PILE HELMETS

Techniques of Operation

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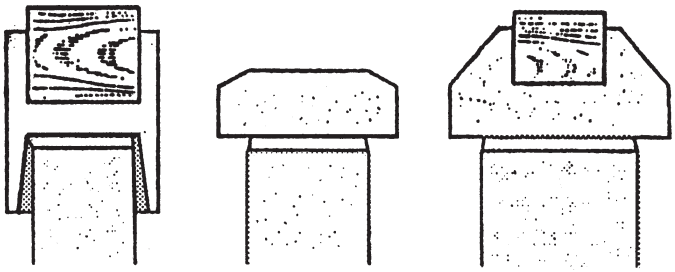
Pile helmets and striking plates should be aplied to all piles and chosen to match them. They distribule the striking energy of the pile hammers evenly on the head of the pile and thus protect it as well as possible.



Pile heimets guide pile head

Impact plates do not guide piles

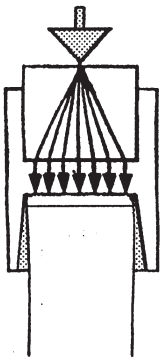
A Pile helmets

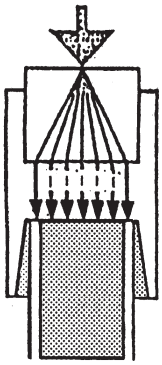
1.Chosing pile helmets

The pile hetmlt must conespond with the striking energy of the pilehammer and the size of the pile.For piles with a massive head cushion heads with a relatively thin vase can be applied.because it rests on the enture piilc head surface and the impact load is distributed over the pole head on a wide basis.

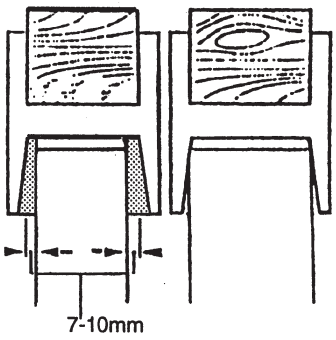
Piles or pipes with a hottow head however require a pile helmet with a thick base.Since the pile helmet only rests on the edge surtace of the pile.the striking load is alxo transmitted to only a small surface of the pite.Thus the pile hetmet base must absorb consideerably more impact load.

The pile shoulde have a clearance of about 7 t9o 10 mm in the pile hetmet all around.to assure sufficient free movement.It pile helmets fit too tight,damage to the pile head cannot be esctuded when the pile point deviates from when the pite pont ddeviates from the driving direction deviates from the driving direction and the pile head is clamped in the pile hctmet.

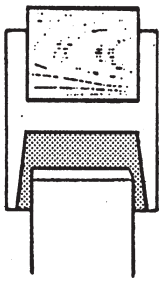




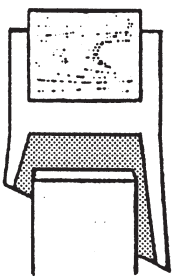
correct wrong



Pole hetmets with large bell-shapcd openings facilitate loading of pile.



without bell-shaped opening

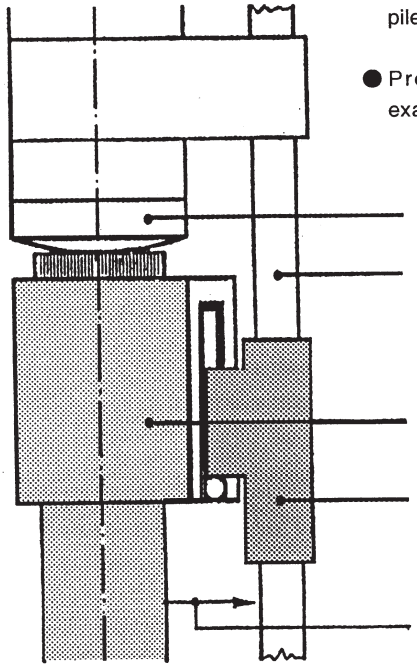


with bell shaped opening

2.Guiding of pile helmets

Basically every pile hetmet should be guided on the leaders.This will result in a number of safety factors which should mot be underestimated.

- Prevents pite hammer from falling. because pile head cannot deviate from driving ditection.
- Guides pile head exactly Prevents lateral deviation of pile head.
- Assutes constant distance between center of pioe to leader guide throughout entire pite driving ope ration.
- Prevents offset impact loads as long as the distance from pile hetmet.



to leader is matched with distance from pile hammer to leader.

- Protects pile head because of exactcentering.

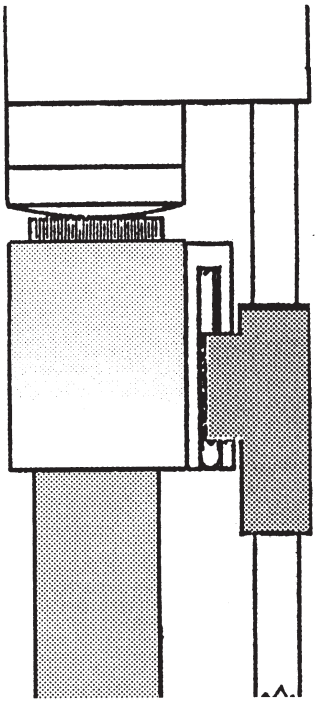
2a Separating pile helmet and guide on leader

It is recommended to keep the guide for pile heimet on the leader separated from the pile heimert.

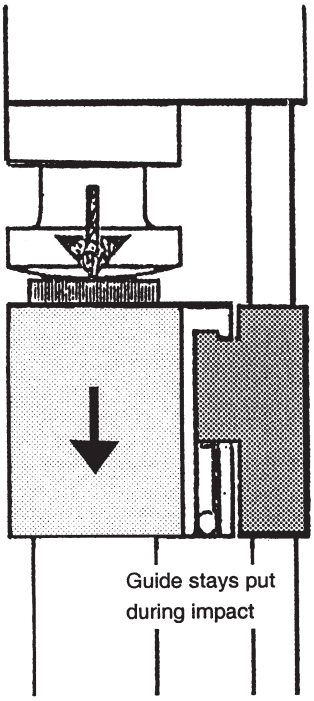
Avoid rigid connections if pwssible.
Advantages:

- The pile hetmet can be applied to any leader by eschanging the guide. and can be matched to any distance from center of hammer to leading edge of leader guide.
- Guide does mot accelerate with impact load, thus less damage on pile hemet.
- Guide can be reptaced when worn.

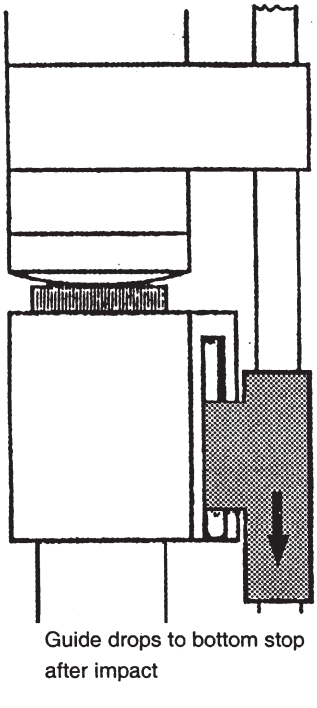
Befor impact



During impact

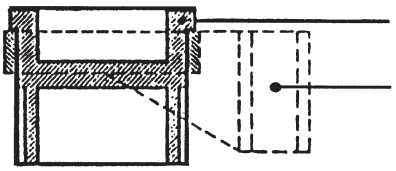


After impact

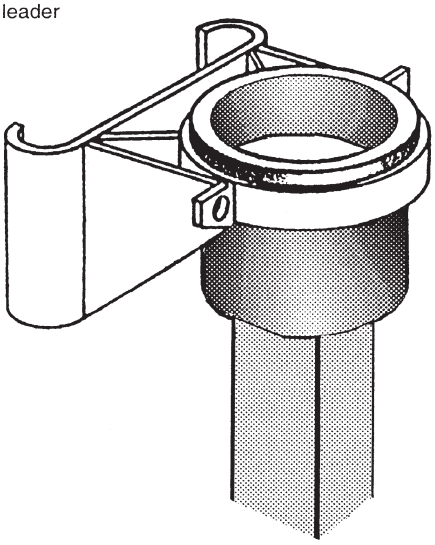


Pile helmet with holders on leader

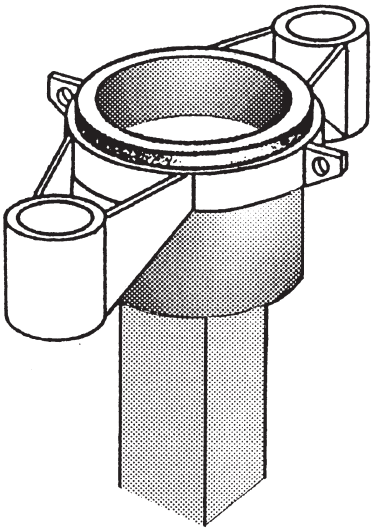
3.Pile helmet with holders on leader



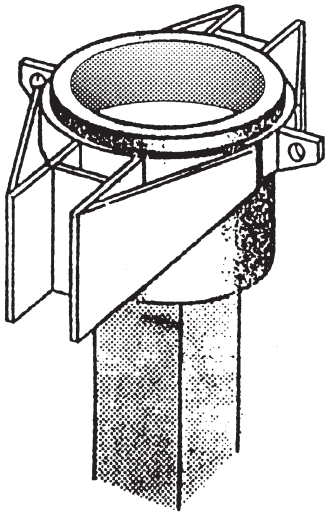
Holder for pile hetmet in front of leader



Holder for pile helmet in Dutch frame



Holder for pile heimet in U-leader



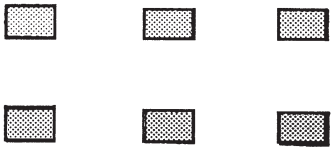
Pile helmet supended on pile driver

Design advantages

- One pile helmet holder can be used for different pile hetmet sizes.
- The pile helmet holder is easy to adapt to different leaders.
- The pile helmet can be turned in its holder.

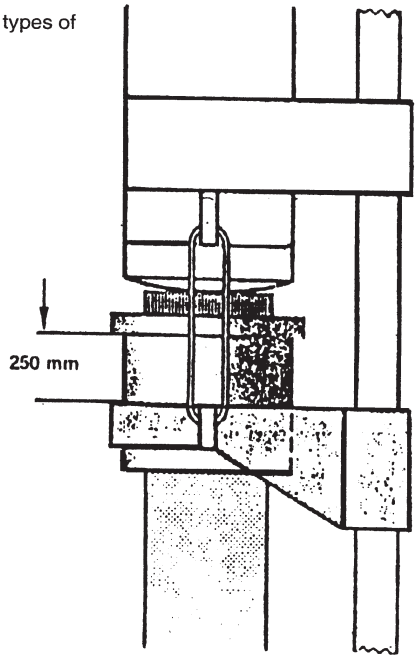
Disadvantages.

- The pile hetmets and theit holders are presently heavier than standard designs.
- If a square or rectangular pile should mot turn while drining or should be pite driven in a certain position to the other piles,the pilemust be guided with an additional pile guide.



- Clamping between the pile hetmer and its holder cannot always be avoided, bicauws the relationship between the inside diameter to the guides height is ungavorable.

- The distance from center of pile hammer to leader guide often has to be larger than for other types of pile heimets.



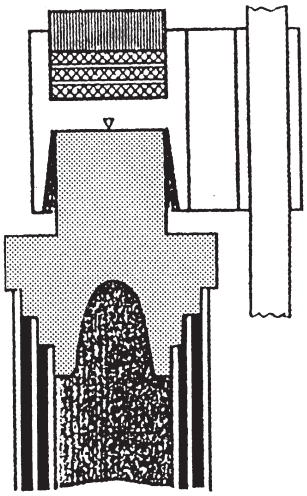
Distance should be at least 250 mm so that pile helmet does not knock against pile helmet holder when pile penctrates fast.

4.Pile helmets with inserts

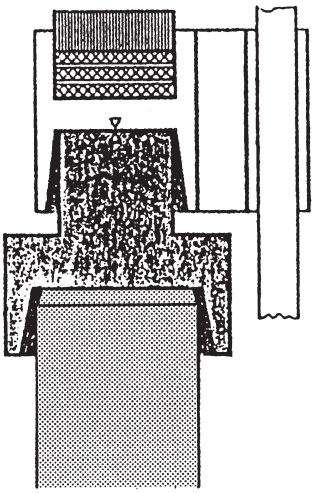
To be able to apply a pile hetmet to different size of piles,inserts corresponding with the piles are placed in the pile hetmet.
It is absolutely essential to machine the bottom surface of the pile helmet base and the top surface of the insert,when using these together If these surfaces have just slight imperfections,the pile hetmet will crack after just a short period of time.

The degree of impact and thus the amount of energy transmitted to the pile per impact blow is less for pile helmet with inserts than for those without inserts. Insert for piles Insert for sheetpiles.

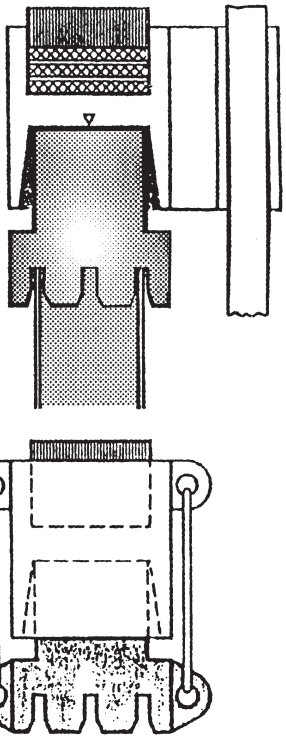
Stepped insert for different pipediameters



Insert for piles



Insert for sheetpiles

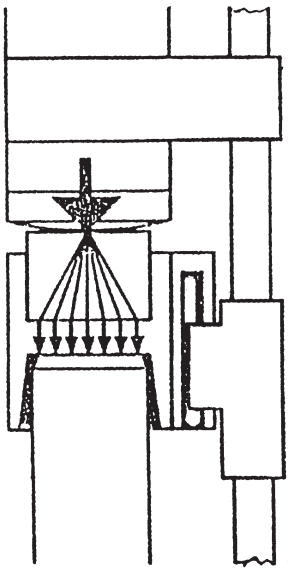


Susperend the insert with cables as close to the pile helmet as possible,so that first of all it is located in the pile helmet properly and secondly the insert cannot fall out.

5. Dollies

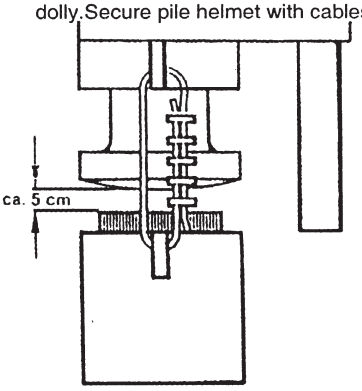
Dollies between the pile hammer and pile hetmet will produce the following effects separately or mutually.

- Absorbance of impact force for sensitive pites.
- Protection of piles on hard grund.
- As even as possible distribution and transmission of forces through the dollies to the pile helmet and pile.
- Extension of impact time through storage of impact energy in dolly.
- Extension of pile hetmets service lite.



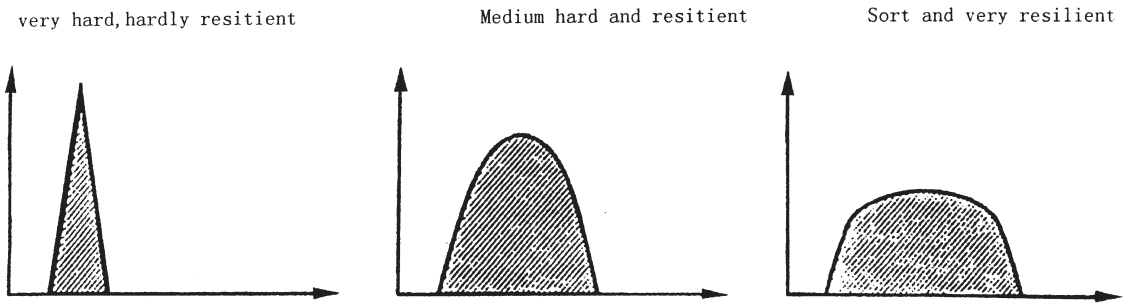
Installing pile hetmet on pile hammer

Place pile helmet on ground.Lower pile hammer with impact block run out,until the impact block is about 5cm above dolly.Secure pile helmet with cables.



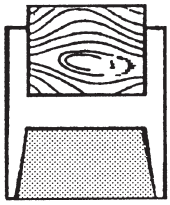
Dollies

Impact Force and impact Time for Various Pile hetmet Dollies



5a.Wooden Dolly

Appropriate for light to medium piledriving.
Replace as soom as destruction is evident or when they start to smoke and burn. if not, very much of the impact energy will be absorbed.

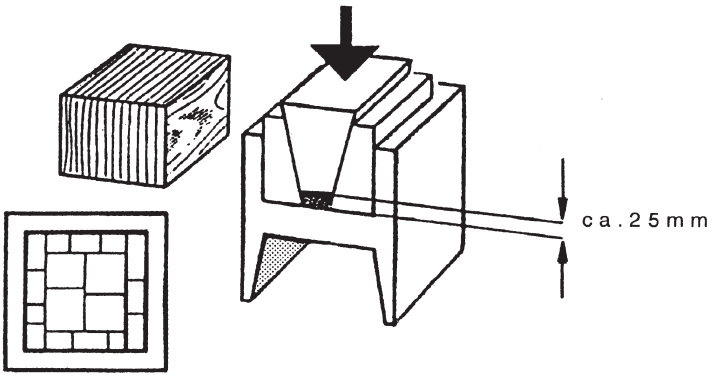


Materlal

Bongossi wood, also called assombe.
Oak rootwood.
Beech rootwood or similar types of wood

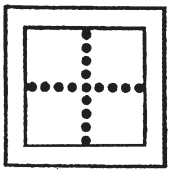
Installation

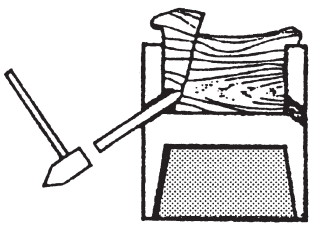
Install wood with evident grain, so that the grain direction is vertical Wood is harder in the direction of grain, is less resilient and will withstand the impact forces longer.The simplest and best solution is a three-piece dolly cut in wedges (see illustration).It is forced imto the pile helmet in one direction,fits tight and holds long.If only small pices of wood are available, the larger pieces are placed in the middle,The smaller ones are used to brace.



Removal

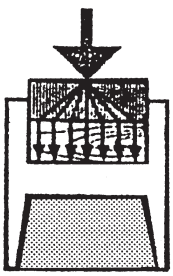
Either drill hotes in cushion according to illustation and chiesl out rest.or knock out pieces through openings on sidesof cushion head to relieve tension on wood .Thewn chisel out cush8on from above.





5b Wooden Dolly with steel Plate

For medium to heavy pile driving.
These dollies are harder than oure wooden dollies.
They last longer because the steel plate spreads the impact load over the entire dolly surtace. However their life is not as long as cushions made of plastic. resinbonded fabrics or steel cable.

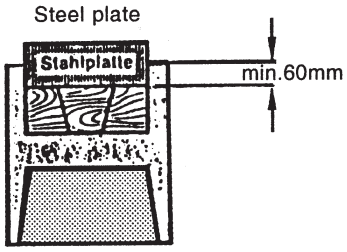


Material
Wood
Bongossi wood. also assombe. Cak rootwood Beech rootwood. or similar types of wood.
Steel Plate
(see page 6)

Installation

Install wooden dollies as descr8bed on page 5

Choose wedth and length or diameter of steel plate so that it fits in the pile helmet without lorce.

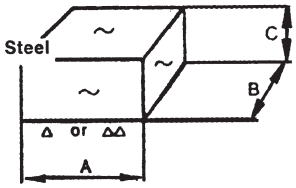


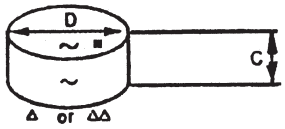
Removal

Lift steel plate and cisel out wooden dolly as described on page 5

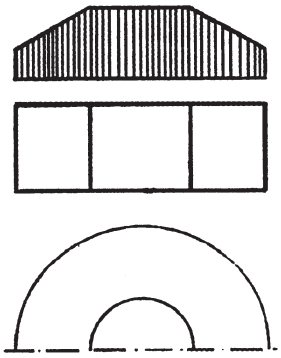
5c Steel Plate

Steel 37.11:50.3 is better. Its beating surtaces must be machined. It should fit at least 60 mm deep in pile heimet.





Wide steel plates or such with large diameters are made up according to the illustrations. In spite of their large size they are mot lidely to break. because the. material thins out loward the circumference and thus loads hear are weaker.



Steel Plate Thickness

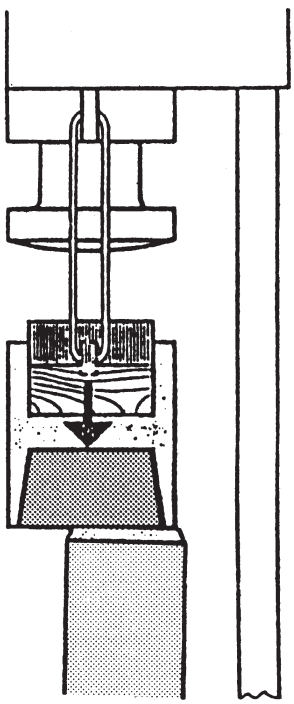
Impact Energy per blow	Widh x Length A x B	Dia. D	Thickness C
up to 3500mkg	400 x 400	to 420	100
up to 10000mkg	550 x 550	to 600	160
up to 15000mkg	max.500 x max.800	to 800	200
up to 20000mkg	max.600 x max.1200	to 1310	300

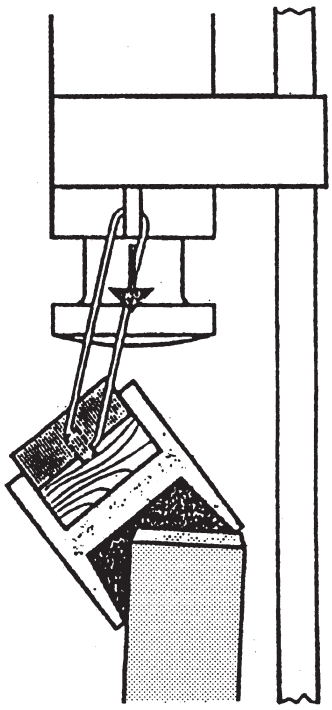
Securing Steel Plate

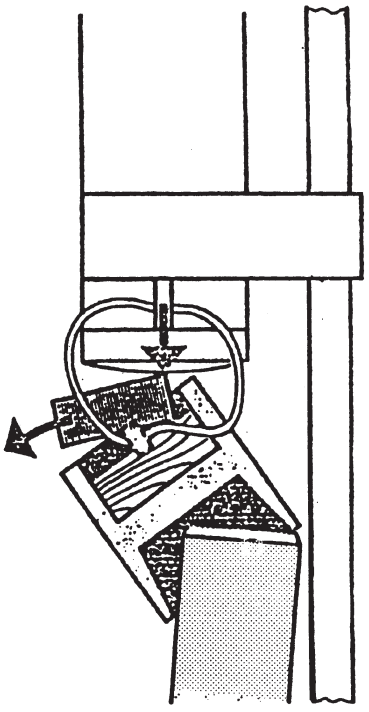
If a steel plate is used to cover a wooden or plastic dolly,measures must be introduced to prevent it from falling out of the pile heimet.

This could happen when the pile helmel is mot guided on the leader When lowering the pile helmet,its edge could hit a pile and it will then tip rorward or sideward.

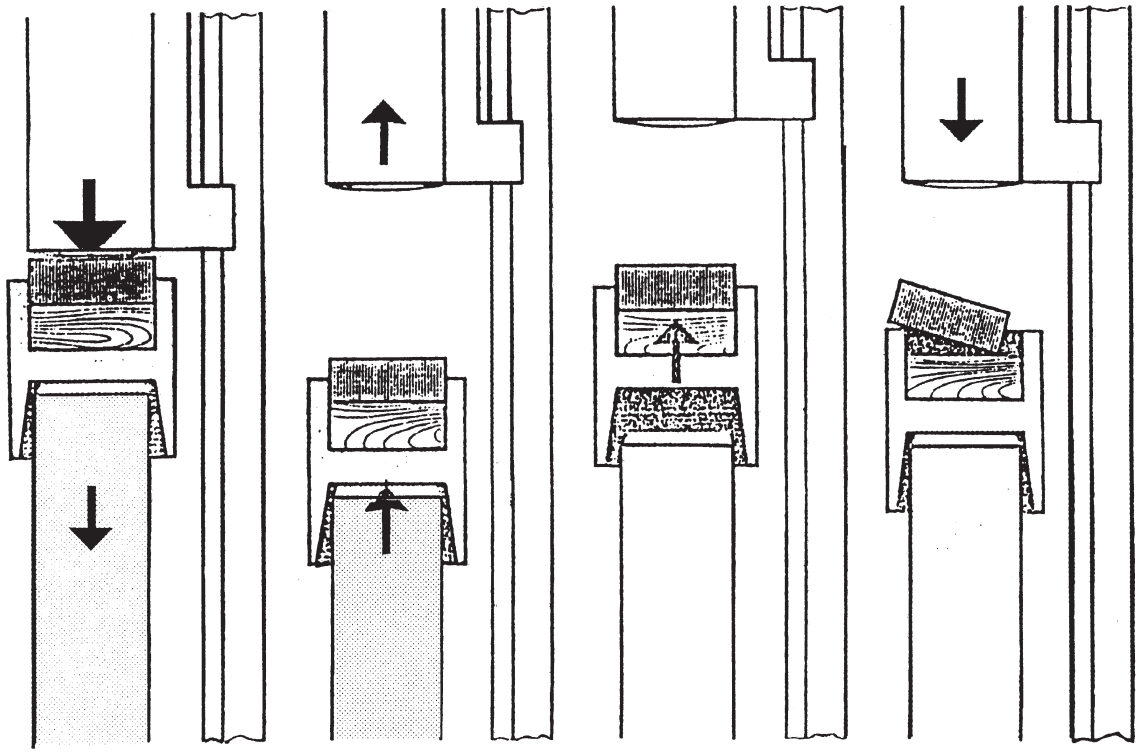
The hammer,which is applied to the inclined steel piate,could tilt the plate and cause it to tall down.







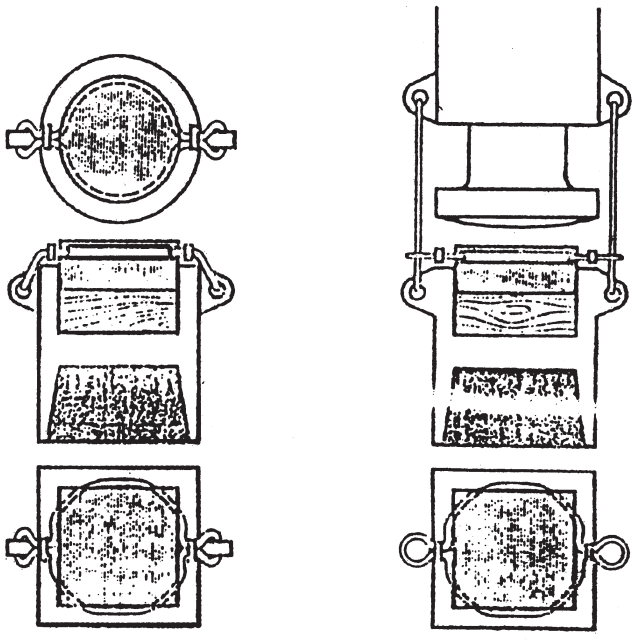
When using free talling or hydraulic pile hammers on very resilient piles and ground, the hammer could lift off of the pile hetmet before the pile has resiliated.The resiliating pile will knock up the pile hetmet,lilting it off of the pile.When falling back it could knock out the steel plate.



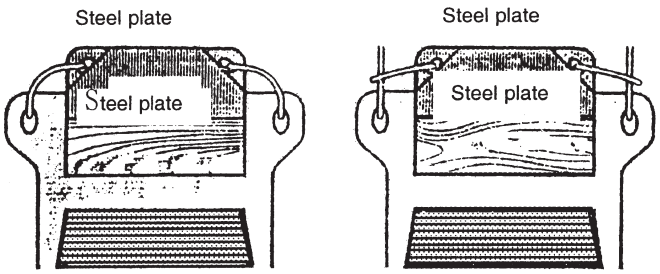
The steel plate is secured either direct to the pile hetmet or via the retaining cables, with which the pile helmet is suspended on the pile hammer and remains connected.during the entire pile driving operalion.

Place a steel cable in the steel plate·s machined groove and pull it through the eyeelets of the pile helmet.
Tighten the steel cable with cable clamps until it fits tight in the stteel plate,s groove.

Place steel cable in steel plate·s machined groove and connect with cable clamps to produce two eyelets on both sides.However cable must fit tight in steel plate·s groove.
`The retaining cable connecting the pile helmet with the pile hammer is then pulled through the eyelets.



If the steel ptates are cast. it is recommended to cast two eyetets too. Don·t weld eyelets. The welding seams would break atter just a short period of time due the extra ordinart impact force.
Steel piate Steel ptate



5d Plastic or Resin Bonded Fabric Dollies

For medium to heavy pile driving. These dollies are less resilient than wood and thus have better degrees of impact.However both pile helmet and piles are subjected to higher loads.

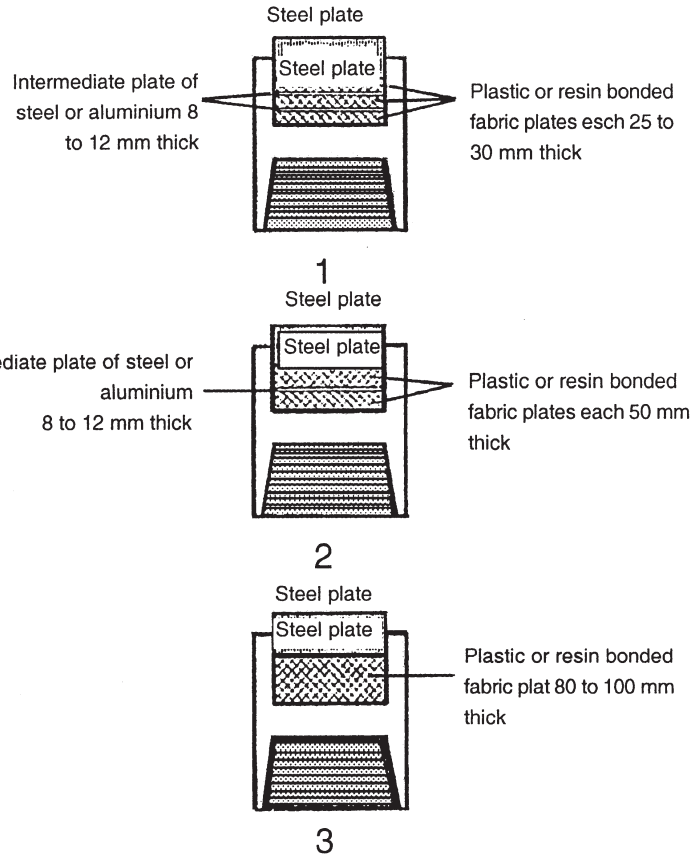
Material

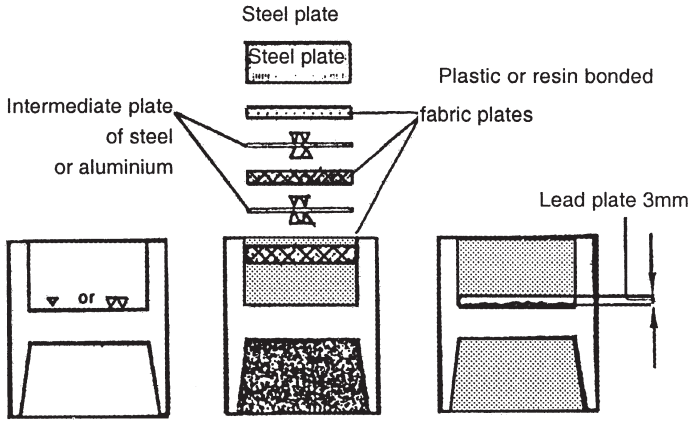
Plastic Plates

Polyamide (nyion),known under brands Sustamid Plus,Endura.
Green Makrolon,Lesan.
Ultramid,Durethan
Resin Bonded Fabric Plates
Novotes
Resitex
or similar
For light to medinm pile driving the fabric used in bonded fabric dollies can be wol or cotton.Fpr jeavy pile drining sandwiched asbestos is best.Asbestos sbsorbs much heat and will mot burn.Metal inserts will improve the strength and carry off heat.

Design

Plastic dollies always require steel plate and depending on design intermediate plafes of steel or alumiium.
The assembly of illustration 1 is very favorable. The heat is carried off sufficiently and espenses are relatively low as well.Of the esamples illustrated.illustration 1 shows the most resilience,illustration 2 theleast.
Important! The base of the pile hetmet. as also the surfaces of the stddl plate and intermediate plates.must be machined to prenent the plastic plates from breaking during the first impact blows .Broden plates disintegrate quickly and destroy very much impact energy. If it is mot possible to machine the ushion head·s base, place a 3 mm thuick lead plate between the base and the first plastic plate.
The lead will compensate the roughness of the base duruing the first impact loads and os an escellent bearing surface for the plastic plates on top.

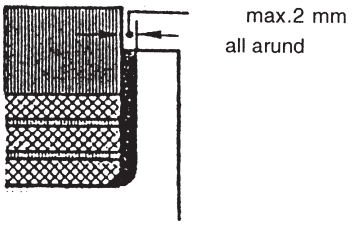




Dolly between pile head and pile helmet

Usually the corners between the base and walls of the pilw hetmet are rouned .The edges of the bottom plastic plate must be chamfered,so that it rests flat.
Produce the separate plates for the dolly wo that they can be inserted in the pile helmet without force.

Secure the steel plato as described on pages 6 trough 8



5e Steel Cable dollies

Appropriate for medium to heavy pile driving.These dollies have an extraordinary long service life,but are also very hard -especially if compactt cables are used.The degree of impact is strong,the resilience weak.Both pile helmets and piles are subjected to heavy forces.

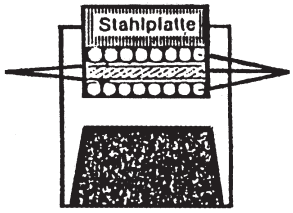
Design

Steel cable dollies always require a steel plate as well as intermediate
Plates of steel.The plates need not be machined; it is sufficient that they be flat. Place first layer of cable pieces in one directiopn, second layer in cross direction and third layer same as first later.See illustration for layers of dolly.

Material

Pieces of steel cable 25 to 30 mm in diamerer. Don·t cut pieces of steel cable with a cable cuters, but instead with a wilding torch to prevent the ends from unwinding Pieces of steel cable with a hemp core will initiallt be more resilient than those with a steel core . Cut steelcaabees to lengths which will fit in the pile helmet without binding.

Intermediate plate of steel 12 mm thick



steel plate Steel cable pieces 25 to 30 mm dia.

6.Dolly between Pile Head and Pile Helmet

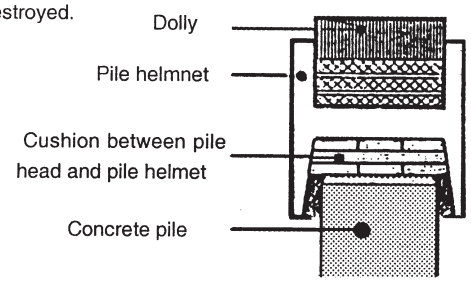
Concrete piles and other similarly sensitive piles can only be driven.if a cushion is placed between the pile head and the pile hetmet.This will assure,that

- the roughness of the pile helmets base and the pile head is compen sated,
- the impact forces are transmitted evenly throught the pile head into the pile.
- the impact peak forces are eliminated,the impact time exlended and
- the pile head is protected and not destroyed.

Best experience has been made with dry fir or spruce wood.Importan!The wood·s grain must always run horizontally.The result is

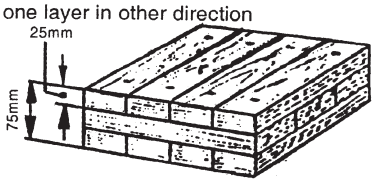
- better resilience,
- better and puicker adaptation of cushion to pile head and pile hetmet base.
- faster elmination of impact peak forces,
- extension of impact time and protection of pile head.

Depending on ground conditions,soft or hard,and total driving time.short or long.the thickness of the cushions varies between 50 and 150 mm
.Soft or hard.and total driving time.the thickness Hard ground and long driving time 100 to 150 mm cushon thickness.



Deaign

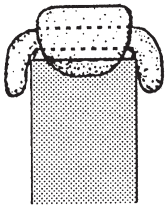
Alternately one layer in one diretion and one layer in other direction



Soft plywood can also be used as a dolly for presfressed concrete piles in soft gtound an dwith short driving times.However the dolly should be at least 25to 30mmthick

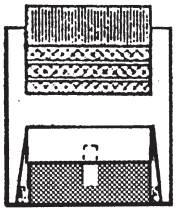
Dollies made of natural or synthetic rubber have alsoproven themselvers for operations which are not tooo heavy.But they are considerably more expensive than wooden dollies.

Paper bags or plastic sacks filled with wood wool are also excellent dollies.Place two filled sacks across each other and then place in pile helmet.The bottom pile helmet opening must however be chosen larger than usual,so that the sacks have enough room on the sides.the sacds are pressed together.



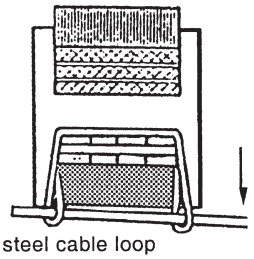
Securing Cushion Plates in Pile helmet

The plates used as a dolly must be cut large enough that they have a slight press fit in the bottom opening and still are flat against the pile helmets base when the pile helmet is placed on the pile.Dollies will tilt if they do not have a slight press fit in the pile helmet opening.



Removal

Experience shows that the followig soluion ia best. Insert a cable loop.as illustrated, when installing the doly .Affer driving a pile.place a steel rod through both loops and then pull down on rod. The tight fitting dolly can be removed easily.Acable can be used for many dollies.



Ca.6mm dia. steel cable loop

BImpact plates

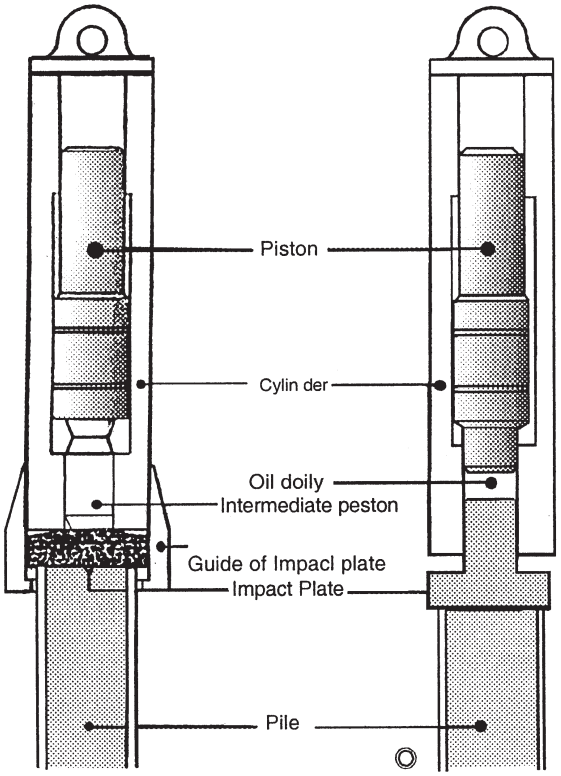
Impact plates are mainly applied to rapid stroke pile hammers and false leaders.

1.Impact plates for quick acting pile hammers

The impact plate for quick action pile hammers has no dolly .Usually transmitted from the piston via an intermediate piston and the anvil to the pile.The anvil is held in location by an anvil guide . In some special cases the impact is transmitted to the anvil via an lil cushion. The neck of the anvil is located in a cylinder,like a piston, and also serves as an oil seal.

2.Impact plates for roope suspened leaders

Steel on steel cannot be driven with these impact plates because of the large forces per impact bolw which have to be transmitted to the pilr via the anvil.The same cushions are used as those for pile helmets. The shape and sizes must match the pile size and force per impact blow of the pile hammer. Installation of dolly and securing of steel plate as described on pages 6 trough 9.



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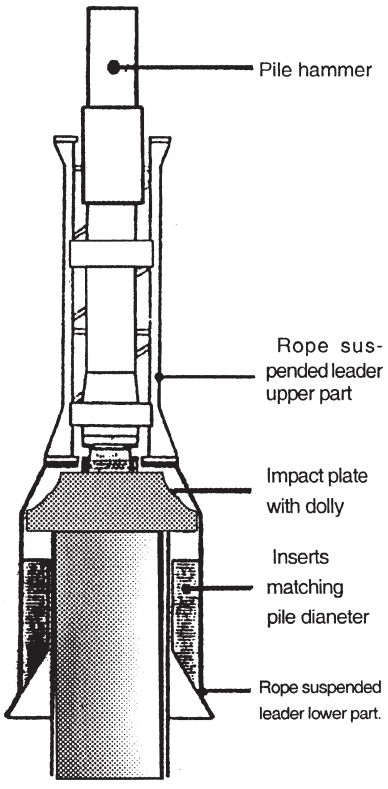

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