

PURPOSE:

When arriving on a drilled pile job, setup and operation of the grout/concrete pump is critical to the safety of the employees and other personnel on site. The superintendent and pump operator should be trained on how to properly setup, operate, and clean the pumps to prevent creating hazards on the job and/or damaging the equipment.

Setup:

In preparation of the job scope, the following should be considered before pumping operations begin:

- Pump operator must be trained and a practical evaluation performed before being issued a Cajun qualified operator card. (See practical evaluation below)
- A pre-use pump inspection shall be performed by the qualified operator and reviewed/signed by a supervisor onsite. This shall be performed on each pump placed in use during the course of the work.
- All hoses and connections must be inspected before each use and cleaned after every use.
- Hoses should be connected with a rubber gasket and clamp. Grease should be placed around the gasket and clamp to help reduce concrete/grout build up that can result in damage.
- Whip-checks must be placed at every hose connection with the spring pressing the cable against the hose firmly.
- A loop bail grip (reference photos below) will be used to secure the hose and 90 degree elbow to the pump with a shackle. The mesh portion of the grip will go around the hose, clamp, and elbow securing all three together.
- Clamps must be installed properly. Threaded type clamps shall be installed as tight as possible, starting at refusal and backed off one whole turn until the clamp can be closed with a considerable amount of force. It shall be secured with a pin to lock the handle in the downward position.
- Any clamps that will be suspended in the air during the job should be the bolted type clamp and tightened to manufacturer's specified torque.

Operation:

- Pump inspection must be documented before the shift begins.
- A biodegradable form releasing agent (i.e.; Durogard 2, or equivalent) must be sprayed on the pump to prevent any material from sticking or building up on the pump. (SDS available for reference and approval needs to be obtained before use)
- Nitrogen for the surge chamber, needs to be opened and set until the gauges read between 100-200 psi. Once the pressure is set to desired psi, the nitrogen bottle should be closed until the pressure falls below 100 psi.
- The fluid level in the splash box should be around the half way point of the box.
- The hydraulic pressure should be set at the lowest point and be gradually increased while pumping until the desired pressure is reached (1000-3000 psi.)
- Hydraulic pressure should be adjusted throughout the day depending on the consistency of the material being pumped.
- Both cylinders should operate at the same pressure when working properly.

Quality Control:

- The specified flow range or slump must be determined before pumping grout/concrete.
- Grout/concrete must be mixed with an additive and the allowable water volume to achieve the target flow/slump. The amount of water added must not exceed the amount of water withheld from the mix design noted on the batch ticket.
- Grout/concrete must be ordered with time spacing between trucks to allow adequate time to pump the material before the time restriction has expired.
- The allowable time between batching and the time the grout/concrete is used must be determined and approved before pumping. The range may vary depending on mix design and outside temperatures.
- Grout/concrete shall not be held for a period exceeding 2 ½ hours at a material temperature below 70 degrees and for a period not exceeding 2 hours at temperatures exceeding 100 degrees, unless project specifications require more stringent requirements.
- The pump shall be calibrated before installation of the piles to determine the volume of material per stroke.
- Theoretical volume, target percentage, and minimal stroke count must be determined at the beginning of the job. A record of total stroke count, total yardage, pile numbers, and drill depth should be kept by the pump operator.
- The pump operator and crane/rig operator must have a clear line of sight to each other. If the operators cannot see each other, a signal person must be placed to translate signals.

Cleaning:

- Between installation of each pile, the pump and screen must be cleaned using a water hose and nozzle.
- At the end of the shift, the pump must be flushed out with water until all material is cleaned out of the system. Water being pumped through the system must be clean and free of any aggregate or cement.
- The 90 degree reducer on the discharge end of the pump must be removed EVERY DAY after the pump is washed out. A hose must be placed in the end of the discharge with water spraying into the material cylinders. The cylinders need to be in the pumping motion to properly clean them out.
- The hopper and screen must be pressure washed at the end of each day using wash skids.
- Splash box must be inspected daily. Any material other than oil/water may indicate a problem with the seals on the cylinders.
- Once a week, adequate time must be allowed to clean fine specks of grout/concrete build-up using a biodegradable solvent (i.e.; spec-blast.)
- All clamps and connections must be free of grout/concrete build-up in order to identify stress cracks and fatigue in the metal.



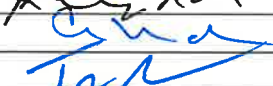
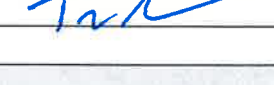

Pump operators will be held accountable for maintaining pump appearance and operation.





CLOSE UP OF LOOP BAIL GRIP



LOOP BAIL GRIP CONNECTING HOSE TO PUMP
(CAN BE USED FOR THREAD AND/OR BOLT TYPE CLAMPS)

<u>First Level Review</u>		
<u>Role</u>	<u>Signature</u>	<u>Date</u>
Drilled Pile General Superintendent		5-21-18
Drill Shafts General Superintendent		5-29-18
Construction Support Manager		5-21-18
Drilled Pile Operations Manager		05/21/18
Drill Shafts Operations Manager		5/25/18

<u>Approvals</u>		
<u>Role</u>	<u>Signature</u>	<u>Date</u>
Division Safety Manager		5/21/18
Company President		6/4/18

Requirement: Work must be performed in accordance with the information in this Best Practice. If it is determined that work cannot be done as required in the Best Practice or that it presents additional risk, you must obtain authorization for variance from the General Superintendent, Construction Manager and the Division Safety Manager.

Course Name:	Course Description:		
Grout / concrete pump	Grout Pump		
Instructor Name: (please print neatly)	Instructor Signature:		
Employee/Student Name: (please print neatly)	Employee/Student Signature:		
S.S. or Employee #: (please print neatly)	Job #:	Score:	Date:

Grout / Concrete pump - PRACTICAL EVALUATION

In each of the following sections, the performance evaluator should mark 'S' for successful or 'U' for unsuccessful. A line is provided after each performance task for notes, if needed.

Section 1: Inspection and Maintenance

	S	U		
1.			Locates operator manual (reviews and understands).	_____
2.			Complete walk around inspection.	_____
3.			Uses daily inspection check list appropriately. (fluids, screens, light indicators, etc.)	_____
4.			Performs necessary maintenance. (filling fluids, splash chamber, etc.)	_____
5.			Tags equipment and reports unsatisfactory findings appropriately.	_____
6.			Ensures whip-checks are in place at all connections.	_____

Section 2: Start-up, Warm-up, and Shut-down

	S	U		
6.			Inspect area of operation.	_____
7.			Applies releasing agent on pump.	_____
8.			Understands all switches, gauges, indicators, etc. (operator's manual)	_____
9.			Start up machine appropriately.	_____
10.			Warms up machine, checking gauges and indicators for problems.	_____
11.			Proper shutdown of machine.	_____

Section 3: Basic Operations

	S	U		
12.			Adds water and intrusion aid properly.	_____
13.			Mixes grout / concrete to desired consistency.	_____
14.			Sets compressed nitrogen to proper pressure.	_____
15.			Adjusts hydraulic pressure to proper setting.	_____
16.			Wears face shield and hearing protection while pumping.	_____
17.			Pays attention to drill operator for start and stop signal.	_____

Section 3: Cleaning of pump

	S	U		
18.			Washes out pump properly.	<hr/>
19.			Breaks all connections on pump and washes material cylinders.	<hr/>
20.			Pressure washes screen and hopper.	<hr/>
21.			Cleans excess grout / concrete off ground	<hr/>
22.			Applies spec-blast to clean fine specs of grout / concrete	<hr/>

Grout Pump Operator		Skill – Grout Pump Operator	
Course Name: (please print neatly)		Course Description:	
Instructor Name: (please print neatly)		Instructor Signature:	
Employee/Student Name: (please print neatly)		Employee/Student Signature:	
S.S. or Employee #: (please print neatly)	Job #:	Score:	Date:

1. A _____ is placed at the pump hopper or inlet to remove oversized particles, which could damage the pump.
 - a. stick
 - b. grouser
 - c. screen
 - d. hand

2. Before starting the pump, the operator must
 - a. turn the engine on
 - b. prime the hoses
 - c. complete pre-start up inspection
 - d. notify flaggers

3. The water separator should be checked every day to see if water is mixed with diesel. If you see that the water is mixed with diesel, then you should contact a mechanic immediately. How can you tell if water has mixed with the diesel.
 - a. Water will apparent in the splash bowl
 - b. I read die will indicate the mixture in the splash bowl
 - c. An alarm will sound
 - d. A indicator light will flash on the main panel

4. The grout may be held in the mixer for a period of _____ hour (s) at temperatures below 70° F and not exceeding _____ hour (s) at temperatures not exceeding 100°F degrees.
 - a. 1 hour and 1.5 hours
 - b. 2.5 hours and 2 hours
 - c. 2 hours and 3 hours
 - d. 3.5 hours and 3 hours

5. If the radiator belts appear frayed or pieces are breaking apart, a mechanic should be notified to replace the belts. How often should the fan belts be checked?
 - a. Reach in an tug on the belts once a month
 - b. Reach in an tug on the belts once daily
 - c. Reach in an tug on the belts once quarterly
 - d. Reach in an tug on the belts once a year

6. You should check the hydraulic oil level on a daily basis. You do this by lifting up the cover on the hydraulic piston chamber. The oil level in this chamber should be.
 - a. Just below the piston rod
 - b. Completely immersing the piston rod
 - c. Halfway up the piston rod
 - d. Just a little in the chamber is all that needed

7. To start the engine: turn the key, push the start button and then:
 - a. Open the throttle and crank up the RPM's to start pumping.
 - b. Let the engine run idle for 2 minutes.
 - c. Pour the grout in the hopper to start pumping
 - d. Inform the crew that you are about to start pumping

8. When the pump is running, the hydraulic temperature should remain between _____ and _____:
 - a. 60° F - 80° F
 - b. 100° F - 150° F
 - c. 33° F - 36° F
 - d. 200° F - 220° F

9. When the pump is running, the hydraulic pressure should remain between _____ and _____:
 - a. 60 psi – 80 psi
 - b. 1,000 psi – 1,150 psi
 - c. 2,200 psi – 3,800 psi
 - d. 200 psi – 500 psi

10. The surge chamber releases nitrogen into the lines so that pumping pressure can be known during operation. To begin, an amount of nitrogen must be present in the lines; that amount is:
 - a. 50 psi
 - b. 500 psi
 - c. 1,000 psi
 - d. 2,000 psi

11. When the pump is running, if _____ is reached, then the pump should be shut down to look for the grout blockage in the lines.
 - a. 50 psi
 - b. 500 psi
 - c. 1,000 psi
 - d. 2,000 psi

12. The minimum temperature that grout can be set at is _____.
 - a. 22° F
 - b. 32° F
 - c. 33° F

- d. 45° F
13. The maximum temperature that grout can be set at is _____.
- a. 75° F
 - b. 95° F
 - c. 100° F
 - d. 105° F
14. A set of samples shall be taken/tested from each truck of grout delivered during pile installation.
- a. once a day
 - b. 6 cubes for each 50 yards
 - c. 2 cubes every 50 yards
 - d. three times a day
15. The normal grout flow rate should remain between _____.
- a. 2-12
 - b. 12 -26
 - c. 26-35
 - d. 36-45
16. The grout flow rate should never be adjusted during operation _____.
- a. true
 - b. false
17. When cleaning the grout pump, it is necessary to put the cleaning acid on everything. This way we are sure that the pump is cleaned
- a. true
 - b. false
18. The hydraulic cooler is a very important component for proper functioning of the grout pump. The hydraulic cooler must be cleaned every day. How should it be cleaned?
- a. Brush off any excess grout to allow air to pass through
 - b. Spray acid on the cooler to dissolve grout
 - c. Use a water hose to rinse off grout
 - d. Nothing needs to be done, it is a self cleaning mechanism
19. The normal PPE required for Grout Pump Operators during pump operation are _____.
- a. ear plugs
 - b. gloves
 - c. face shield
 - d. all of the above
20. A harness is required when climbing onto the back of a readimix truck.
- a. true
 - b. false

21. When the days work is complete, it is best to let the grout sit overnight and chip it away the next morning.
 - a. true
 - b. false

22. It is not necessary for the grout pump operator to watch the 3rd party testing organization test the grout because they can take care of it themselves.
 - a. true
 - b. false

23. During grout pump operation, it isn't necessary to watch the lines for leaks because the pump indicators and gauges will tell you if there is a problem or not.
 - a. true
 - b. false

TRAINING DOCUMENTATION FORM



Course Name: <i>(please print neatly)</i>	Course Description: <i>(please print neatly)</i>	Date: <i>(please print neatly)</i>
Instructor Name: <i>(please print neatly)</i>	Instructor Signature:	

Print Name	Signature	Refresher (Y/N)	Co	BU	Job #	Job Title	EE # or SS#
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*Business Unit Reference List

01	Infrastructure	02	BR Civil	04	Houston Civil	05	Industrial Buildings
11	Drilled Shafts	12	Drilled Piling	14	Driven Piling	15	Deep Foundations
23	Marine	29	BR Mechanical	30	Houston Mechanical	31	Pipe Fabrication
33	Engineering Solutions	60	Equipment Services				