

BSP 357 Hydraulic Hammers

Models HH3, HH5, HH7



INTRODUCTION

The BSP range of hydraulic hammers has been developed from the mid 1970's and aimed to bring the most recent technology to pile driving techniques. With more than 70 years pile driving experience, BSP have maintained a long contract with pile driving contractors and with their help have built a hammer which can meet most driving conditions likely to be encountered anywhere in the world.

As there is no exhaust these hammers can be used within pile tubes or noise reducing sleeves, therefore making pile driving in an urban environment more acceptable without reducing efficiency.

DESIGN CONCEPT

The hammer system has been designed with flexibility of use as one of the major objectives. The modular form and interchangeability of parts enables a wide range of piling techniques to be undertaken with one complete hammer system. The hammer can be tailored to suit any customer and/or piling requirement without radical changes in design and be environmentally acceptable in the modern world. It can be used in a piling lead, pile frame or freely suspended. The design incorporates either solid or segmental ram weights, and with its variable stroke control gives a wide pile driving energy range. With extra sealing and modification of controls the hammer can also be used under water to depths exceeding 100 metres.

VERSATILITY

A major benefit of the BSP hydraulic hammer is its versatility and it is suitable for driving all types of steel sheet piles, bearing pile including steel box, steel tubular and steel pipe piles, pre-cast reinforced concrete, pre-stressed concrete and timber. It is adaptable to suit a wide range of energy and pile requirements and the modular construction with the interchangeability of ram weights etc., leads to a more economic total hammer package.

ECONOMY

BSP hydraulic hammers are not subject to any ignition difficulties when starting which occur in most diesel hammers. Even in the softest strata the hammer will maintain its driving performance. The high striking rate of the hammer even at full stroke is equal or greater than most conventional hammers, and this combined with its excellent driving performance reduces operating time.

THE HAMMER SYSTEM

The basic components of the hammer system are

A. HYDRAULIC HAMMER The heart of the BSP hydraulic hammer system is the hydraulic actuator which is coupled directly to the ram weight by means of resilient mountings. The hydraulic actuator is activated by switching a solenoid operated control valve enabling hydraulic fluid at high pressure to accelerate the piston rod. When the piston rod has moved upwards to a pre-determined distance dependent on stroke height required, the inflow of high pressure fluid is ceased. Hydraulic pressures within the actuator then equalize allowing the ram to decelerate to the top of its stroke. The hammer ram then free falls onto the pile or pile helmet repositioning the piston rod ready for the next stroke.

B. THE RAM WEIGHT Segmental or solid ram weights are in the standard form either 3,5 or 7 tons weight. The basic segmental form is 3 tons and then additional weights of 2 tons each can be added to allow the ram weight to be extended to the 5 and 7 ton forms.

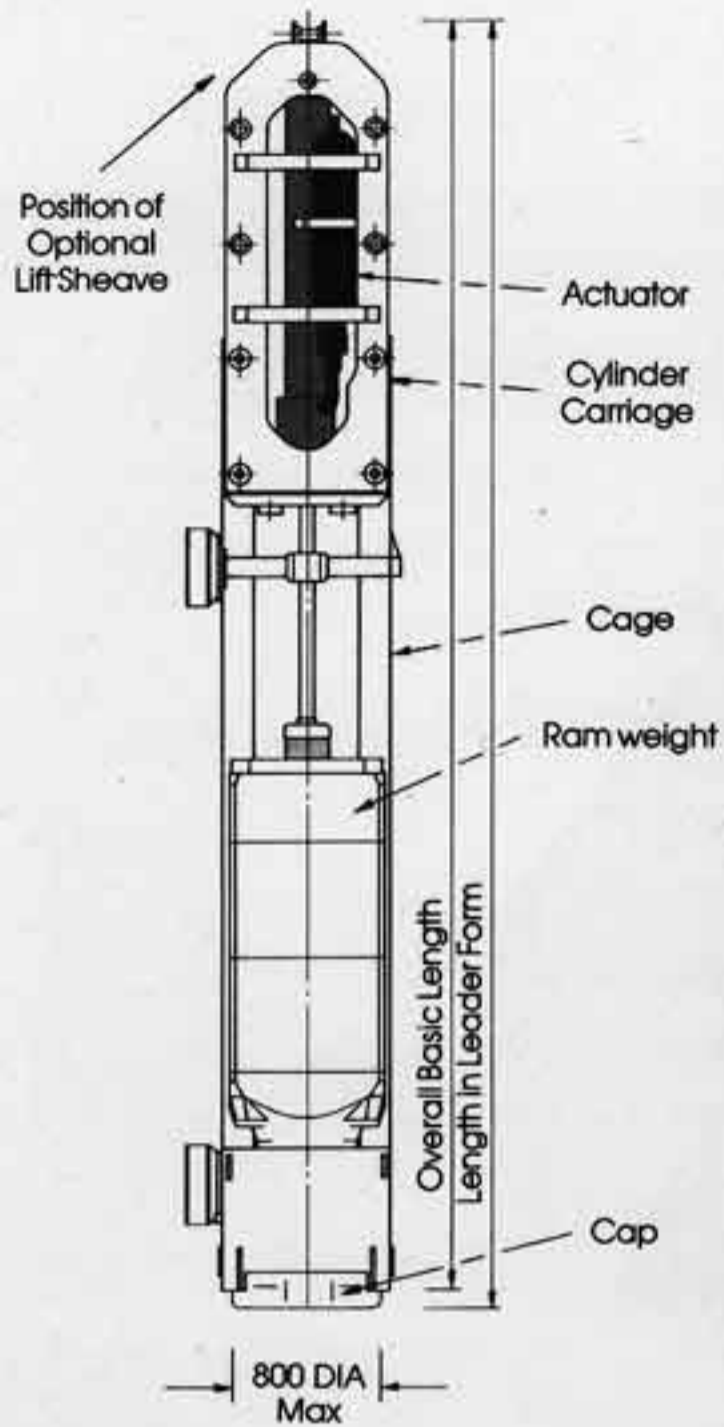
C. THE SUPPORT CAGE The rigid cage by which the actuator is supported and the ram weight guided is formed from longitudinal corrugated sections which are matched to ram weight size. These cage cords are simple and easy to fit into position. The cage is of a simple design and can be fitted with back guides to suit all types of lead-in masts and also has suitable lifting eyes for suspension work if necessary. The cage cords are fitted with various fixings so that suitable pile driving legs and inserts can be placed on the hammer to suit varying piling needs.

D. HAMMER CONTROL The hammer system is controlled by a remote electric hydraulic system which allows for both manual single blow operation or fully automatic mode. The drop height of the ram can be varied from between 0.2 and 1.2 metres even during a driving cycle, therefore permitting a high degree of energy variation to suit any sort of piling or soil condition. When an automatic sequence is chosen the hammer blow rate will normally be in the region of 40 blows per minute at maximum stroke height, but this number can vary depending on the ram weight and stroke height chosen. The controls are normally mounted in the driver's cab but can be at other isolated positions if required.

When BSP hydraulic hammers are used for underwater work the controls are normally situated in a separate cabin which can easily be placed on a barge or work boat deck. They also include blow recorder, stroke indicator and inclinometer so that a complete record of the hammer situation and performance can be maintained at all times.

E. THE POWER SOURCE The power source for the hammer depends upon the base machine on which the system is to be placed. At the present time more hydraulic excavators and cranes are being produced and it is easy to fit either a hydraulic pump or to utilise a power take-off from the hydraulic base machine. Should a hydraulic base unit not be available, then the hammer can be powered from a separate diesel hydraulic power pack which can be mounted on the rear of the base machine.

Leader Operations



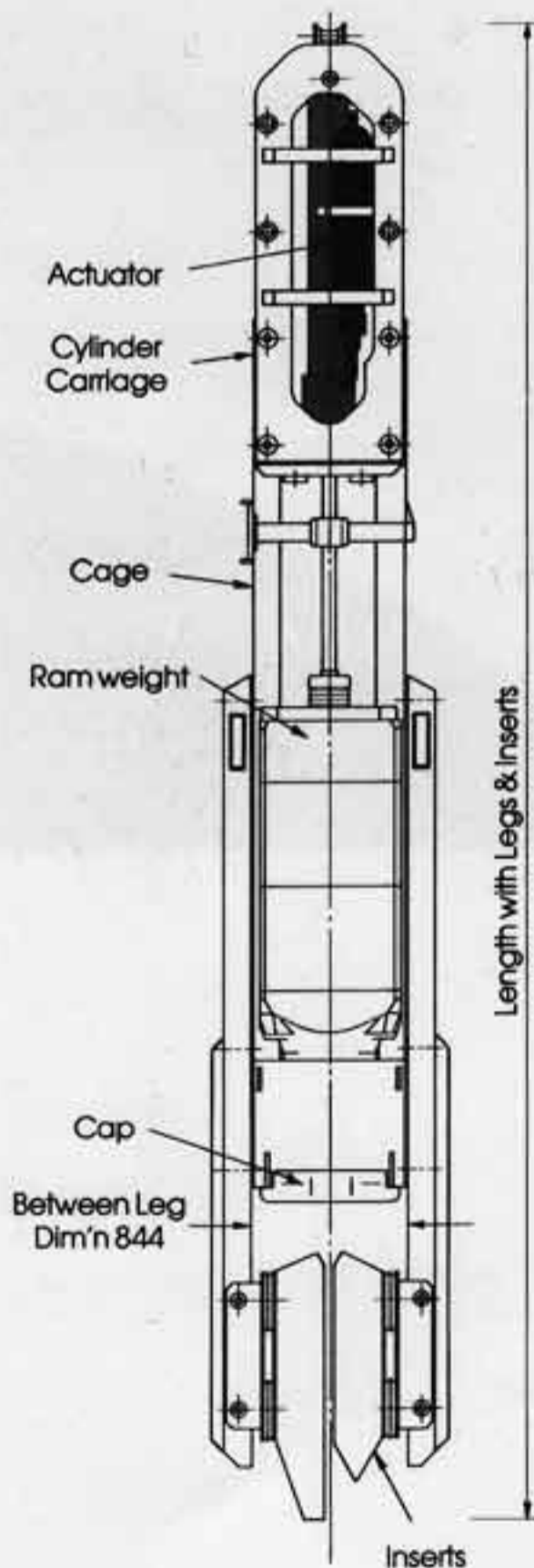
Technical Data

Hammer size		HH3	HH5	HH7	HH9
Ram weight	Tonne	3	5	7	9
Ram stroke	Metre	- (Variable 0.2 to 1.21) -			
Energy at max stroke	Kgm	3600	6000	8400	10800
Blow rate at max stroke	bpm	46	42	40	32
Basic hammer weight	Tonne	5.25	7.25	9.25	11.25
Drive cap weight simple flat form	Tonne	0.99	0.99	0.99	0.99
Overall length basic hammer	Metre	5.20	5.80	6.40	6.40
Overall width basic hammer	Metre	0.76	0.76	0.76	1.25
Overall depth basic hammer	Metre	0.82	0.82	0.82	0.82
Hydraulic operating pressure	Bar	160	210	240	265
Hydraulic oil flow rate	Lit/m	152	180	190	190
Hose weight (full) per metre	Kg	10	10	10	10

Weights & dimensions of hammer equipped for leader operation

Total weight excluding hoses	Tonne	6.30	8.30	10.30	12.30
Overall length with flat cap	Metre	5.25	5.85	6.45	6.45

Suspension Operations



Weights & dimensions of hammer equipped for suspension operation

Total weight excluding hoses	Tonne	7.10	9.10	11.10	13.10
Overall length	Metre	7.00	7.55	8.10	8.10
Projection of legs below pile top	Metre	1.44	1.44	1.44	1.44

Weights and dimensions for driving large diameter tubes available on request

Noise enclosure - optional extra

The enclosure is a common size for all hammers

Total additional weight to hammer 0.48 tonne leader operation

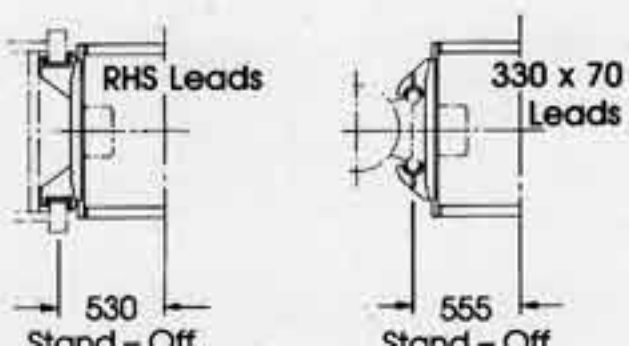
0.34 tonne suspension operation

Overall dimensions Depth 0.97m Width 0.89m

Projection below pile top 0.65m

Hydropack for 357-9 Series

Dimensions	Length 2.4m 7.87ft	Height 1.9m 3.6ft	Width 1.1m 6.5ft
Weight	Dry 2.0 tonne	Full 2.45 tonne	
Operating pressure	265 bar 3845 psi		
Variable flow at high output	190 litre/min 42 imperial gallons/min		
Engine power - typical	118 kw 158 bhp		
Engine (turbocharged diesel)	Deutz BF6M1012C		
Fuel tank capacity nominal	230 litre 51 imperial gallons		
Hydraulic oil capacity nominal	300 litre 66 imperial gallons		
Hydropack weight	Dry 2.0 tonne 4410lb. Full 2.45 tonne 5400 lb		



BSP 357-9 Hydraulic Hammers

Introduction

The BSP range of hydraulic hammers has been developed since the mid 1970's and aims to bring the most recent technology to pile driving techniques. With more than 70 years experience, BSP have maintained long contact with pile driving contractors and with their help have built a hammer which can meet most driving conditions likely to be encountered anywhere in the world.

As there is no exhaust these hammers can be used within pile tubes or noise reducing sleeves, thereby making pile driving in an urban environment more acceptable without reducing efficiency.

Design concept

The hammer system has been designed with flexibility of use as one of the major objectives. The modular form and interchangeability of parts allows a wide range of piling techniques to be undertaken with one complete hammer system. The hammer can be tailored to suit any customer and/or piling requirements without radical changes in design and be environmentally acceptable in the modern world.

It can be used in a piling lead, pile frame or freely suspended. The design incorporates either solid or segmental ram weights, and with its variable stroke control gives a wide pile driving energy range.

With extra sealing and modification of controls the hammer can also be used under water to depths exceeding 100 metres.

Versatility

A major benefit of the BSP hydraulic hammer is its versatility and it is suitable for driving all types of steel sheet piles, pre-cast reinforced concrete, pre-pressed concrete and timber. It is adaptable to a wide range of energy and pile requirements and the modular construction with interchangeable ram weights etc, leads to a more economical total hammer package.



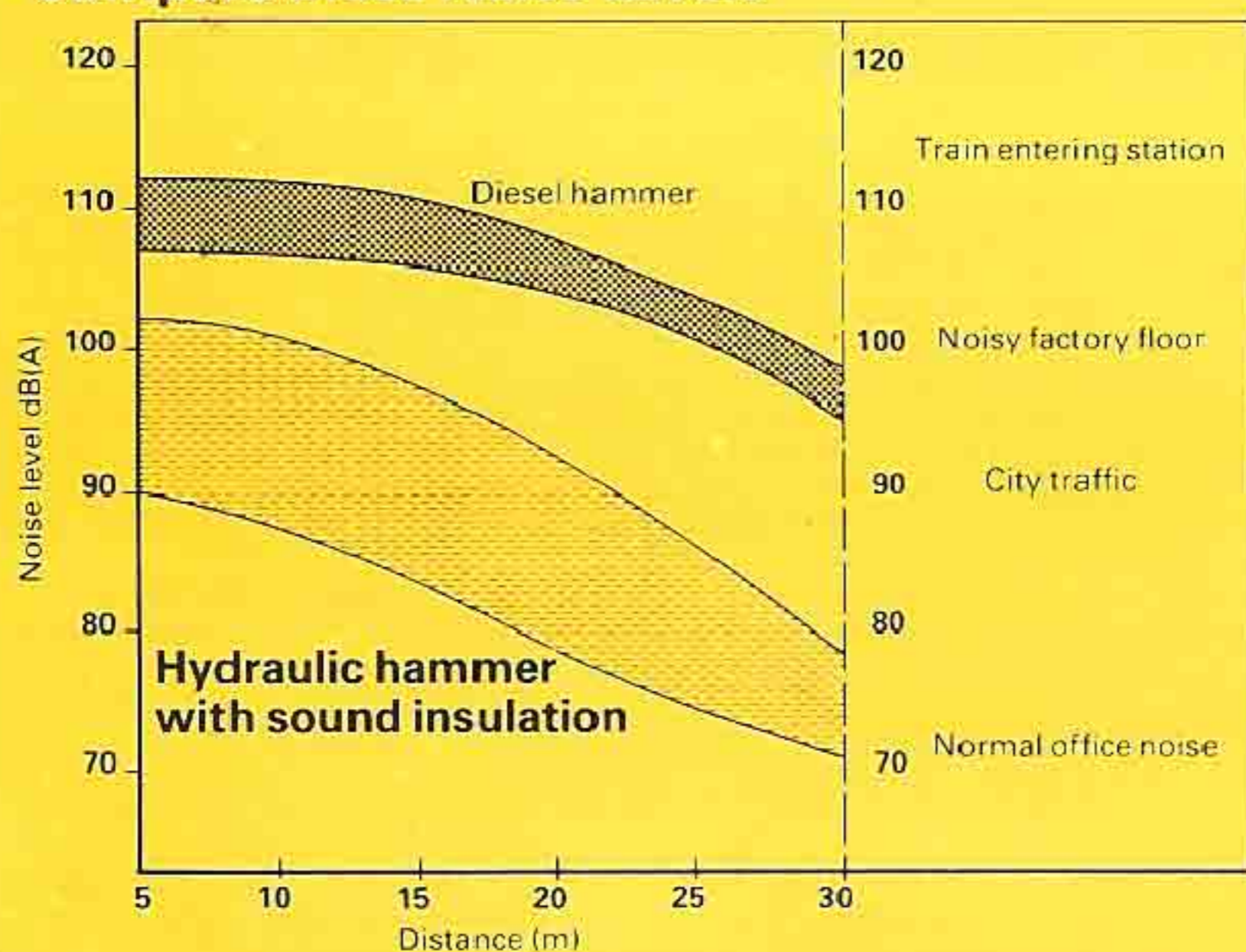
Modifications for large diameter tubes

Watson & Hillhouse have increased further the versatility of the 357-9 hammer by building a special wide leg assembly to enable 1.2m O/D tubular piles to be driven. Further modifications to the hammer by ourselves also means that it can be fitted inside a Delmag MA270 leader to drive upto 2.0m O/D tubular piles.

NOISE CONTROL

A considerable reduction in operating noise can be achieved by surrounding the striking area with a closed sound insulated construction. This can minimise noise output to well below that of diesel hammers. The BSP hydraulic hammer system features noise emission levels which are in line with Government legislation and can therefore be employed at sites in urban and residential areas without undue problem.

Compare these Noise Levels



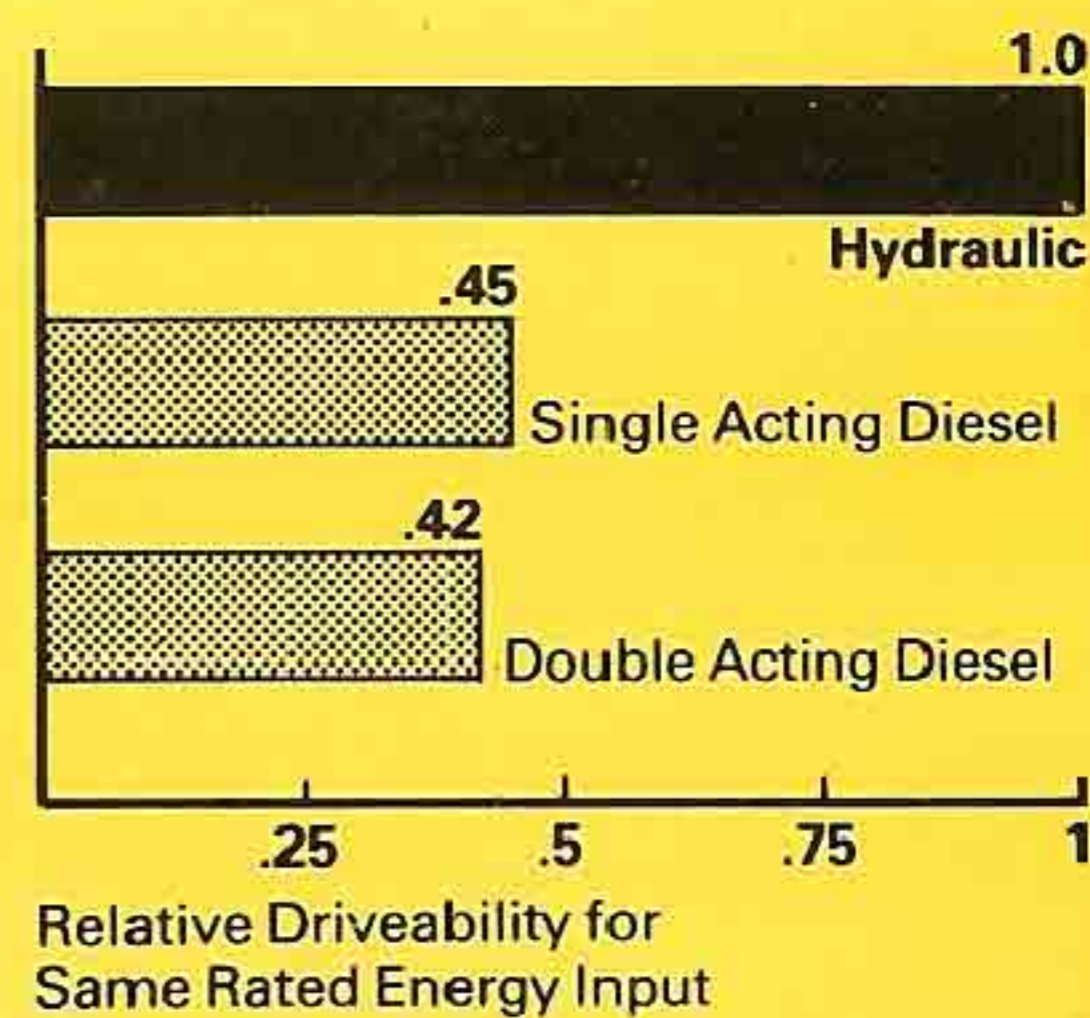
Graph of typical sound levels on and off site

ENERGY BONUS

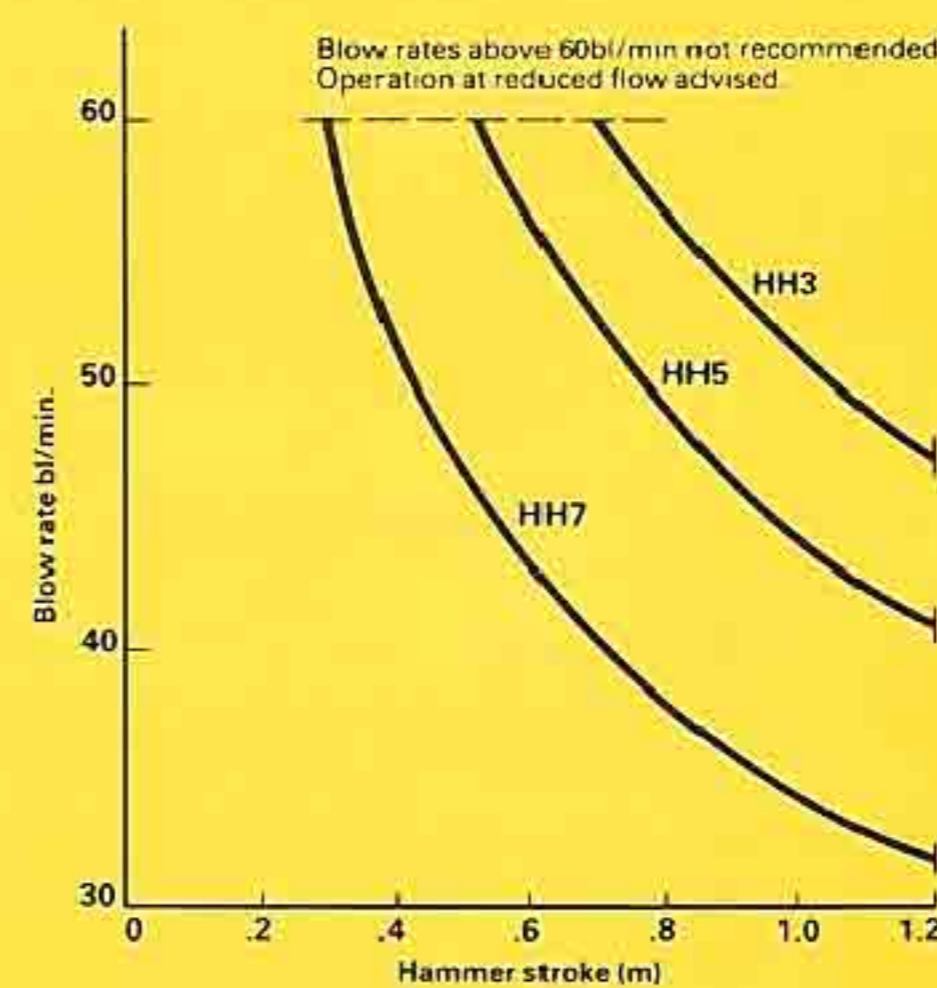
BSP hydraulic hammers provide a consistent energy input to the pile but allow a degree of flexibility should conditions alter. Recent stress wave analyses carried out compare the hydraulic hammers with known diesel hammers and show the increased efficiencies obtained.

The driving performance is exceptional and in many instances the BSP hydraulic hammer has been able to drive through hard strata where competitive diesel hammers have failed. This, therefore, ensures that the pile is driven well into and anchored into the desired bearing stratum.

Bar chart comparison of hammer type



Ram / stroke variation



SPECIFICATION

The graph on the right shows the performance of the various hammer models using a standard power source. It shows the variation in blow rate at differing stroke heights. This wide range in stroke heights enables a correct driving energy to be chosen for each pile driving and soil condition. Should a particular site require special precautions, minimal vibration levels can be accurately maintained, along with a high degree of control over stress levels imparted to the pile so that a consistent driving force is maintained.

HAMMER DATA

MODEL	HH3	HH5	HH7
Ram weight (tonnes)	3	5	7
Maximum ram stroke (metre)	----- (1.2) -----		
Ram stroke variation (m)	----- (0.2 to 1.2) -----		
Maximum rated energy (kJm)	36	60	84
Blows/min at maximum stroke	46	40	31
Basic hammer weight (t)	4.4	6.65	8.7
Drive cap weight (t)	0.6	0.85	0.85
Total weight suspended with legs & inserts (t)	5.9	8.4	10.6
Total weight leader use (t)	5.2	7.6	9.7
Overall basic length (m)	4.82	5.39	5.96
Length in leader form (m)	5.24	5.81	6.38
Length with legs & inserts (m)	6.77	7.34	7.9
Hydraulic operating pressure (bar)	160	210	240
Fluid flow rate (l/min)	152	180	162

POWER PACK DATA

Build	Skid mounted portable
Hydraulic pressure	240 bar
Flow rate	180 litres/min
Control	Remote Electro/Hydraulic or Manual
Type	Variable delivery open circuit
Weight	2000kg