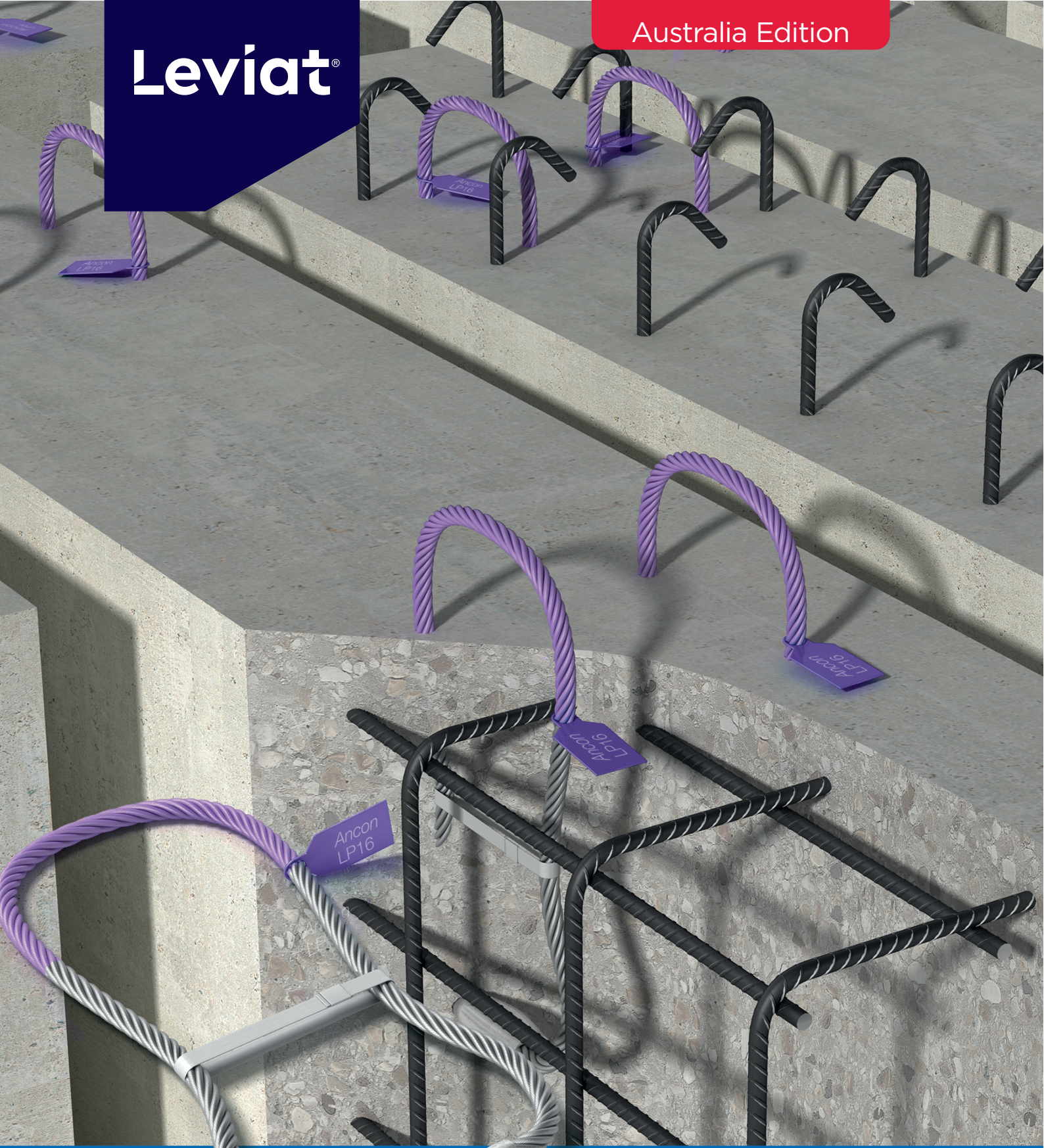
Leviat®

Australia Edition



Ancon®

LinkPro Lifting Loops

for the Precast Concrete Industry

June 2022

Leviat

We imagine, model and make engineered products and innovative construction solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

Leviat is a world leader in connecting, fixing, lifting and anchoring technology.

From the build of new schools, hospitals, homes and infrastructure, to the repair and maintenance of heritage structures, our engineering skills are making a difference around the world.

We provide technical design assistance at every stage of a project, from initial planning to installation and beyond.

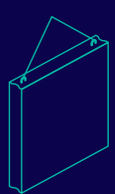
Our technical support services range from simple product selection through to the development of a fully customised project-specific design solution.

Every promise we make locally, has the commitment and dedication of our global team behind it. We employ almost 3,000 people at 60 locations across North America, Europe and Asia-Pacific, providing an agile and responsive service worldwide.

>3,000
People

60+
Locations

~20
Countries

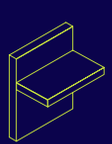


Lifting & Bracing

Systems for the safe and efficient transportation, lifting and temporary bracing of cast concrete elements and tilt-up panels before permanent structural connections are made.

- Precast Lifting
- Tiltup Lifting
- Bracing & Anchorage

Other areas of expertise:



Structural Connections

Systems to form robust, efficient connections, and continuity of concrete reinforcement as necessary, between walls, slabs, columns, beams and balconies, providing structural integrity as well as enhanced thermal and acoustic performance.

Façade Support & Restraint

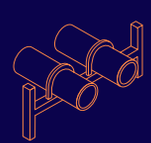
Systems for the safe and thermally-efficient fixing of the external building envelope, including brick and natural stone, insulated sandwich panels, curtain walling and suspended concrete façades, and also the repair and strengthening of existing masonry installations.

Anchoring & Fixing

Systems for fixing secondary fixtures to concrete, including anchor channels, bolts and inserts; also tension rod systems for roofs and canopies.

Formwork & Site Accessories

Non-structural accessories that complement our engineered solutions and help keep your construction environment operating safely and efficiently, including moulds for casting standard and special concrete elements and construction essentials such as reinforcing bar spacers.



Industrial Technology

Mounting channels, pipe clamps and other versatile framing systems that provide safe fixing in a wide range of industrial applications.

Leviat product ranges:

Ancon | Aschwanden | Connolly | Halfen | Helifix | Isedio | Meadow Burke | Modersohn | Moment | Plaka | Scaldex | Thermomass

Ancon LinkPro Lifting Loops

Ancon LinkPro fibre-cored/steel-cored lifting loops help to facilitate the safe and efficient handling of precast and prestressed reinforced concrete units, including bridge and shell beams

The Ancon LinkPro Lifting Loop system consists of a range of loops in 12 load classes with working loads reaching from 10t - 65t.

Each Ancon LinkPro loop is manufactured from galvanized, high strength, 1770MPa grade fibre-cored/steel-cored steel wire rope, joined with a swaged ferrule and fitted with a colour-coded tag detailing the product code, working load limit (WLL) and batch number. A colour-coded painted section, designed to be left exposed after installation, provides a visual check that the correct embedment depth has been achieved.

- ✓ Safe, reliable, fully engineered solution
- ✓ Suitable for axial and diagonal lifting
- ✓ Colour-coded for WLL visual check
- ✓ Manufactured from corrosion resistant galvanised steel
- ✓ No specialist lifting clutches or equipment required
- ✓ No recess formers required
- ✓ Suitable for use with standard lifting hooks/shackles
- ✓ Thimbles available for applications, where standard lifting equipment does not meet requirements

Design Considerations

Ancon LinkPro applications should be engineered to meet the requirements of relevant standards, e.g. AS 3600, AS 3850 for building elements, AS 5100 for bridge elements and TMR MRTS73 for prestressed concrete members, taking into consideration the rigging, element dimensions, weight, concrete strength, reinforcing etc.

System Benefits

Ancon LinkPro provides a safe, reliable, fully engineered solution for the handling of large precast concrete units used in the civil engineering sector. Ancon LinkPro is easily installed, without recess formers, ready for direct connection to standard lifting hooks and shackles.

Ancon LinkPro Lifting Loops are suitable for axial and diagonal lifting, with a maximum sling angle of 60° at the hook (maximum 30° to the vertical line), from manufacture until final installation of the precast concrete element.

The multi-stranded, fibre-cored/steel-cored construction of Ancon LinkPro features small diameter outer wires (see table for details), which generate low bending stresses when loaded.

When shackle pins are used in high load designed applications, we recommend a diameter not less than 3.5 times the rope diameter d, see page 9 for further information.

For further information, please contact the Leviat Technical Team for engineered lifting design guidance.

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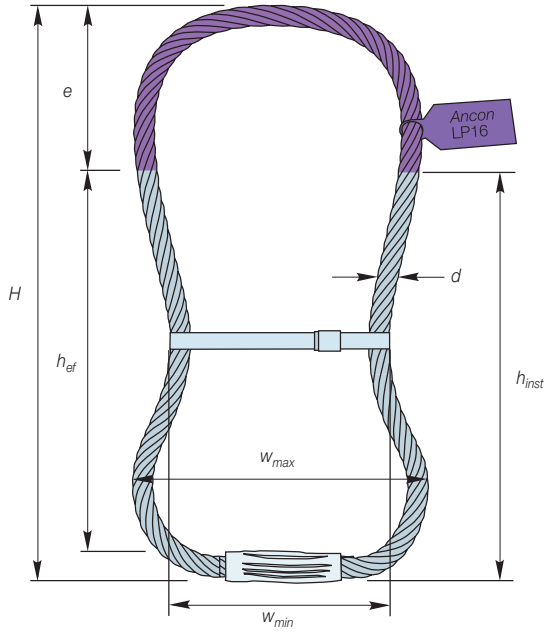
Ancon LinkPro Lifting Loops

Ancon LinkPro Range, Colour Codes and Dimensions

The Table below shows the dimensions of the Ancon LinkPro Lifting Loops.



Part Number	Tag Colour Code	Rope Diameter d (mm)	Overall Height H (mm)	Embedment Depth h_{ef} (mm)	Installation Depth h_{inst} (mm)	Exposed Insert Height e (mm)	Min. Width (W_{min}) (mm)	Max. Width (W_{max}) (mm)	Approx. Weight (kg)
LP10	Pink	20	525	370	390	135	185	255	2.4
LP12	Yellow	22	590	413	435	155	200	285	3.5
LP16	Lilac	24	670	465	490	180	260	330	4.5
LP20	Ochre	28	750	518	545	205	280	345	6.8
LP25	Brown	32	850	583	615	235	300	400	9.8
LP32	Black	36	870	615	650	220	310	425	12.9
LP37	Bright Orange	40	950	650	690	260	340	470	17.5
LP42	Bright Orange	44	1000	675	720	280	350	545	22.2
LP47	Bright Orange	44	1100	723	770	330	390	545	24.3
LP52	Bright Orange	48	1200	815	870	330	420	580	31.5
LP57	Bright Orange	48	1350	915	970	380	480	590	35.4
LP65	Bright Orange	50	1430	975	1030	400	590	690	43.9

Ancon LinkPro Working Load Limits

The Ancon LinkPro Lifting Loop design includes a factor of safety of 3.0, which exceeds the requirements of AS 3850.

Ancon LinkPro Lifting Loops can also be used for applications that require a Factor of Safety (FoS) of 4.0.

The table on the left shows the Working Load Limits (WLL) for Ancon LinkPro Lifting Loops for factors of safety of 3.0 and 4.0.

Part Number	WLL FoS=3 (t)	WLL FoS=4 (t)
LP10	10.0	7.5
LP12	12.5	9.4
LP16	16.0	12.0
LP20	20.0	15.0
LP25	25.0	18.8
LP32	32.0	24.0
LP37	37.0	27.8
LP42	42.0	31.5
LP47	47.0	35.3
LP52	52.0	39.0
LP57	57.0	42.8
LP65	65.0	48.8

Concrete Capacity Design

Like all other lifting anchors the Ancon LinkPro Lifting Loops depend on the tension capacity of the surrounding concrete. When being exposed to tension they activate a cone of concrete. For unrestricted concrete cones with a width of at least 3 times h_{ef}, the tension capacity is calculated using the Concrete Capacity Design (CCD) Method as specified in Appendix B of AS 3850.1:2015:

$N^0_{Rk,c}$ = $k_{cr} \cdot \sqrt{f_{lift}} \cdot h_{ef}^{1.5}$

where

k_{cr} = Factor relating to the condition of concrete
13 – non cracked concrete
10 – cracked concrete

f_{lift} = characteristic compressive strength of the concrete at time of lift (MPa)

h_{ef} = effective embedment depth of the insert (mm) – see table on page 6

Ancon LinkPro Lifting Loops are often used in slender concrete members, so that the full cone capacity cannot be activated.

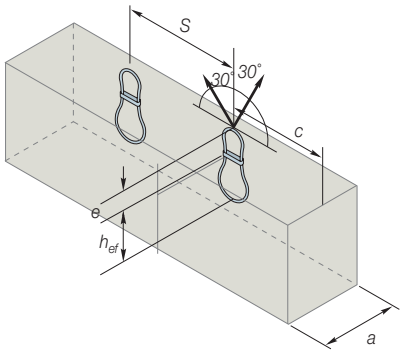
The following table shows the minimum width of the concrete member and the required edge spacing that is required to achieve the required Working Load Limit of the Lifting Loop. The values are based on an end spacing c=1.5·h_{ef} and an anchor spacing s=3.0·h_{ef}, which means that the concrete cone is un-restricted in the longitudinal direction of the beam and only restricted in the direction perpendicular to the longitudinal direction.

Minimum Precast Element Dimensions for lifting at 30MPa

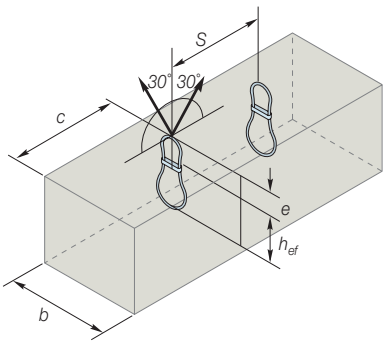
Part Number	End Distance c (mm)	Minimum Anchor Spacing S (mm)	Minimum Precast Element Width a,b (mm)
LP10	555	1110	720
LP12	620	1239	816
LP16	698	1395	1004
LP20	777	1554	1176
LP25	875	1749	1373
LP32	923	1845	1652
LP37	975	1950	1833
LP42	1013	2025	2009
LP47	1085	2169	2168
LP52	1223	2445	2300
LP57	1373	2745	2422
LP65	1463	2925	2655

The dimensions in the table above are based on non-cracked concrete, the design relies on the concrete cone only, no effect from supplematary reinforcement is taken into consideration. For concrete members that do not allow the development of the required concrete cone, please refer to page 8 for recommendations on supplementary reinforcement.

Longitudinal Installation



Transverse Installation



Ancon LinkPro Lifting Loops

Design of Supplementary Reinforcement

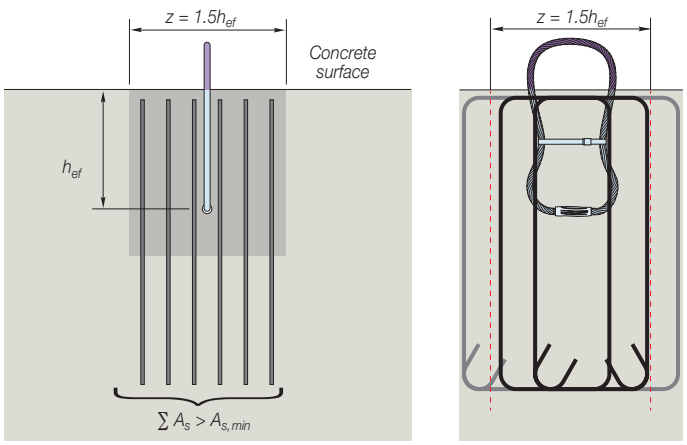
In many cases the size of the concrete member is too small to allow for a sufficient concrete cone capacity. In these cases, a design of supplementary reinforcement according to EN 1992-4 – Design of fastening for use in concrete can be done utilising the existing shear reinforcement in the concrete member.

The reinforcement should be evenly distributed in the critical zone either side of a loop over the critical zone width z = 1.5 h_{ef}.

Minimum Required Supplementary Reinforcement within Critical Zone

Part Number	Critical Zone Width $z=1.5h_{ef}$ (mm)	Required Cross Section Reinforcement $A_{s,min}$* (mm^2)
LP10	555	545
LP12	620	681
LP16	698	872
LP20	777	1090
LP25	875	1363
LP32	923	1744
LP37	975	2017
LP42	1013	2289
LP47	1085	2562
LP52	1223	2834
LP57	1373	3107
LP65	1463	3543

** All cross sections based on Grade 500N reinforcement bar in accordance with AS/NZS 4671*



Reinforcement Details

• The preferred shape for supplementary reinforcement is closed stirrups. Other types of bars like stirrups that are not closed in the first cast to work as a connection to a consecutive cast, might not be fully developed and might only be partially effective.

• The development length of reinforcement bars depends on the concrete strength at the time of lift. A concrete strength of 30MPa is recommended.

All reinforcement must be developed in the concrete member (below the concrete crack) and in the concrete cone (above the concrete crack formed by the anchor). The required cross section in the table above assumes that the supplementary reinforcement is fully developed. If the design shear reinforcing of the precast element A_s is less than $A_{s,min}$ shown in the table, additional reinforcement e.g. hairpins, stirrups or hooked bars should be added to increase the area to $A_{s,min}$. The ties should be evenly and closely spaced around the Ancon LinkPro loop at approximately 50mm spacing while complying with bar spacing requirements of relevant design standards.

Reinforcement should be designed by the lifting design engineer, detailed on the shop drawings and placed in accordance with the approved lifting design. Where additional reinforcement is required, ensure it is not in contact with the swaged ferrule.

In the transverse installation, if any bars need to be cut to install the loop, they should be replaced by bars of the same size and lapped in accordance with the relevant design standard.

For applications which fall outside the scope of the table, please contact the Leviat Technical Team for design guidance.

Installation, Lifting and Handling

Pre-Installation

Store to avoid any damage to loops. Check Ancon LinkPro for defects prior to casting. Loops with evidence of mechanical damage, kinking, broken or unravelled wires, crushing, wear, corrosion or other serious damage should be discarded. If in doubt, contact Leviat.

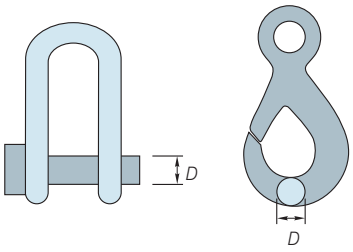
Installation

Carefully place Ancon LinkPro in its correctly measured position between the reinforcement, with the swaged ferrule at the bottom and the coloured section and WLL tag left exposed at the top. Tie to the reinforcement to minimise movement during casting. Ensure the swaged ferrule does not come into contact with the reinforcing bars or prestressing strand.

Ancon LinkPro should be placed and aligned either parallel (longitudinal installation) or perpendicular (transverse installation) to the direction of the expected load in accordance with the shop drawings, as approved by the lifting design engineer. The specified loop capacities, embedment depths, spacing and edge distances should be strictly adhered to. During installation, take care not to damage the exposed lifting section of the loops. When installing Ancon LinkPro ensure the band around the loop is not removed. For guidance, please contact Leviat's Technical Team.

Notes

- Ensure that the rigging configuration does not result in a lever arm or bending moment during hook up
- When using crane hooks, Leviat recommends lifting with D/d = 3.5., where D is the hook diameter and d is the rope diameter of the Ancon LinkPro.

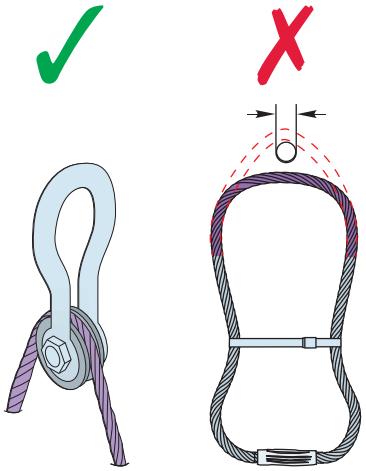


In addition, when lifting with large Ancon LinkPro sizes (LP20 and above) Leviat recommends lifting with Ancon LinkPro Thimbles so the correct radius is on the loop to ensure safe lifting

- Do not bend Ancon LinkPro to an angle greater than 30° during any lifting, handling or storage of the precast elements prior to the final installation of the precast element
- Where precast elements are to be stacked, sufficient separators must be used between the precast elements to prevent damage to Ancon LinkPro by bending beyond 30°, mechanical damage, crushing or abrasion
- After installation/use, the exposed loop may be cut off as required. Consideration should be given to corrosion protection of the cut ends if they are to remain exposed

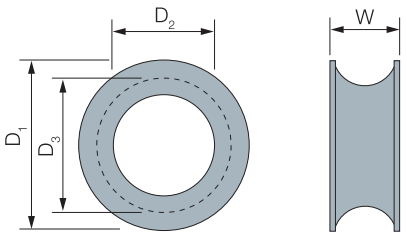
Leviat Thimbles for Ancon LinkPro Lifting Loops

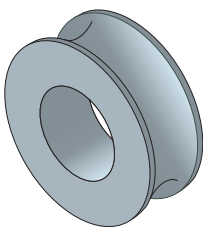
Part Number	Lifting Loops	D_1 (mm)	D_2 (mm)	D_3 (mm)	W (mm)
LPS10-16T	LP10 - LP16	70	40	50	65
LPT10-16T	LP10 - LP16	110	60	85	40
LPT20-25T	LP20 - LP25	150	85	117	48
LPT32-37T	LP32 - LP37	185	100	140	56
LPT42-57T	LP42 - LP65	230	135	179	64



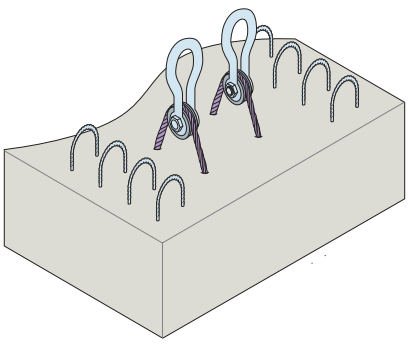
Use of Ancon LinkPro Thimble avoids kinking

Dangerous kink through use of wrong lifting gear





Ancon LinkPro Thimble type LPT



Ancon LinkPro Thimble type LPS

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