

SP-991054 Series BEAM BREAKER

Version 1.0

Operator's Manual

DURHAM GEO-ENTERPRISES, INC.

Operating Instructions

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Setup

Thank you for purchasing a Durham Geo Beam Breaker. By following the setup, operating, and maintenance procedures, you can enjoy a lifetime of use.

Upon receipt, please inspect the frame and electronics for damage. If you note any problems, please notify the freight company that delivered the frame and call Durham Geo Enterprises at 1-800-837-0864. ☎

Due to the weight of the frame, extreme care should be taken when un-crating the load frame. One can unload the frame with a forklift or a hoist. A load capacity of at least 1/2 ton is recommended.

Warning!

Always lift the frame from the top of the frame. The frame should not, under any circumstances, be lifted from the bottom.

While you are un-crating the machine, you should be aware that each load frame is shipped full of oil. Take care not to tilt or tip over the frame. Also, take care not to damage any accessories, such as the hydraulics or readout(s) that are in the crate with the load frame.

SETUP

After unpacking the frame, place it on a flat level surface. A few things to think of when choosing a place to set the frame are:

1. Proximity to at least 2 electrical outlets. Due to the power required by the motor at startup, it is not advisable to plug the pump and digital readout(s) into the same outlet.
2. Relatively cool (less than 100°F/37°C) and low humidity (less than 80%) area.
3. Place the machine so that the back is accessible.

Mount the load frame using the holes provided on the sides of the frame. The recommended bolt diameter is 7/16". Some measurements to aid in the mounting of the frame are listed below:

- A. Distance between the two holes: 15" (394.7 mm)
- B. Distance from the center of either mounting hole to the front, and also the back, of the frame: 5" (127 mm)

Check all hydraulic fittings for tightness. Each fitting should be pulled tight and snugly seated. Loose fittings will result in leaking fittings, however, don't over-tighten the fittings as this may strip out the threads and make future repairs difficult.

Your test frame should now be ready to use. Take a second and check that everything is attached and ready for testing. Check the oil level in the tank. It should be approximately 1/2" to 3/4" (1 - 2 cm) from the top of the tank. If it is low, fill the tank with 215 grade hydraulic oil.

Operation

The SP-991054 series test frames are constructed of carbon steel plate. These machines are precision machined and welded to provide an accurate platform for the hydraulic loading piston and top platen. The top platen is designed to swivel as necessary, so that the load is applied evenly across the specimen. The Durham Geo load frames are also specially engineered to minimize stretch under load, which is critical to uniform breaks. This means that deformation from front to back and side to side, under changing loads, will be equal.

Load is applied through a top-loading piston. The piston is precision machined with a chrome finish to reduce friction. A electric drum (Forward-Reverse) switch controls piston direction, either forward (piston down) or reverse (piston up).

The test frame is powered by a two-speed high-pressure hydraulic pump. The pump, 2-gallon (7.57-liter) reservoir, and control valve are mounted on the side of the load frame, allowing easy access for service.

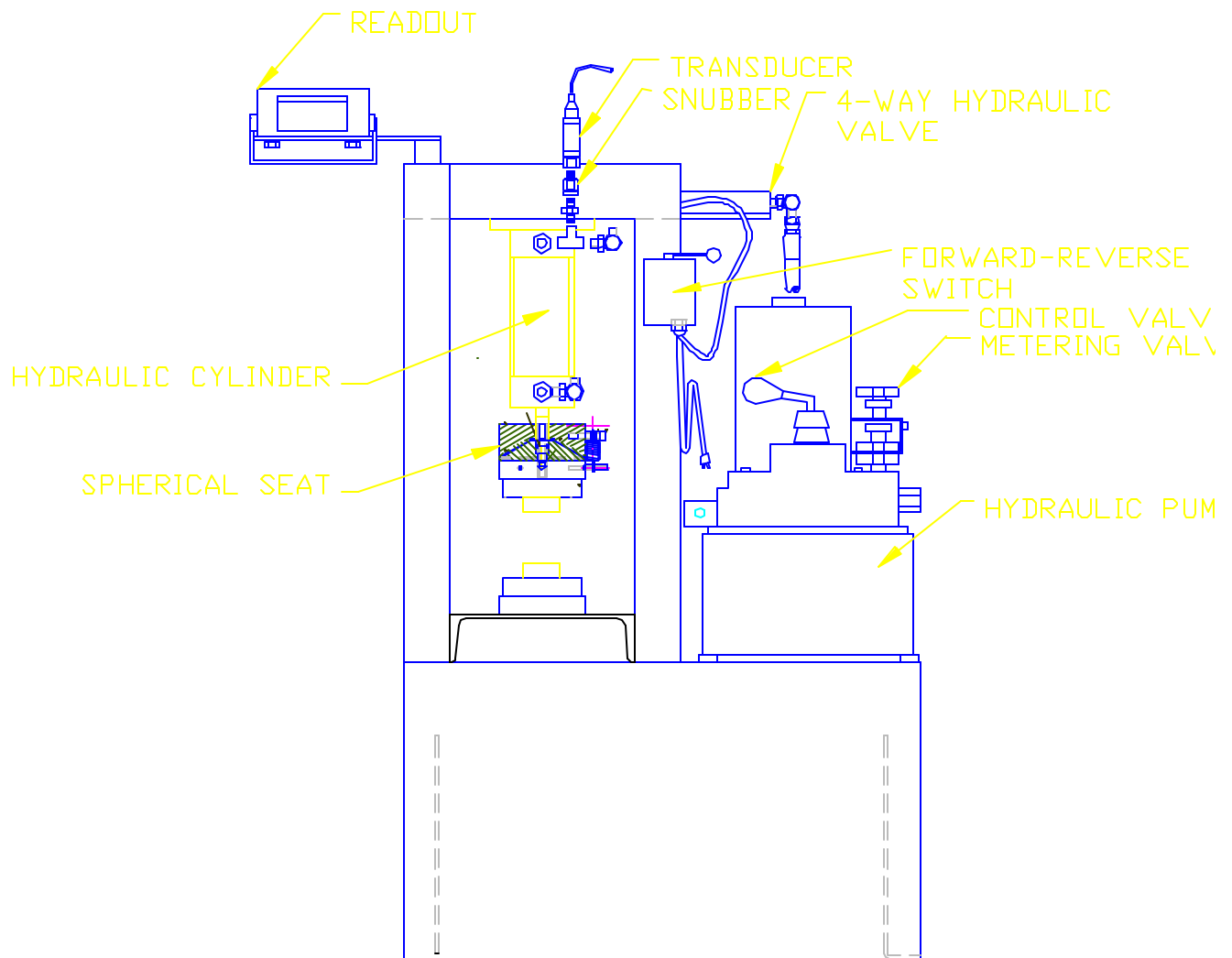
The applied load is displayed and monitored by a digital indicator. Readings can be displayed in the engineering units of the user's choice at the time of ordering the unit, or at calibration. All calibration data is held safely in non-volatile memory. Peak hold and zero offset features are standard on all Durham Geo digital readouts.

The load sensed at the loading piston is displayed on the digital readout via a precision pressure transducer. The transducer converts the hydraulic pressure into an electrical signal, which is converted to engineering units and displayed on the digital readout. The pressure transducer has a 5,000 psi (34474 kPa) range, 0.1% linearity, and 1 ½ times over-pressure capability. This is a simple, but very effective and accurate method for converting hydraulic pressure to load.

The following 2 pages show details and descriptions of the major parts used in operation, calibration, and maintenance of the SP-991054 test frame.

OPERATION

Figure 2.1 Detail of the SP-991054 Series test frame.



OPERATION

Hydraulics

The movement of the hydraulic cylinder is controlled through the valve and the drum switch mounted on the pump and frame. The valve has 4 positions:

1. Retract
2. Hold
3. Metered Advance
4. Full Advance

These four positions are actuated by moving the lever on the valve to the appropriate position. The star shaped knob is used in the metered advance position and allows the user to control the rate of loading during a test. In most cases, once you find a satisfactory rate of loading, the metering valve can be left alone and should not need to be changed.

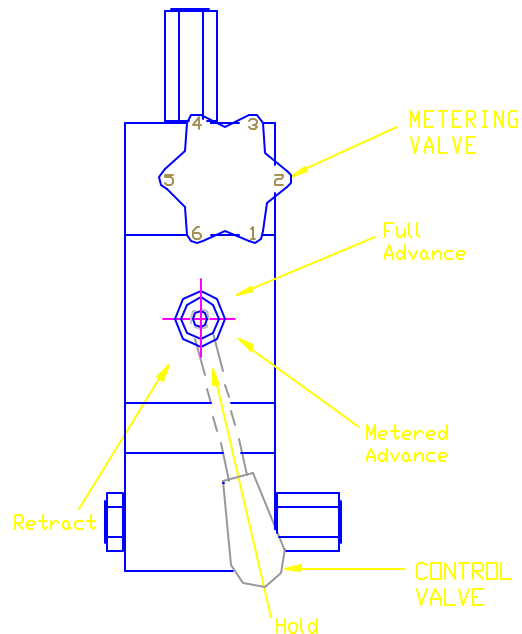


Figure 2.4 Detail of the Hydraulic Control Valve.

OPERATION

- Retract** The retract position is used to release pressure from the cylinder . This is the position the valve should be in when the frame is not in use.
- Hold** The hold position is used to lock the cylinder in its place and maintain a pressure. This position is not normally used during testing but is frequently used during calibration.
- Metered Advance** The metered advance position is used during the actual test to control the rate of loading. When the valve is in this position, the user controls the rate of loading with the metering valve. Turning the valve clockwise decreases the rate of loading. Turning the valve counter clockwise increases the rate of loading. Once the proper rate has been achieved, further adjustment of the metering valve should not be necessary. For this peculiar kind of beam breaker, we recommend leaving the lever in the metered advanced position and just moving the drum switch either forward or reverse when running samples.
- Full Advance** The full advance position is used to rapidly maneuver the cylinder into position for testing. Typically, the valve is placed in this position to move the sample up to the top platen.

Warning!

Remember that the hydraulic system is active as soon as the pump is turned on. Always place the valve in the retract position and the drum switch in the centered position when not using the load frame. This will prevent possible injury to personnel or accidental damage to samples.

Electronics

The readout comes complete with a peak-hold feature, which allows you to trap and display the load at which the sample failed. To see the peak value in memory, simply toggle the switch on the front of the readout to “Peak hold”. The value displayed is the peak. To clear this value from memory, toggle the switch to “Reset”. The screen will display -9999 to indicate that the peak memory is now clear and ready for testing. A reset should be performed after each test.

To use the readout, simply plug it into an outlet. Attach the transducer cable to the “input” socket on the back of the readout. The readout should display “0”. If there is an offset, depress the down arrow “↓” and the setup “S” key simultaneously on the front of the readout to tare the offset. The readout is now ready for use.

Reference

More detailed information on the use and calibration of the digital readout is available in its accompanying instruction manual. It is strongly suggested that you read the digital readout manual before using the device.

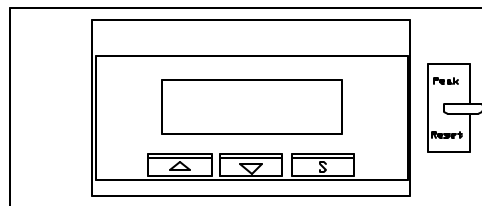


Figure 2.5 Detail of the Peak Hold Readout.

Running a Test

Before running a test, check all your setup conditions to insure the frame is ready for testing. All readouts should be set to zero, the hydraulic valve should be set in the “retract” position and the drum switch in the centered position. The cylinder should be all the way up.

To run a test, do the following:

1. Turn the pump on.
2. Place the sample between the platens.
3. Run the top platen down using the “Fast Advance” position on the valve and the drum switch on “forward”.
4. Once contact has been made, place the control valve in the “Metered Advance” position.
5. Control the rate of loading with the star-shaped knob on the metering valve.

Note

Once you have achieved the proper load rate, further adjustments of the metering valve should not be necessary.

6. Load the sample to failure.
7. When the sample fails, and still in metered position move the drum switch to the “reverse” position.
8. Record all pertinent information. (Use the peak hold switch to read the peak load.)
9. Reset the peak hold device for your machine.
10. Remove the sample.
11. Brush off aggregate and dust with a small brush or cloth. Do not spray off with water. A moist sponge or cloth is acceptable.

12. Repeat steps 2-10 to continue testing.

Safety / Warnings

Operation

Always wear safety goggles when operating, calibrating, maintaining, or otherwise using the equipment.

Always have the fragment guard in place before operating the equipment.

This equipment must be bolted to a stable base before use. Failure to properly secure the equipment may result in serious injury or death.

Pump

1. Close the oil fill plug to prevent leakage when transporting the pump.
2. This pump is rated at 10,000 psi. (68,947 kPa), but is set at the factory at 1900 psi do not change pump pressure relief to a higher setting, damage to the cylinder and operator could occur
3. Do not tamper with the high-pressure relief on the pump.
4. Do not adjust the low range or high range relief valve, they are preset at the factory to 9000 lbf. Any adjustments will void all warranties.

Cylinder

1. Do not exceed the load rating of the cylinder. (i.e. the load rating of the frame)
2. Do not set loads that are poorly balanced or off-center on the cylinder.

Power Supply

1. Do not use an ungrounded extension cord.
2. Avoid conditions, which could create an electrical hazard.
3. If the power cord is damaged or wiring is exposed, replace or repair immediately.
4. The line voltage must be the same as the voltage your pump is wired for. (i.e. a 110 volt pump plugged into a 110 volt outlet or 220 to 220)

UPKEEP

Calibration

Each concrete load frame is calibrated before it leaves the factory. When you receive the load frame, you will find a calibration certificate enclosed. The certificate does not replace the required ASTM on-site calibration. However, it is useful for comparing calibration results. In most instances a re-calibration of the load frame is unnecessary. In actuality, the readout can be left in the RUN mode and calibration will simply be verified. However, if for some reason, such as a change of transducer or display, a re-calibration is necessary, the readout manual describes the procedure.

Warning!

When you are in the readout SETUP mode, there is a chance you could erase all calibration information. Please read the Durham Geo E-400 Digital Transducer Readout manual.

ASTM requires a calibration be performed a minimum once per year.

Maintenance

The hydraulic system is powered by a two-stage hydraulic pump coupled to a selector valve. The cylinder is a single acting spring return device. The maximum rated pressure of the system is 10,000 psi (68947 kPa). For safety reasons, the pressure relief on the pump has been set below 10,000 psi (68947 kPa).

Before operating the system for the first time, after any repairs, or after an extended period of inactivity, please check the following items.

Hydraulic Hose and Fittings

Warning!

NEVER work on hydraulic lines without first disconnecting power to pump and placing valve in the retract position.

1. Before operating the pump, make sure all hose connections are tight. Use an open-end wrench of the proper size to tighten the fittings.
2. If you find a loose fitting, be careful not to over-tighten it. Over-tightening may cause premature thread failure or cause high-pressure fittings to split at pressures lower than their rated capacities.
3. Unplug the pump before breaking any hydraulic connection in the system.
4. Should a hydraulic hose ever burst or rupture, immediately shut off the pump.

Warning!

NEVER attempt to grasp a leaking hose under pressure with your hands. The force of the escaping hydraulic fluid could cause serious and permanent injury.

5. Avoid any conditions, which could damage the hose and impair the pump's performance. Never allow the hose to kink, curl, or bend so tightly that the oil flow within the hose is blocked or reduced. This could damage the hose and possibly result in serious injury to persons working in the immediate vicinity.

6. Do not subject the hose to any potential hazard (i.e. fire, extreme heat or cold, heavy impact or sharp surfaces) which may rupture or weaken the hose.
7. Do not use the hose to lift or move the equipment connected to it.
8. Periodically inspect the hose for signs of wear. NEVER use a defective hose with pressurized equipment.
9. Always consult the manufacturer before painting the hoses. NEVER paint the fittings.

Spherical Seat

(Please refer to the Drawing #2594 located at the back of this manual)

The spherical seat and upper platen are precision made and should be handled carefully. The spherical seat will need to be oiled semi-annually to insure proper operation. To remove the spherical seat:

1. Make sure the spherical seat is supported from underneath before removing the retaining bolt.
2. Remove the eye bolt from the top of the load frame.
3. Using the “T” wrench supplied with the frame, remove the bolt located in the cavity left by removing the eyebolt.
4. Remove the spherical seat from the frame and place on a flat surface. Remove the springs retaining bolts #9 (3 each) and springs #6. Separate the dome from the seat and inspect both surfaces from rust, scratches, and any deformities. Remove any rust, and oil both surfaces with a 40-weight oil and reassemble. Use caution when reinstalling the spherical seat back on the frame.

Platens

If the machine is not being used for several days, apply lightweight oil to the platens. A cloth that is soaked in oil will work to apply the oil to the top and bottom platens. This will prevent any rust from forming on the platens, and lengthen their life and appearance.

Filling / Changing the Oil in the Reservoir

1. Before filling or changing the oil in the reservoir, thoroughly clean the area around the filler cap with a clean cloth to prevent contamination of the oil by foreign particles.
2. Remove the filler cap and insert a clean funnel with filter. Add enough oil to fill the reservoir to within approximately $\frac{1}{2}$ " to $\frac{3}{4}$ " (1 - 2 cm) of the fill hole when the cylinder is in the fully retracted position. Use only new, clean, approved hydraulic oil (215 SSU @ 100°F/37.8°C). Tank capacity is 2 gallons.
3. Check the oil level in the reservoir weekly.
4. Drain, flush, and fill the reservoir after every 600 hours of use. If conditions are abnormally dirty or dusty, more frequent oil changes are recommended.

Draining and Flushing the Reservoir

1. Clean the exterior of the pump before the pump interior is removed from the reservoir.
2. Disconnect hose at valve.

3. Remove valve by taking out the 4 socket head cap screws on the top of the valve.
4. Remove the ten screws that fasten the motor and pump to the reservoir. Do not damage the gasket or bump the filter or pressure regulating valves when lifting the pump and motor off the reservoir.
5. Clean the inside of the reservoir and refill with suitable nonflammable flushing oil. Rinse the filter clean.
6. Place the pump and motor assembly back onto the reservoir and secure with four of the ten screws. Assemble the screws in opposite corners of the housing. Replace valve and hose assembly.
7. Turn the pump on, and place the valve in the hold position. Run the pump for 4 to 5 minutes. Turn the pump off. Disconnect the power cord. Remove the motor and pump assembly, drain and clean the reservoir.
8. Refill the reservoir with two gallons of high-grade hydraulic oil (215 SSU at 100°F/37.8°C) Replace the motor and pump assembly with the gasket. Thread in the ten screws, tightening them securely and evenly. Replace valves and reconnect the hose at the valve.

HELP!

Troubleshooting

Problem	Cause	Solution
Motor does not run.	Pump not turned to “On” position.	Flip toggle switch to run position.
	Unit is not plugged in.	Plug in unit.
	No voltage supply.	Check line voltage.
	Broken lead wire or defective power cord plug.	Replace defective parts.
	Defective switches.	Check switches.
	Defective motor.	Replace motor.
	Thermal protector switch inside motor housing is open.	Wait for motor to cool before starting.
Defective starter relay.	Replace defective parts.	
Pump is not delivering oil or delivers only enough oil to advance ram partially or erratically	Oil level is too low.	Fill reservoir to within 1” of the filler plug with all rams retracted.
	Loose fitting to cylinder.	Check couplings to cylinder. Inspect couplers to insure that they are completely coupled.
	Air in the system.	Bleed the system.

Troubleshooting (continued)

Problem	Cause	Solution
—	Air leak in suction line.	Check and tighten the suction line. The pump filter should be cleaned and if necessary, the pump should be dismantled and all parts inspected and cleaned.
	Cold oil or oil is too heavy. (Hydraulic oil is higher viscosity)	Change to a lighter oil. Call Factory.
	Relief valve or low pressure Unloading valve out of adjustment.	Adjust as needed. Call Factory.
	Defective directional valve. 4 way valve not shifting	Inspect all parts carefully and Replace if necessary check voltage to valve
	Sheared drive shaft key.	Replace. Call Factory.
	Motor rotating in wrong direction.	Reverse rotation. Call Factory.
Pump builds pressure, but cannot maintain pressure.	Oil leak.	Check to see if there are any external leaks. Tighten any loose fittings.
	Leaking valve.	Call Factory.
	Faulty relief.	Call Factory.
Pump will not build to full pressure.	Faulty pressure gauge.	Calibrate gauge.
	External leakage	Tighten loose fittings.
	Relief valve setting.	Take note of the maximum pressure that the pump reaches. Call Factory.
	Check for leaks in the valve.	Call Factory.
Electric motor cuts out.	Insufficient power supply.	Check if line voltage matches equipment range.
	Faulty motor and/or thermal protector.	Call Factory.

HELP!

Troubleshooting (continued)

Problem	Cause	Solution
Ram will not retract.	Check the system pressure; If the pressure is zero, the control valve is releasing pressure and the problem may be in the ram(s)	Check the rams.
Factory.	Defective valve. 4 –way hydraulic valve	Test valve operation and inspect parts. Call
Pump delivers excess oil.	Relief valve not properly set. Call Factory.	
	Check pressure gauge.	Calibrate gauge.

Specifications

SP-991054	English Units	Metric Units
Load Capacity	9000 lbf.	1112 kN
Vertical Daylight	4.00 in.	101.6 mm
 between platens		
Horizontal Daylight	10.00 in.	254 mm
Upper Spherical Seat	4.25 in.	108 mm
Bottom Platen	4.25 in.	108 mm
Piston Area	4.90 in. ²	124.46 m ²
Max. Ram Travel	4.0 in.	101 mm
Overall Height	47.0 in.	1193 mm
Overall Width	28.0 in.	711 mm
Overall Depth	10.0 in.	254 mm
Net Weight	400 lbs.	181.44 kg

Hydraulics	
Max. Operating Pressure	10,000 PSI (68,948 kPa)
Pump Type	2 stage 1st stage - low pressure, high volume 2nd stage - high pressure, low volume
Hose Size	3/8" R9 Hydraulic hose
Oil Type	ASTM/150 (ref.) 215/46
Capacity	2 gallons (7.5 liters)

Model #	Voltage [V]	Frequency [Hz]	Phases
CM-200	110	60	1
CM-20010	220	60	1
CM-20015	220	50	1
CM-215	110	60	1
CM-21510	220	60	1
CM-21515	220	50	1

Accessories and Related Products

Equipment/Product	Purpose	Part #
Flexural Strength Test Beam Attachment	Two-piece unit easily installed in the CM-200 series load frames for flexural strength testing of beams	C-170
Cube Spacer Set	Attachment for testing 2" cube specimens	C-18040
Cylinder Spacer Set 3" x 6"	Used with the CM-200 series load frames when testing 3" x 6" cylinder specimens	C-18060
Cylinder Spacer Set 4" x 8"	Used with the CM-200 series load frames when testing 4" x 8" cylinder specimens	C-18070
Concrete Load Frame Stand	Stand ready made for the CM-200 series load frame Allows easy installation and securing of the machine	260201
Upgrade from single to dual readouts (scales)	Convert a single range digital readout to a dual range readout on the CM-200 series load frames	Call
Cylinder Mold, Disposable Plastic (three sizes)	Constructed of one-piece, non-absorbing, non-adhering plastic for forming cylindrical test specimens of wet concrete	C-210 C-215 C-220
Mold Stripping Tool	Used for splitting disposable cylinder molds to remove cured concrete sample	C-211
Domed Plastic Lid	Reusable lid for plastic cylinder molds	C-212
Steel Cylinder Mold	Reusable steel mold to form 6" x 12" cylindrical test specimens splits vertically for easy sample removal	C-225
Beam Mold (three sizes)	Fill with fresh concrete to produce a concrete test specimen for flexural testing of concrete beams	C-230 C-231 C-232
Cube Mold	Used to form three 2" compressive test cube specimens	C-235
Pi Tape	Gives a fast, accurate measurement of cylinder diameter in one reading, to an accuracy of +/- 0.001"	C-196
Vertical Capping Set	Set includes all equipment needed for efficient and accurate capping of 6" x 12" cylindrical samples	C-270
Vertical Cylinder Capping Fixture (three sizes)	An aid in capping concrete cylinders, the fixture enables accurate alignment and simplifies the process	C-275 C-27510 C-27520
Capping Compound (three sizes)	Specially formulated powder for capping provides a smooth, level test surface	C-280 C-281 C-282
Padcap System (three sizes)	An alternative to traditional capping, cast urethane or neoprene padcap discs slip into solid steel receivers, which fit easily over the ends of the cylinder for testing	C-289 C-28903 C-28904

Warranty Statement

Durham Geo warrants that equipment shall be free from defects in material and workmanship for a period of **90 days** from the time equipment is put into service. In any event, the warranty period will not exceed **6 months** from the date of shipment.

Durham Geo liability shall be limited to replacement of components or equipment (at the manufacturer's discretion) that have been determined by the manufacturer to be faulty. No claims in excess of component replacement value will be recognized. Durham Geo will not be held liable for damages or lost business relating to a warranty claim.

Specifically excluded from this warranty are claims deemed by the manufacturer to have resulted from normal wear and tear, improper use, or abuse of the equipment.

Exceptions to this warranty are:

Steel Frame	Lifetime Warranty
Motor & Pump	1 Year Warranty
Electronics	9 Month Warranty

For a complete warranty disclosure, please call 1-800-837-0864 📞 (outside Georgia, USA) or (770) 465-7557 📞 (inside Georgia, USA) or refer to the printed statement on the back of any Durham Geo original invoice.

Information Record

Frame Model #: _____ Digital Readout Model #: _____

Frame Serial #: _____ Digital Readout Serial #: _____

Sold By: _____

Date Purchased: _____

The model and serial numbers, for the frame and readout, are listed on the side and back of the equipment, respectively. You will need these numbers if you call Durham Geo for service or support.

We can be reached between 8:00 am and 5:00 pm Eastern Standard Time (EST) at:

1-800-837-0864 (outside Georgia, USA)

(770) 465-7557 (inside Georgia, USA)

ATTENTION:

Please attach the following drawings:

- 2594 Assembly, Spherical Seat (1 page)
- 2607 Assembly, CM-200 Load Frame (1 page)
- b2607 CM-200 Concrete Load Frame Ass'y (3 pages)
- 2590 7.0 x 3 x 4.0 Hydraulic Cylinder (1 page)
- b2590 7.0 x 3 x 4.0 Hydraulic Cylinder (1 page)

NOTE: Discard this sheet and attach the above drawings in the order above!