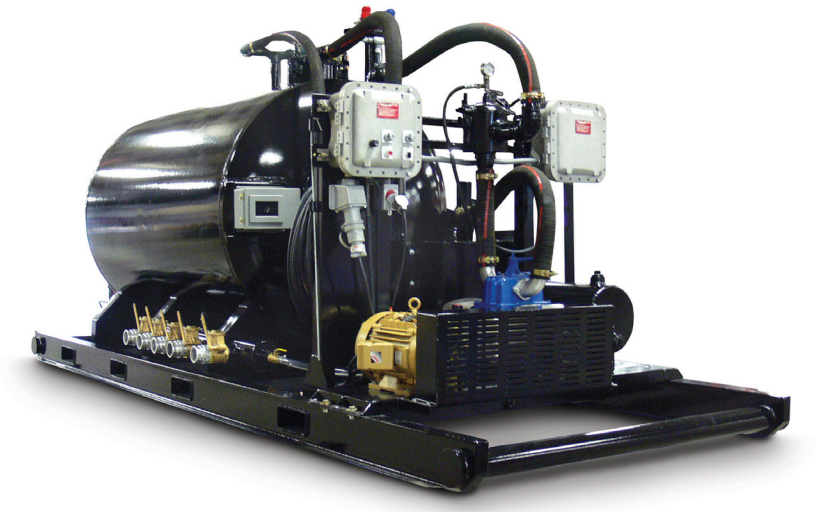
Header Section 4 - Fluid Handling	
Product Section:	**4.3 SuperVacs**
Product Sub-Section:	**4.3.1 25bbl SuperVac Tanks**
	
Features/Specs:	• Skid mounted or container enclosed • 480 volt electric 15 HP motor • Fluid level auto shut off • Open skid or installed in a heated conex enclosure for cold weather application
Advantages/Benefits:	• Used for liquid waste control on well site • Quick cleanup on floors, decks and cellars
Set-up Requirements:	• 480 volt power source • Enough hose to reach across location for cleanup and transfer of fluid
Current Availability:	All areas

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Header Section 4 - Fluid Handling	
Product Section:	**4.3 SuperVacs**
Product Sub-Section:	**4.3.2 Cylider SuperVac Tanks**

Features/Specs:	• 30 barrel capacity (1,260 gallons) • 3" vacuum hose connections • 5" vacuum hose connection points • Vacuum hose connection type: aluminum cam lock fittings • Valve type: Brass, lever operated gate • 480 volt, 20 HP motor
Advantages/Benefits:	• Used for liquid waste control on well site • Quick cleanup on floors, decks and cellars Safety Features • 30 minute run time, auto shut-off • Phase indicator light (3 phase motor, on/off) • Auto motor shut-off, at < 3 phase current • Motor rotation indicator light (on/off) • Pump/ motor operating light (blue) • Emergency kill switch • Floor operated start/stop switch (remote) • Vacuum/ pressure switches, auto shut-off and restart at presets • Mechanical pressure/ vacuum reliefs (pop-off valves) • Automated pump/ motor shut-off at tank capacity
Set-up Requirements:	480 volt power source • Enough hose to reach across location for cleanup and transfer of fluid
Current Availability:	All areas

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Header Section 4 - Fluid Handling	
Product Section:	**4.3 SuperVacs**
Product Sub-Section:	**4.3.3 Heated Conex Enclosed Supervac**
 	
Features/Specs:	• 480 volt electric 15 HP motor • Fluid level auto shut off
Advantages/Benefits:	• Unit is enclosed in a heated conex box to withstand cold weather • Some units are equipped with heated pressure washers as well
Set-up Requirements:	• Unit is enclosed in a heated conex box to withstand cold weather • Some units are equipped with heated pressure washers as well
Current Availability:	Pennsylvania, North Dakota

Trouble shooting	
Problem	**Possible Issues or Solutions**
Not sucking properly	• Rocks or obstructions in hoses (trash, rags, etc.) • Fluid freezing up in hoses and limiting or preventing flow • Fluid drying or caking up in hoses limiting or preventing flow
Not starting or staying running	• Make certain you have clean power (480 volt)
Workers do not know how to reverse pump	• Tank is full and must be discharged before continuing to vacuum • Tank is empty and cannot discharge any more
Non LTR personnel have tampered with, moved or run into the equipment with a vehicle and caused damage.	• Breaking of handles on valves because of using foot to close and open. • Damaged Wire on remote Any damage caused by a non-Gravity employee must be reported to the consultant or rig site supervisor immediately to ensure that Gravity is reimbursed any repair costs.

SuperVac Troubleshooting Guide

Is the **RED** **or** **BLUE** beacon on top flashing?

BLUE light is flashing:

1. Tank is over full.
2. Bleed off all pressure or vacuum in tank.
3. Switch pump to discharge or blow.
4. Push reset button behind panel (it should run for 10 seconds) .
5. If it shuts off push it again. When the tank gets below ¾ full it will stay on.
6. Empty tank completely.

RED light is flashing and it still won't discharge or suck:

1. Bleed off all pressure or vacuum in tank.
2. Switch to discharge and empty the tank.
3. Still won't empty?
4. Check for clogged hose. (remove hoses at manifold to see if it will discharge there).
5. Still won't work then call LTR.

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Header Section 5 - Cleaning	
Product Section:	**5.1 Pressure Washers**
Product Sub-Section:	**N/A**

Features/Specs:	• 500 gallon capacity water tank • Two high-pressure wands
Advantages/Benefits:	• Helps to clean and maintain the rig and equipment
Current Availability:	On Demand (Check with your local Branch Manager)

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Header Section 5 - Cleaning	
Product Section:	**5.2 Shaker Washer**
Product Sub-Section:	**5.2.1 Electric Shaker Washer**
	
Features/Specs:	• 5 HP motor • 480 3 Phase power • Approximately 2500 psi
Advantages/Benefits:	• Helps clean and maintain shale shakers on drilling rig
Current Availability:	On Demand (Check with local Branch Manager)

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Header Section 5 - Cleaning	
Product Section:	**5.3 Trash Trailers**
Product Sub-Section:	**N/A**
	
Advantages/Benefits:	• Used on locations to hold regular household trash • Not to be filled with any regulated or contaminated items
Current Availability:	West Texas

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Header Section 6 - Accommodations	
Product Section:	**6.1 Office and Meeting Trailers**
Product Sub-Section:	**N/A**

Photos: Office Trailer

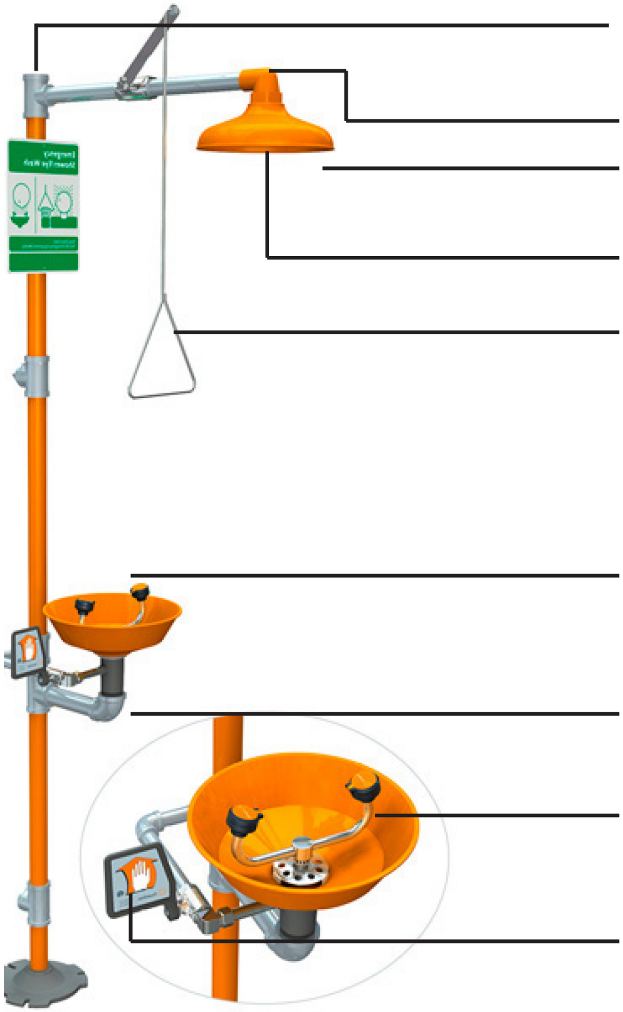
Photos: Meeting Trailer

Features/Specs:	Office Trailer Standard Features: • Large Windows for clear view of operations • Heater & Air Conditioning for year round comfort • Microwave Oven; Refrigerator & Coffee Pot • Radio includes CD/DVD Player • Two Heavy Duty Office Chairs • Couch with Hide-away bed • Optional Cell Phone Booster • Optional Flat Screen TV • Optional Satellite TV & Internet • Trailer requires 30amp external power source

Features/Specs:	Meeting Trailer Standard features: • Large Windows for clear view of operations • Heater & Air Conditioning to provide year round comfort • Microwave Oven; Refrigerator & Coffee Pot • Radio includes DVD Player • Heavy Duty Office Chair • Cushion Bench seating for up to 16 people - Hinged Benches for additional storage • Cell Phone Booster • Optional Flat Screen TV • Optional Satellite TV & Internet
Advantages/Benefits:	Office Trailers: • Provide comfortable work space for locations with space restrictions Meeting Trailers • Provides a clean, comfortable area to conduct meetings and give safety training to workers • Can be used as a break room during work hours • Can be used as a cooling station in the summer and protection from cold during the winter
Current Availability:	North Dakota On Demand (Check with local Branch Manager)

Header Section 7 - Safety Equipment	
Product Section:	**7.1 Emergency Shower/Eye Wash**
Product Sub-Section:	**N/A**

Features/Specs:	• ANSI Z358.1-2009-compliant shower performance (20 gallons/ minute for 15 minutes with 30 PSI at tepid temperature) • ANSI Z358.1-2009-compliant eye wash station (.4 gallons/min- ute for 15 minutes) • Steel-frame trailer with 2 5/16 in. ball coupler • Tandem 5,200-lb. axles with brakes on both axles • ANSI-required 8-ft. interior height • Diamond Plate exterior skin panels • Minimum 325 gallons of fresh water capacity • Insulated cabin • Circulating pump with cold weather thermostat • Self-Contained Diesel Powered Generator • GPS Monitoring for Power & Temperature Controls



Connected to water supply, capable of delivering required flow when all components are operated simultaneously. Outlet heads positioned between 33” (83.8 cm) and 45” (114.3 cm) from the floor.

“Hands-free” stay-open valve activates in one second or less.

Height of water column between 82" (208.3 cm) and 96" (248.3 cm) above floor.

Shower shall provide 20 gallons (75.7 liters) of water per minute for 15 minutes.

Easily located, accessible actuator no higher than 69" (173.3 cm) above floor.

At 60" (152.4 cm) above floor, the water pattern 20" (50.8 cm) in diameter.

Center of water pattern 16" from any obstructions.

Outlet heads positioned between 33" (83.8 cm) and 45" (114.3 cm) from the floor.

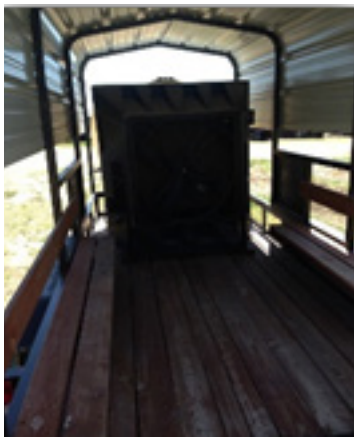
Unit delivers at least 3.0 GPM (11.4 liters) (for eye/face wash) or 0.4 GPM (1.5 liters) (for eyewash) for 15 minutes.

“Hands-free” stay-open valve activates in one second or less.

Valve actuator shall be easy to locate and readily accessible to user.

Advantages/Benefits:	OSHA has adopted several regulations that refer to the use of emergency eyewash and shower equipment. The primary regulation is contained in 29 CFR 1910.151, which requires that… “…where the eyes or body of any person may be ex posed to injurious corrosive materials, suit- able facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.”
Current Availability:	On Demand (Check with local Branch Manager)

Header Section 7 - Safety Equipment	
Product Section:	**7.2 Cooling Trailer**
Product Sub-Section:	**N/A**



Features/Specs:	• 16' Trailer • 300 Gallon Water Tank • 36" Port-a-Cool Evaporative cooler • 8' Bench down both sides • Covered top and sides for shade Some units may vary slightly from these specs because of different manufacturers.
Advantages/Benefits:	Provides cool, shaded area for crew members to take breaks and have meetings
Current Availability:	All Areas On Demand (Check with local Branch Manager)
Troubleshooting:	
Problem:	Possible issues and solutions
Run Out of Water	Running unit without water will burn up the water pump • Always check water level frequently
Clogged Filter	Filter on evaporative cooler becomes stopped up with dirt or other obstructions • Limits air flow • Limits cooling capability Use high pressure air or water to clean the filter on units regularly. Check units for clean filter before going on job and whenever on location

Header Section 8 - Miscellaneous	
Product Section:	**8.1 Fresh Water Station**
Product Sub-Section:	**N/A**

Features/Specs:	• 1000 Gallon Water Tank • 110 volt pump • Pressure Tank • 2 nozzles for connecting water hoses
Advantages/Benefits:	Supplies water to trailer houses without an internal water tank
Current Availability:	On Demand (Check with local Branch Manager)

Trouble shooting	
Problem	**Possible Issues or Solutions**
Freezing Temperatures	• Frozen water lines which keep water from reaching trailer • Heat tape can be used to keep hoses from freezing Cold temperature freezes the water inside the pressure tank and ruptures it • Keeping a heat lamp or small heater running inside the front compartment helps to eliminate this problem