General rigging appliances and storage

Concrete lifting clutches

On this page

Find out how to use and inspect different types of lifting clutches.

Concrete elements can be pre-made on or off site.

Face lifting clutch

Edge lifting clutch (Ring clutch)

Some of the benefits for (on or off-site) prefabrication are:

- increased construction speed
- improved quality
- lower overall build cost
- minimisation of formwork and formwork risks
- improved efficiency through the use of parallel and repetitive activities.

Prefabricated concrete elements include:

- concrete pipes
- culverts
- bridge elements
- tunnel elements
- concrete poles
- concrete piles
- drainage and sewerage manholes
- lintels
- headwalls
- covers and surrounds
- water quality products.

Types of concrete lifting systems

Concrete element being rotated

In Australia, there are two common lifting anchor systems available for the lifting of precast concrete elements.

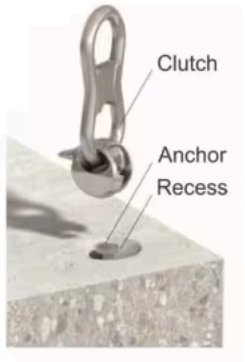
Typical clutch types are shown below:

Lifting clutch (face type)

There are various types of lifting clutches available in the industry. They must be compatible with the anchor. The type of anchor shown in the image below is located on the face of the concrete element:

Lifting clutch and recessed anchor systems

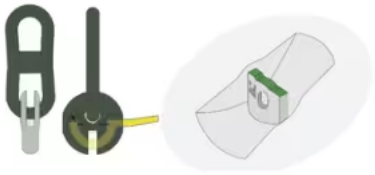
Lifting clutches have a variety of applications for face-lifting concrete elements. The anchor is generally specified for mostly tensile loads.



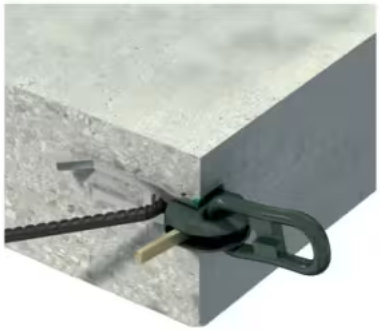
Typical spherical headed (SH) face lifting anchor with a claw-like lifting clutch

Lifting clutch (edge lifter)

The image below shows a ring clutch that is commonly referred to in industry as a “donut”. This edge clutch attaches to an insert on the edge of the concrete element.

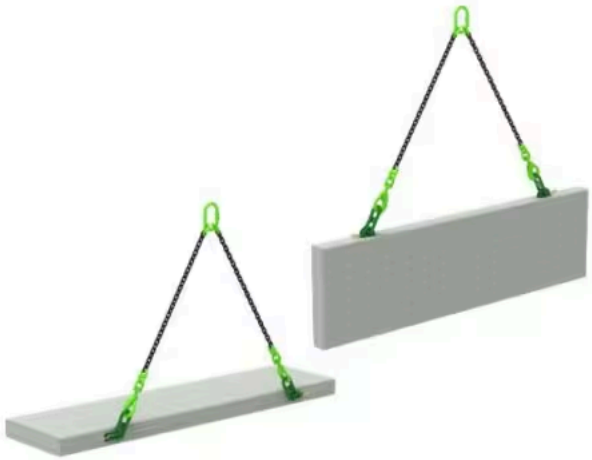


Edge lifting clutch and plate anchor systems



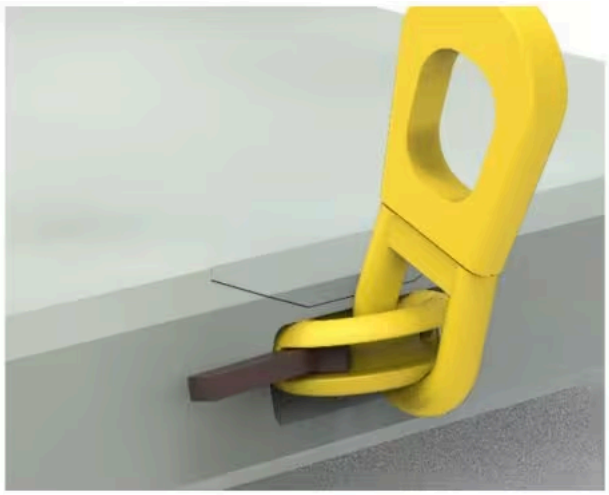
Typical edge lift anchor systems with recess former and ring clutch (RC)

Plate Anchors are preferred for edge lifting applications with significant shear loads. An example of shear load is the cutting of a piece of paper with scissors.



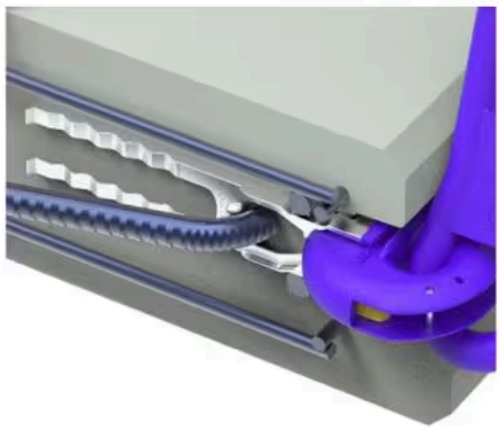
Edge lift anchor systems

Edge lift anchor systems are safer for rotation and handling thin panels by their edges. Spherical headed clutches should not be used for rotation of thin panels by their edges.



Spalling can reduce lifting capacity

In some systems the handle may press against the concrete causing breakout (spalling), which can reduce the lifting capacity.

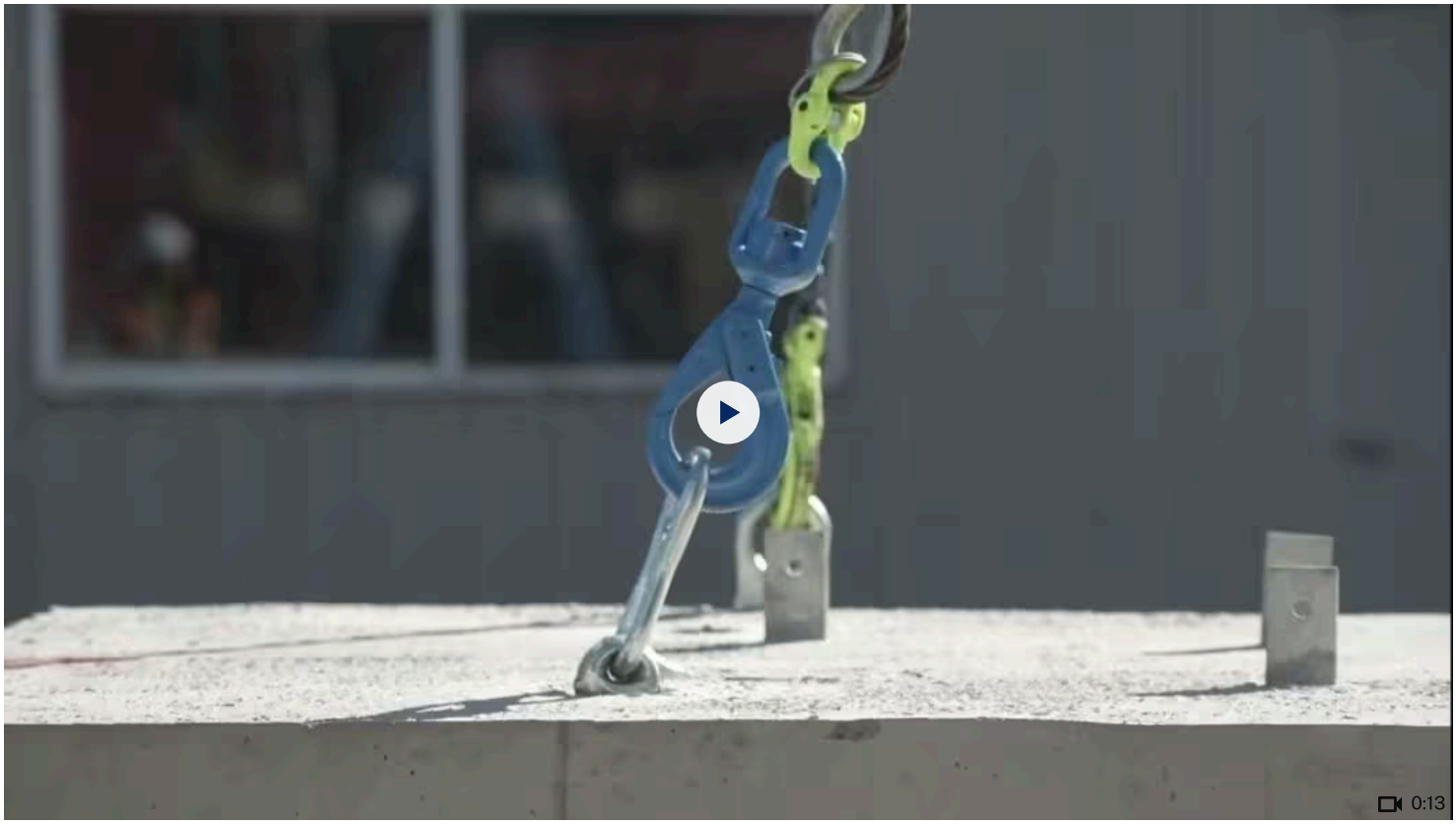


Tension bar attached to anchors

Use of a tension bar attached to the anchor strengthens the anchorage in thin panels.

Clutch operation

Concrete element being rotated



CICA Precast 230-241

When using face type spherical clutches it is recommended to incorporate a swivel hook into the rigging, as this can alleviate the potential for the clutch to spin as it realigns with the direction of the lifting equipment.

Lifting operations in Australia should be in accordance with AS3850.

Here's what to consider when using lifting clutches:

Compliance

Make sure that lifting clutches have been designed, manufactured and tested by the requirements of AS3850.1.

Make sure written confirmation of all conformance is available from the clutch manufacturer.

Inspection

AS3850.1 requires all clutches to be identified and inspected before lifting. They must also be proof-loaded annually to 1.2 x working load limit (WLL).

Before every lift, make sure the clutch is:

- marked correctly with valid proof test tag
- physically undamaged
- not modified
- not distorted
- in good working order.

Modified clutches

Certification

No attempt should be made to lift with a clutch that does not have valid certification.

Clutch compatibility

AS3850.1 requires all lifting anchors and clutches used in Australia to be permanently marked with:

- the manufacturer's identification
- WLL
- and be compatible with the anchor it is used to lift.

Lifting anchor example 1

Lifting anchor example 2

Lifting anchor example 3

If anchors and clutches are supplied by different manufacturers, their compatibility must be confirmed by testing. This is required by AS3850.1.

Two examples of component compatibility documents are provided by REID and ANCON.

Compatibility must show that the items may be used without:

- compromise to the WLL, or
- the utility of either component.

This is outlined in AS 3850.1

AS3850.1 also requires:

- knowledge and control of the design, materials, manufacturing processes
- testing, including ongoing batch testing
- assurance that the clutches are individually proof loaded, Magnetic Particle tested and identified.

Sellers must be able to produce evidence (like materials certificates and test certificates) showing that the clutches are manufactured in accordance with AS3850 Prefabricated Concrete Elements, Part 1 – General Requirements.

Care and maintenance

Here's how to care for and maintain clutches so they can continue to be used safely:

Don't use damaged clutches

Damaged or distorted clutches should be immediately removed from service and replaced.

Don't drop clutches

Don't drop or throw lifting clutches.

Direction of force

When rigging, make sure that the lifting components are in line with the direction of force.

Lifting components should be in line with the direction of force

Clean clutch

Make sure the clutch insert aperture is clean and not effected by debris or deformation. This is to allow for correct engagement and orientation.

Clutch insert aperture should be clean

CICA Precast 000-007

Ensuring the clutch insert aperture is clean

Freely rotating clutch

Make sure the clutch is free to rotate and is not jammed or bent around corners. This can lead to damage, distortion and reason for discard.

Storage

Always store lifting clutches carefully to prevent damage in storage or transit.

Store clutches in a dry environment, away from moisture to prevent corrosion.

Test before putting into service

Before being placed into service, each lifting clutch should be:

- proof-tested
- certified
- uniquely identified.

Test before each use

Before each use, inspections of the lifting clutches should be inspected. Check for wear and deformation to supplier's specification.

A proof test using a load equal to 1.2 times the WLL should be conducted and recorded for each lifting clutch. This should be completed every 12 months.

Markings

Each clutch should be permanently marked with this information:

- unique identifier (traceable to the proof tests)
- the manufacturer's symbol or name
- its WLL or compatible anchor identifier.

Working load limit

Confirm that the working load limit (WLL) of the clutch matches the anchor.

The clutch and the anchor need to be from either:

- the same manufacturer, or
- approved for compatibility by the manufacturers of each component.

Lifting clutch and recessed anchor systems

Component sizes are designed to avoid the possible mis-connection between anchors and clutches of different load classes.

Typical Australian load classes are:

- 1.3tn
- 2.5tn
- 5tn
- 7tn
- 10tn
- 20tn
- 32tn
- 40tn

Note: Some manufacturers use a comma in place of the full stop (.) For example: 1,3 = 1.3

The clutch may be also be marked with a manufacturer's part code. For example: “1LK, 2LK”.

The WLL of the clutch must equal to or more than the anchor load class with which it is used.

The failure strength of anchors is limited either by:

- the anchor (steel) failure, or
- concrete failure (for example, cone breakout).

Failure is dependent on many factors, including:

- the embedment depth (anchor length)
- concrete strength
- location of the anchor in the concrete element geometry.

The anchor's WLL is limited by steel failure. Anchors are marked with their WLL on the head of the anchor. It is not possible to show a WLL for every different possible combination of factors which limit concrete failure, which may be less than the capacity of the anchor steel.

The diagrams below show typical head markings of two different manufacturers for load class 2.5T. The markings show the manufacturer’s mark. For example:

- “U”
- “DH K D”
- the load class “2.5 or 2,5” with or without a T.

Examples of typical head markings from different manufacturers

The first anchor head also shows the anchor length (120mm). Knowing this length provides confirmation of the embedment depth. From there, the concrete breakout capacity can be determined from the manufacturer's load tables. This capacity will be for the particular application (for example, concrete strength or anchor location).

Clutch connection

All quick-connect lifting systems operate by similar principles:

- the clutch is placed onto the head of the anchor
- either the clutch head (SH systems) or the locking ring (RC systems) is rotated through the anchor head
- rotation continues until it is fully closed to make the connection.

The clutch must connect freely to the anchor using hand pressure only. Hammers should not be used to install the clutch.

Suitable hand tools (like a wire brush) should be used to clear the aperture. The aperture is the hole where the anchorage point connects, or the depression around the insert. Clutches should not be used for cleaning around the insert.

Examples of incorrect clutch connection

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