Reinforcement at threaded lifting inserts	Published Date: 01/06/2010

Most major suppliers of threaded lifting inserts give recommendations for reinforcement to be included to ensure that the inserts function properly. The purpose of this reinforcement is simply to ensure that the tension forces are transferred into the body of the precast element and do not allow the insert to pull out under load.

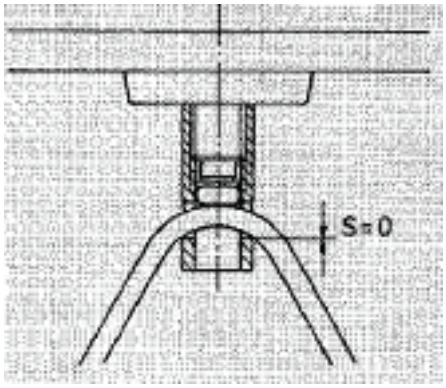
These recommendations are generally based on simple or idealised conditions, and it is up to the designer to decide what reinforcement detail to adopt in other, more unusual instances. The following guidance is based on a selection of common inserts and some frequently used situations. The list is far from exhaustive though, and common sense and engineering judgement is required to ensure safe lifting in all conditions.

The reinforcement is an integral part of the lifting system and it cannot be emphasised enough that correct detailing of the reinforcement is essential to ensure that failures do not occur.

This failure, in a very thin panel, was due to the reinforcement being too far from the top of the insert, allowing movement to take place.

Socket lifter

This is probably the most simple and commonly used lifting insert. It is primarily used for vertical (or near vertical) lifting. It has a hole near the base to take a reinforcement bar. Manufacturers normally recommend that an opened-out 'U' bar is used for vertical lifting. It is normally bad practice to use a simple straight bar through the hole. Such a bar would be in bending rather than in tension and would have a very limited capacity. A possible exception to this is to incorporate numerous hairpin bars around the straight bar so as to prevent movement.



When the bar is inserted, it is important that there is no gap between the bar and the socket. Any gap is likely to be subject to local crushing under load, and the socket could (partially) pull out. To ensure that bars are kept in place, sockets have a plastic 'plug' inside. This plug should be firmly pressed down the inside of the socket to sit on the bar. The bar should be long enough to take loads well into the body of the unit, and ideally lap onto other reinforcement.

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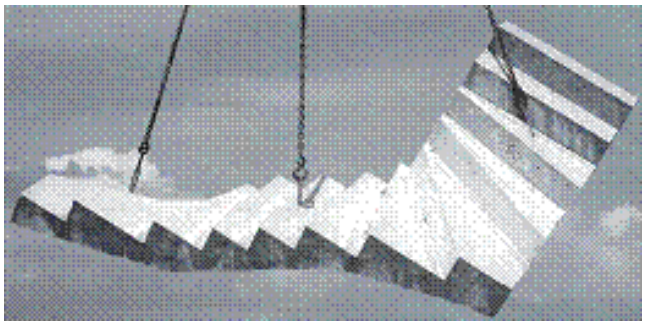
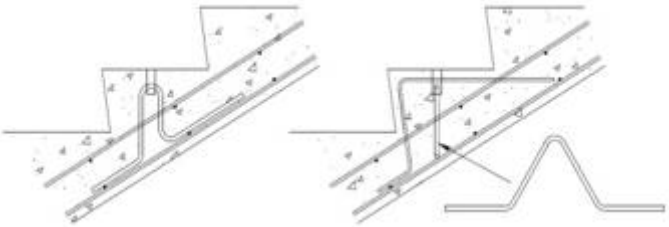
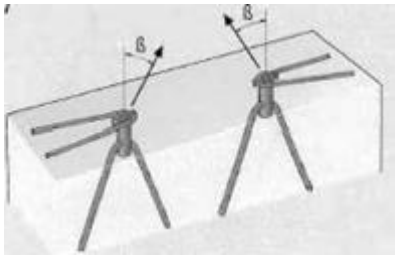
One particular example that needs attention is precast stair flights.





The lifting insert is often positioned on the tread surface as shown here. In this case, the U bar has to extend down to the reinforcement in the bottom face of the waist. If this is not done, then there is a risk of the top surface of the tread breaking out. Better still is to reinforce the tread locally so as to prevent the nose of the tread failing if the lift creates inclined forces. A straight bar, running horizontally along the tread, should not be used.

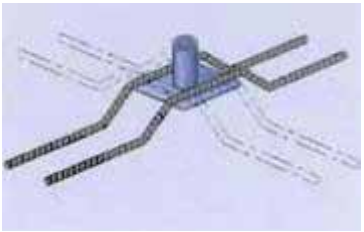


If non-vertical loads are anticipated, particularly near the end of a unit, then additional, inclined, bars should be added to resist the loads as shown. The open end of the bars should always point away from the direction of the force.

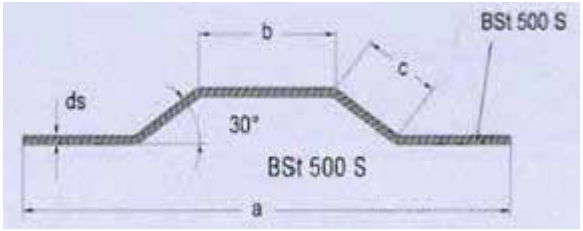
Plate anchor

These are frequently used in thin/flat slabs. Again they are mainly used for vertical lifting, although, unlike most inserts, they also have full capacity for transverse lifts.

Reinforcement is placed on top of the plate, and for larger sizes is in both directions as shown.



Most suppliers give recommendations for the shape of the bars along the lines of the sketch below. These are only guidelines however, and two main points need to be considered. For small size inserts, the bars are close to the top surface. For example, for an Rd12 insert the top of the bar may be only 21mm from the top surface. This may cause problems clashing with any reinforcement in the top 50mm or so of the unit. Similarly, for a larger size of insert, the reinforcement shown may extend down some 185mm from the top surface, and this could clash with bottom reinforcement. To avoid this, an accurate drawing should be created.



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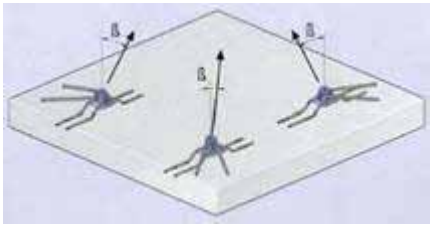
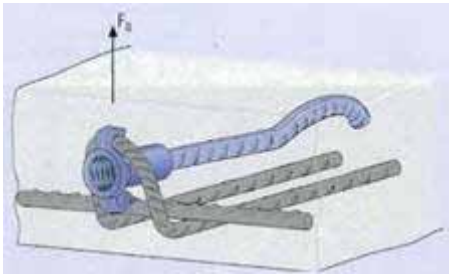
For inclined loads, especially near to the edge of the concrete, U bars should be placed around the insert to resist loads. Manufacturers' catalogues give guidance on the size of these bars. If inserts are close to the edge of a unit so that the bars specified by the manufacturer would project from the concrete, then the bars should be bent at right angles so as to maintain the full bond length.

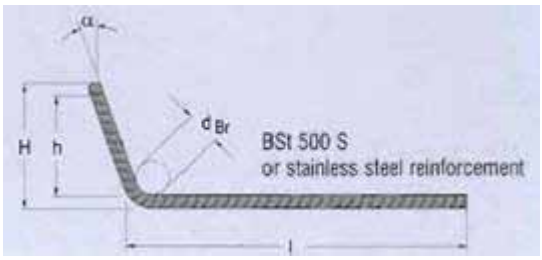


Waved tail anchor

These inserts have a large reinforcement bar swaged onto them and are mainly intended for lifting and turning flat panels.

For simple turning from horizontal to vertical, reinforcement is positioned around the insert as shown, to prevent it bursting through the face of the unit. This arrangement is detailed for turning from horizontal to vertical. It consists of a U bar with a further bend in it (sometimes called a 'P-link') plus a straight bar. In the example shown, the P-link is held in position by a data clip (available as an accessory from most insert suppliers).





If however, the turn then continues back to horizontal in the same direction, then a different arrangement is needed. Since the load can be in either direction, the two P-links are needed, one from each face. These must bear onto the lifting insert near the end, and to avoid a clash between the two bars, the bend must be 90 deg rather than the 105 deg typically shown

It has been argued that if turning tables are used to turn from horizontal to vertical, there is no need for this reinforcement as there are no sideways forces. In reality it remains good practice to incorporate the appropriate reinforcement even in these conditions, since it may be necessary to lay panels down flat unexpectedly on site.

There are some lifting inserts that, under certain conditions of use, do not require any additional reinforcement when used in a normally reinforced precast element. When considering these, it important to be sure that any future handling remains within the parameters of the 'certain conditions'.

These notes do not apply to some specific lifting inserts such as 'Frimeda'/Rapid Lift types. These have their own details which should nevertheless be followed.