CROSSHOLE SHEAR WAVE ENERGY SYSTEM WD7501

since 1988
allied
Associates
GEOPHYSICAL LTD

WARRANTY

1. Allied Associates Geophysical Ltd (AAGL) products are fully tested in our workshop both during construction and after completion and are dispatched in full working condition. Instruments are guaranteed for 12 months from the date of dispatch from the factory, liability being limited in accordance with clause 9 of the General Conditions for the Supply of Plant and Machinery for Export (UN Economic Commission for Europe, Geneva, 1953).

2. When unpacking, please check the contents against the packing list and inspect for damage and malfunction of any kind. In the case of any defect, inform the carrier immediately and report in full to AAGL or their local agent the extent of the damage. Await their reply before taking any further action, except in exceptional circumstances.

3. Should a fault be identified that cannot be remedied on site within the guaranteed period, consult with AAGL. Normal procedure will be to return the unit (or complete system if necessary), carriage paid, to AAGL for inspection and repair or replacement free of charge, provided the fault has not been due to misuse.

4. As far as possible use original case and packaging material for return of the instrument. Equipment is on occasions subject to very rough handling during transit and AAGL cannot be liable for damage due to faulty packing.

5. It is the responsibility of the customer to notify AAGL or their agent of defect or damage to the equipment within a reasonable time of receipt. We would recommend that any defect or omission should be notified verbally but with written confirmation no more than 72 hours after receipt of the product.

6. Allied Associates Geophysical Ltd will take all necessary steps to rectify any failure, which is deemed the responsibility of the manufacturer, as quickly as possible.

7. No liability against consequential loss can be expected under any conditions.

Thank you for purchasing the Crosshole Shear Wave System.

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Published by Allied Associates Geophysical Ltd.
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Blackburn Road
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Printed in Great Britain

INTRODUCTION

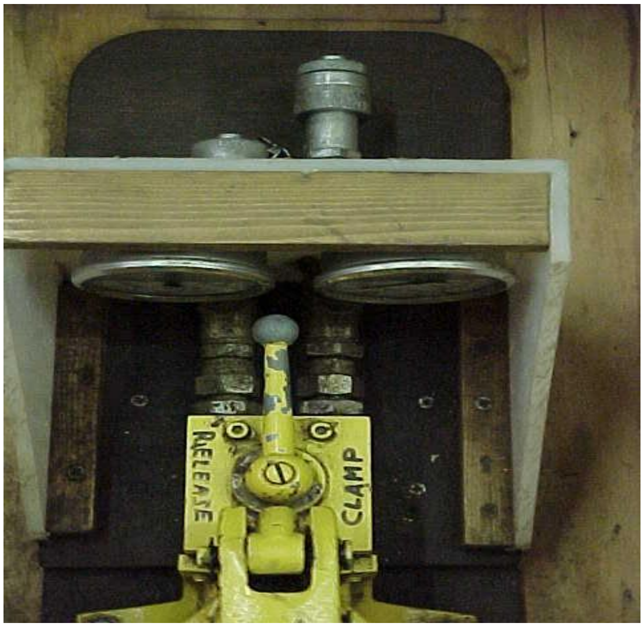
The Crosshole Shear Wave System.

The Crosshole shear wave system offers the user the ability to generate, identify and measure shear waves for velocity measurements. Designed for borehole to borehole applications the Shear Wave hammer is traditionally used with borehole geophone devices and a recording seismograph.

It is known that Shear Wave velocities are useful in foundation studies, soil and rock mechanics, earthquake engineering and other branches of civil engineering and can determine dynamic elastic moduli of undisturbed soil and rock.

Shear wave velocities provide vital data for analyzing the stability of soil structures such as dams, assessing the safety of soils for construction projects, mine openings and underground structures.

Principle of Operation

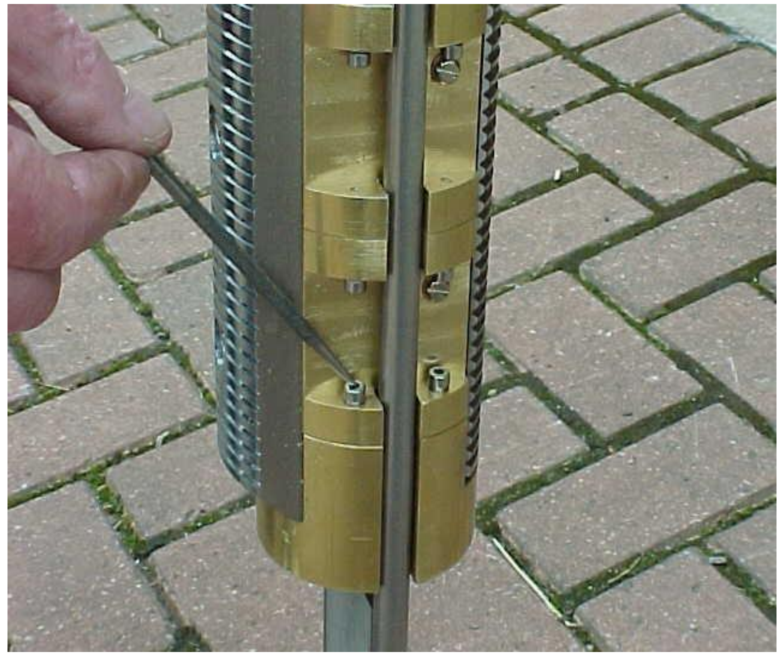


The shear wave hammer system employs a simple mechanical principle whereby the hammer is lowered into a borehole to the desired depth and is clamped in situ by means of a moveable plate which extends out from the hammer body. This plate is activated by a hydraulic pump at the surface, with fluid transferred by hose from the pump to hammer. The pump is fitted with a diverter valve to direct hydraulic fluid to one side or the other of three double acting pistons built into the body of the hammer which extends the moveable plate (to clamp the hammer in the borehole) or to retract it (to release the hammer) when it is required to move it up or down the borehole. A mid position of the valve isolates the pump from the hoses.

The shear waves are generated by a striker consisting of two metal plates connected by two steel rods which run in grooves along the length of the hammer body. The striker is moved sharply upwards and downwards manually from the surface by means of a wire rope attached to the top of the striker.

Maintenance

Hammer main assembly.



Whilst the hammer body is a series of complicated engineered blocks, the combined assembly offers a simple mechanical device which if treated with care will offer trouble free operation, provided some basic rules are followed.

Due to the nature of operation of the hammer both internal pressure and external mechanical impacts may cause loosening of bolts employed in the hammer construction as illustrated. It is recommended that regular and routine inspection (before and after a survey) is carried out to the overall assembly. This will alert the operator to any issues which should be rectified before use or storage of the hammer. Failure to adhere to this may result in hydraulic leaks within the hammer body.
Allen keys and a suitable socket are enclosed with your hammer for such basic maintenance.

Hydraulic pump

The hydraulic pump is a standard Enerpac system which under normal conditions offers maintenance free operation. Should it be required to top up the fluid in the hammer system (due to oil leaks) it is strongly recommended that Enerpac hydraulic fluid is used otherwise the warranty of the pump will be invalidated. Since the hammer system is a comparatively low-pressure system it is most unlikely that standard operation will put excessive working pressures on the pump or hammer system.

Hydraulic hose

The hydraulic hose is expected to be maintenance free due the low-pressure nature employed with the borehole application. Mechanical damage due to mis-handling or storage is however an area where damage could be experienced especially if the hose is kinked.

Couplings employed on the hose, Which are standard industry hose fittings, will suffer from damage should sand or grit be allowed to enter the couplings.
This could prevent the couplings from sealing when connecting them together, which could result in the ball valves in the couplings not opening and thus not allowing oil transfer through the coupling. Alternatively grit could prevent the ball valves closing when the couplings are separated resulting in leakage of hydraulic fluid. Allowing grit to enter the hydraulic fluid could result in expensive internal damage to the internal parts of the hammer.

Care should be taken to avoid any such ingress of grit or debris.

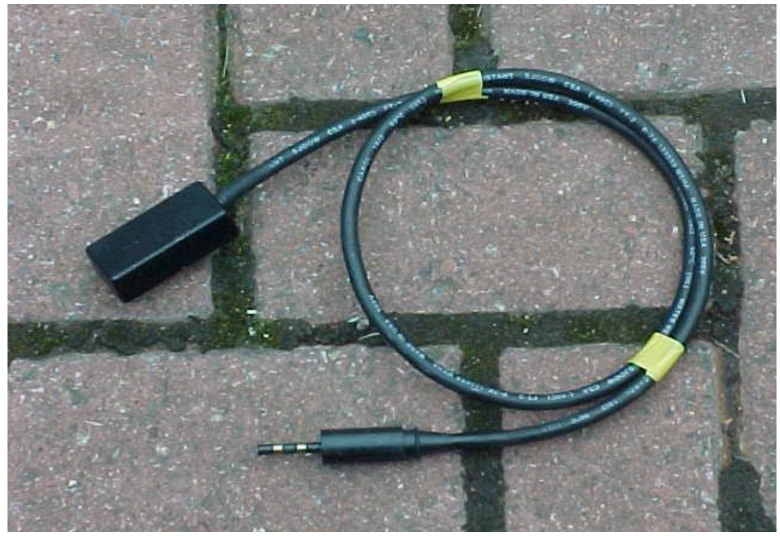
Suspension cable

The wire suspension cable used to support the hammer assembly is of multi strand construction. Visual inspection is

required to ensure no strands are broken as this could cause wear to the hose. It is also important to assemble in the correct way as indicated by the picture on the left. The nut on the cable bolt is shown to be on the opposite side to the hose, which is important as the striker assembly moves up and down in relation to the hoses during operation. This assembly configuration minimizes the potential for wear to the hose.

If the hose is to be assembled and disassembled care should be taken to ensure the central bush is inserted between the outer plates as illustrated. This bushing offers better seating for the cable thimble. Several spares are included with the hammer should these be lost or damaged.

Trigger cable



The trigger cables supplied Are fitted to the top of the Hammer body as shown and Provide satisfactory triggering of the seismograph. Depending on conditions the operator may need to adjust the sensitivity of the seismograph triggering circuit to ensure no mis triggers are received.

Operation of the Hammer

AAGL ship equipment in an operational state, however we are unable to compensate for freight handling, which has in the past caused damage to equipment during transit. It is therefore a sensible procedure to inspect equipment prior to unpacking and assembly.

In the case of the hammer source look out for excessive oil leaks to hammer, hose and pump. If shipping cases appear to have received damage during transit this may indicate rough treatment of the shipment, which could lead to damage of the system itself.

This may simply save you time assembling defective equipment, which will not operate as designed.

Assuming that the inspection of the equipment has revealed no faults, proceed with the assembly of the system as follows:-

1. Fit the wire rope to the hammer.

    a. Remove the Nyloc nut from the M8 bolt at the top of the hammer support plates and carefully pull the bolt out taking care not to lose the spacer, which fits onto the bolt between the two plates.

    b. Place the spacer into the thimble on the end of the wire rope and position the thimble between the two plates.

    c. Insert the M8 c/sk bolt through the holes in the top of the support plates and through the spacer, which is inside the thimble on the wire, ensuring that the bolt is inserted in the same direction as the two bolts through the lower holes. This will prevent abrasion to the hydraulic hose.

    d. Fit the nyloc nut onto the bolt and tighten firmly.

WARNING. *When handling the hydraulic hose take great care to ensure that no grit or dirt enters the couplings as this can cause oil leaks or even malfunction of the hammer.*

2. Unreel sufficient of the twin hydraulic hose to enable the hoses to be connected to the oil tubes on the hammer. Ensure that the gland nuts at the joints are fully tightened,

as the valves inside the couplings do not open until the nut is fully seated.

3. Complete unreeling the twin hydraulic hose and lay it out on the ground so that it can be lowered down the hole without kinking.

4. Connect the twin hose to the pump, again ensuring that the couplings are clean and fully tightened.

5. On the surface, before putting the hammer into the hole, check that the pump extends and retracts the clamp plate correctly and that there are no oil leaks. When satisfied, retract the clamp plate.

6. Connect the extension lead to the trigger switch and the seismograph. Test that the switch is operating correctly by tapping the brass body of the hammer. **DO NOT** tap the trigger switch itself as this will damage the switch.

7. When all checks on the surface have been completed satisfactorily, lower the hammer down the hole to the required depth using the wire rope while a second person feeds the hydraulic hose and the trigger extension lead into the hole, ensuring that there are no tangles or kinks. During this operation ensure that the wire rope is undamaged. Broken strands could abrade the hydraulic hose (and cause the operator to sustain cuts), and kinks will reduce the strength of the rope.

8. When the required depth has been reached, one operator holds the wire rope to keep the hammer on station while a second operator uses the oil pump to clamp the hammer in position in the hole. Move the switch lever to the clamp position and operate the pump until pressure is indicated on the gauge in the clamp hose, a pressure of 500psi - 34.5

Bar is normally sufficient to secure the hammer in position. Test the efficiency of clamping by lifting and dropping the hammer slider several times and carefully noting, by watching the hydraulic hose, if there is any movement of the hammer. If the hammer is not secure under load, increase the pressure from the pump but under no circumstance exceed 1,000 psi – 69 Bar.

9. Make the required number of upward and downward strokes to the hammer by sharply lifting and then releasing the wire rope.

10. Move the hammer to the next position in the hole.

    a. Move the lever on the hydraulic switch attached to the pump from the CLAMP to the RELEASE position.

    b. While one operator takes the strain on the wire rope the second operator makes a few strokes on the pump handle until the pressure on the “release” hose just moves off zero. This indicates that the clamp plate has fully closed.

    c. Raise or lower the hammer to its next position in the hole while a second operator lifts or lowers the hydraulic hose and the trigger extension cable in unison to avoid tangles or kinks.

11. When the hammer is at the next station repeat steps 8 to 10.

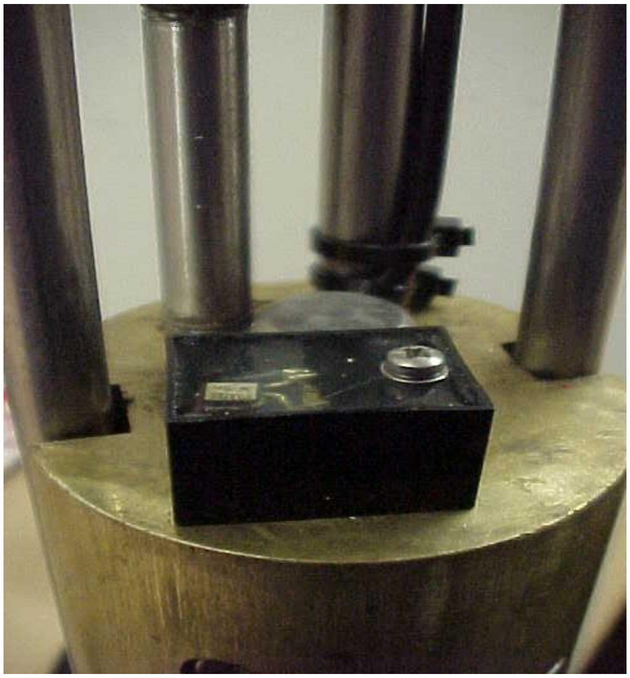
12. On completion of the measurements remove the hammer from the hole by releasing the clamp plate as in steps (10a and 10b).

13. Lift the hammer from the hole using the wire rope while a second operator lifts the hydraulic hose and the trigger extension cable, ensuring that it is laid out on the ground smoothly without any kinks.

14. When replacing the twin hydraulic hose on the reel ensure that the couplings which attach to the pump are put onto the reel first so that they are on the inside of the coils.

Trigger Switch

The trigger switch and its cable



need to be attached to the hammer body with some care to ensure reliable operation and to protect the cable from damage by the operation of the sliding hammer.

The switch has a short length
of cable with a waterproof
connector attached.
Connection to the seismograph
on the surface is by means of an
extension lead, which has a waterproof
connector that mates with the connector
on the switch lead and a connector
at the surface compatible
with the seismograph.

The switch is attached to the
brass body of the hammer as
shown in the photograph.
The switch body must be in
good contact with the body of
the hammer and secured in place
with an M3 x 25 pan head screw
and washer.

The switch lead is laid across the
top of the brass body beside the
steel anvil and upwards along one of
the oil supply tubes to which it is
fixed with cable ties at 100mm
intervals.

It is important to position the lead so
that there is no possibility of it being
struck or damaged by the slider.

<u>Crosshole hammer WD7501 Specs</u>

Diameter:	75mm
Diameter with packer:	87.5mm

Diameter with locking plate fully extended:	102mm
Diameter with packer and locking plate fully extended	114.5mm
Striker length:	1350mm
Stationary body length between impact points:	315mm
Striker travel distance:	385mm
Active weight (striker):	5.1Kg
Total hammer weight:	15.3Kg
Maximum Hydraulic pressure: Normal Working Pressure	1000psi (70 bar) 500psi (35 bar)
Locking plate surface area:	0.0112m²
Hydraulic hose length:	50m (extendable)
Wire rope length:	100m
Wire breaking strain:	580Kgf
Trigger cable length:	100m