Leviat®
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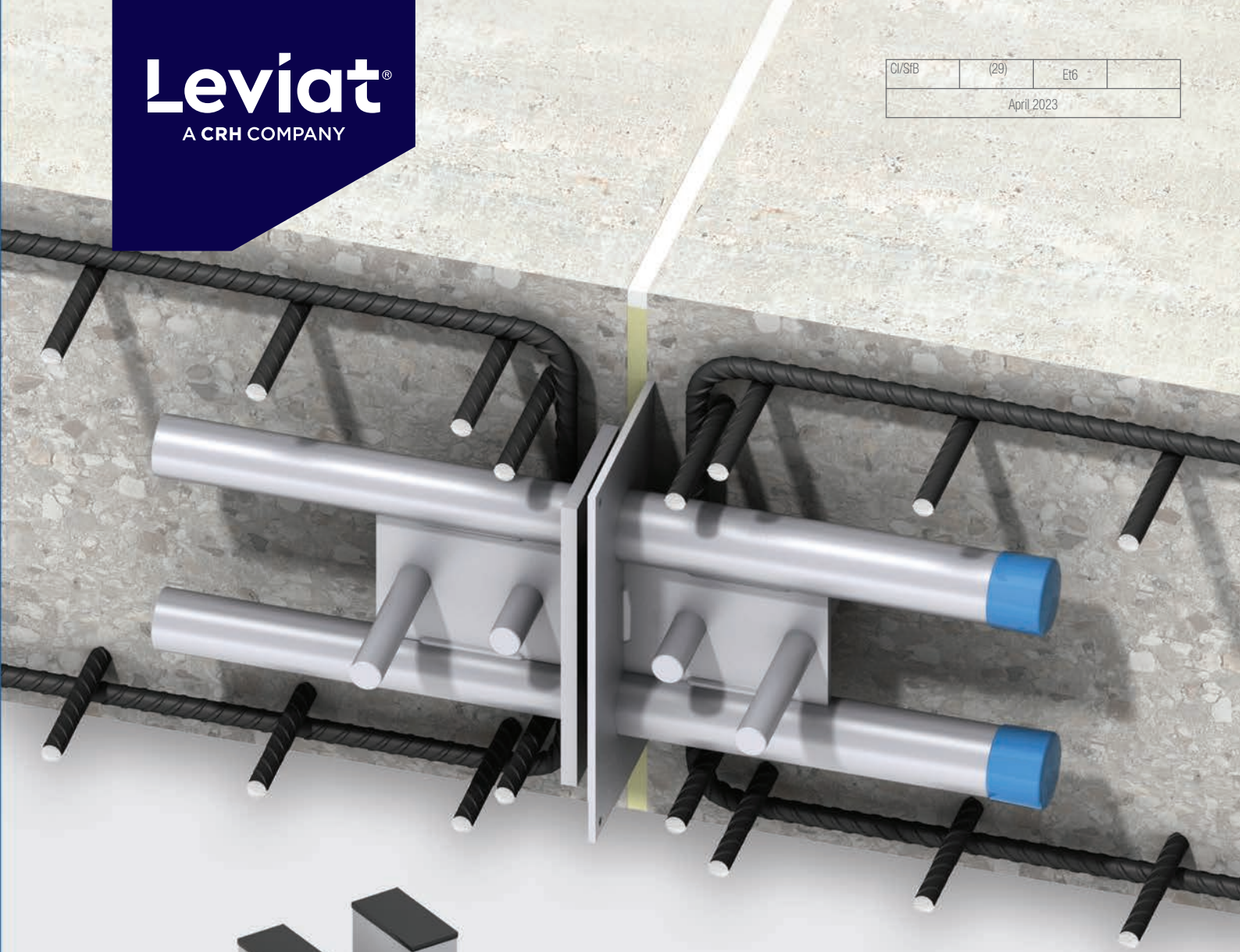
| CI/SfB | (29) | Et6 | |
|---|---|---|---|
| April 2023 | | | |



DSD/Q Design Program Available

# Ancon®

## DSD/ESD
## Shear Load Connectors

for the Construction Industry

Leviat®
A CRH COMPANY

# We are one team.
# We are Leviat.

## Leviat is the new name of CRH's construction accessories companies worldwide.

**Under the Leviat brand, we have united the expertise, skills and resources of Ancon and its sister companies to create a world leader in fixing, connecting and anchoring technology.**

The products you know and trust will remain an integral part of Leviat's comprehensive brand and product portfolio. As Leviat, we can offer you an extended range of specialist products and services, greater technical expertise, a larger and more agile supply chain and better, faster innovation.

By bringing together CRH's construction accessories family as one global organisation, we are better equipped to meet the needs of our customers, and the demands of construction projects, of any scale, anywhere in the world.

**This is an exciting change. Join us on our journey.**

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Our product brands include:

Ancon

HALFEN

HELIFIX

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**60**
locations

sales in
**30+**
countries

**3000**
people worldwide

**Imagine. Model. Make.**

**Leviat.com**

# Shear Load Connectors

## Efficiently transfer shear load across movement joints in concrete

Reinforced concrete is an important construction material. It offers strength, durability and can be formed into a variety of shapes. Concrete structures are designed with expansion and contraction joints at appropriate places to allow movement to take place. The design of the joint is important for the overall design to function correctly.

Ancon shear load connectors offer significant advantages over plain dowels. These connectors are more effective at transferring load and allowing movement to take place, easier to fix on site and can prove a more cost-effective solution.

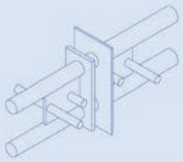
Each connector is a two-part assembly comprising a sleeve and a dowel component. Installation is a fast and accurate process, drilling of either formwork or concrete is not required. The sleeve is simply nailed to the formwork ensuring subsequent alignment with the dowel, essential for effective movement.

They are manufactured from stainless steel to ensure a high degree of corrosion resistance with no requirement for additional protection.

In most cases, dowelled or keyed joints can be replaced by joints incorporating Ancon shear load connectors. They can be used for movement joints in floor slabs, suspended slabs, and for replacing double columns and beams at structural movement joints.

Applications in civil engineering include joints in bridge parapets, bridge abutments and diaphragm wall construction.

**Building Information Modelling**

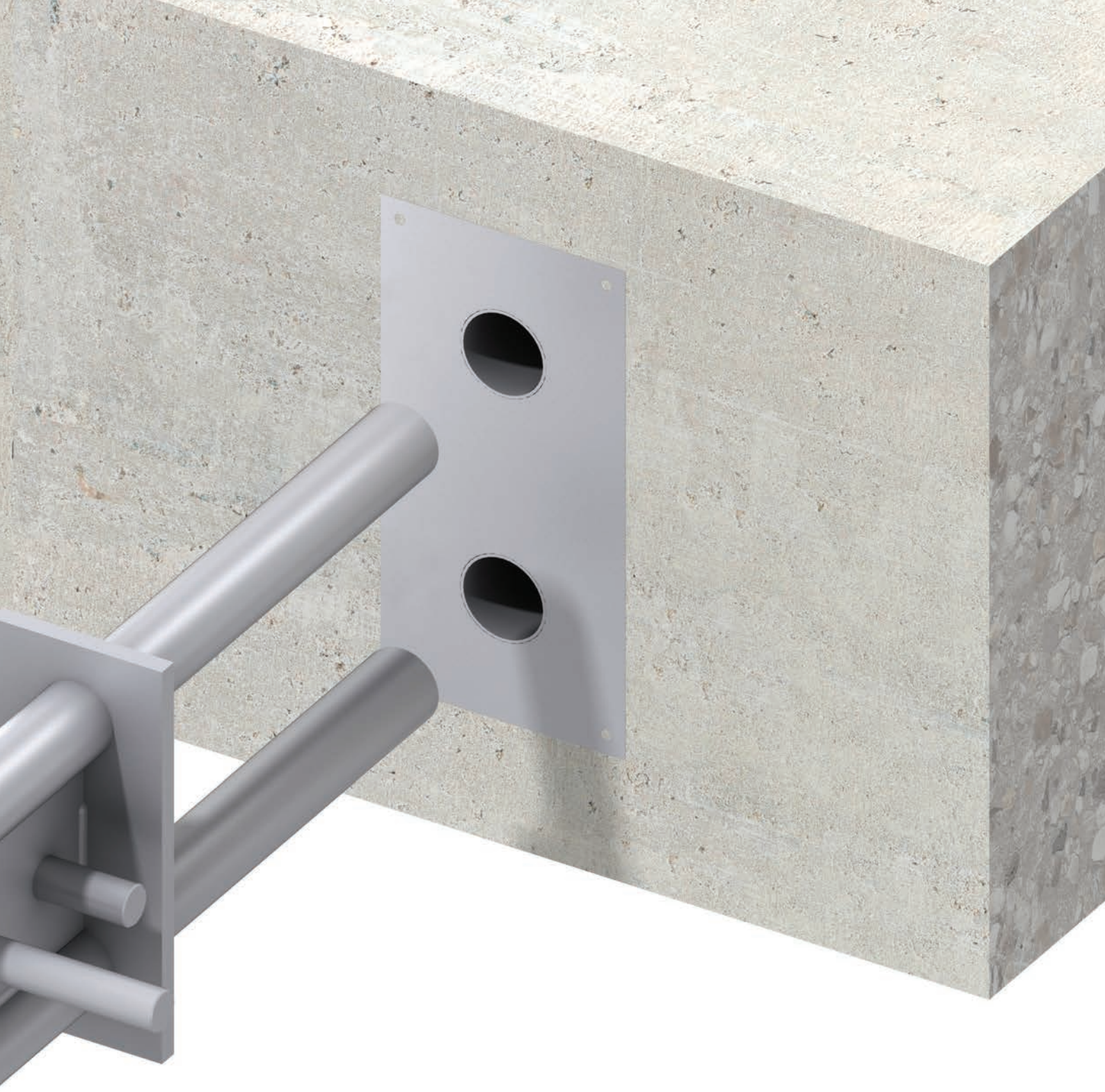


BIM objects of Ancon products are now available to download from either www.ancon.co.uk/BIM or the NBS National BIM Library.

NBS National BIM Library



## Contents



- High Load Transfer
- Sleeve Component Accommodates Movement
- 'Q' Range Allows Lateral Movement
- Two Step Installation Guarantees Alignment
- Corrosion Resistant Stainless Steel
- Acoustic Resilient Dowel Available
- Design Program Available
- BIM Objects Available

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# DSD/ESD Shear Load Connectors

## Dowelled Joints

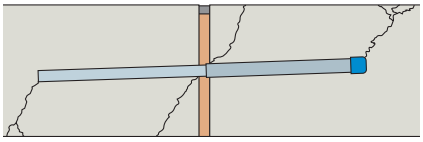
Dowels are used to transfer shear across construction and movement joints in concrete. They are often either cast or drilled into the concrete. A single row of short thick dowels provides reasonable shear transfer but suffers from deformation. This can lead to stress concentrations, resulting in subsequent spalling of the concrete.

Where dowels are used across expansion and contraction joints, half the length of the bar is debonded to allow movement to take place.

Dowelled joints either require formwork to be drilled for the dowels to pass through, or concrete to be drilled for dowels to be resin fixed in one side.

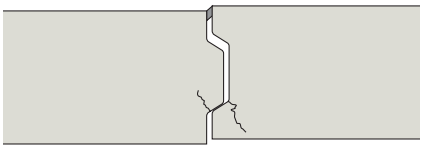
At movement joints, dowels will need to be accurately aligned in both directions to ensure movement can actually take place, otherwise cracking is likely to occur.

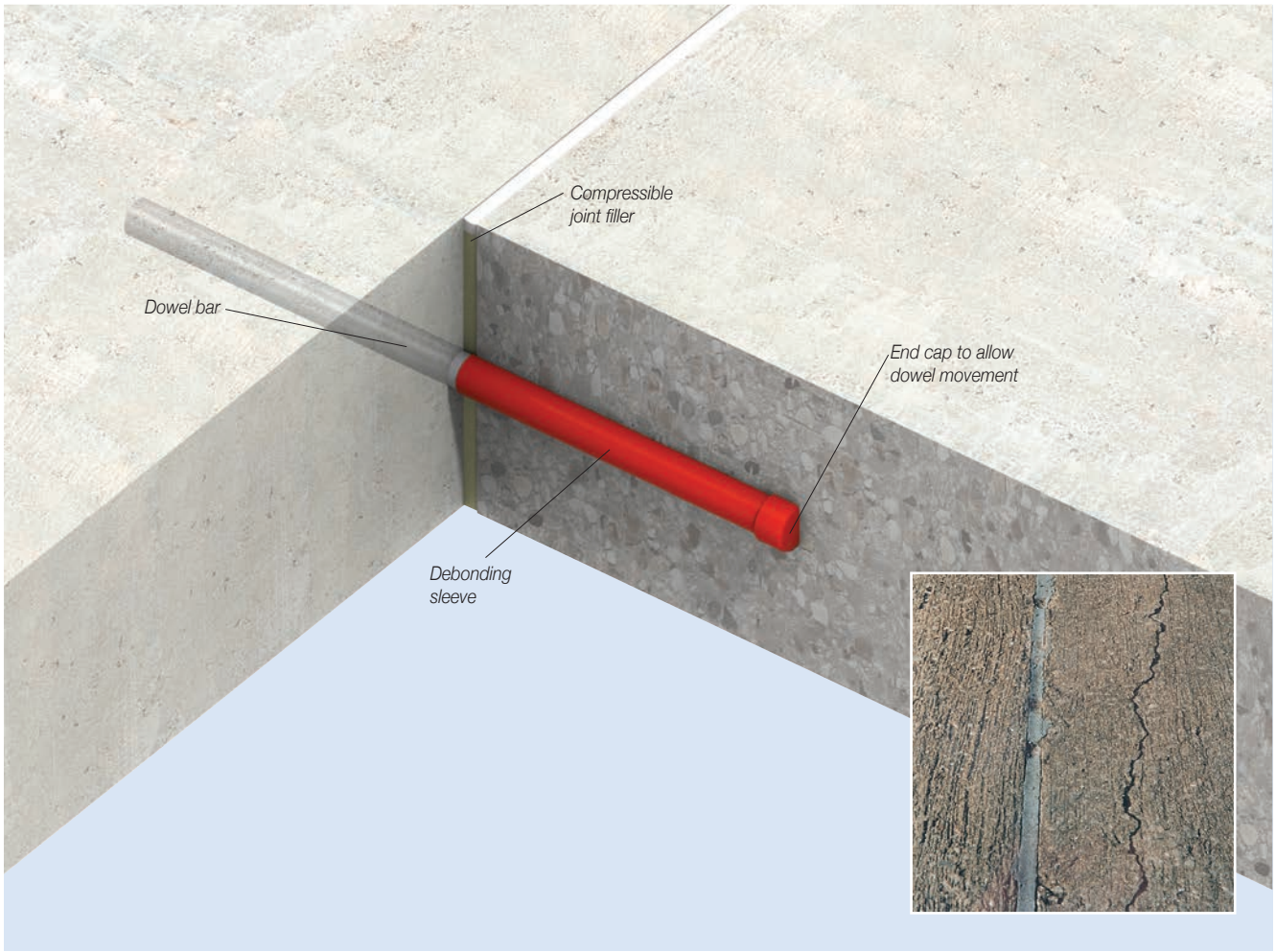
Plain dowels are not very effective when used across joints wider than 10mm.



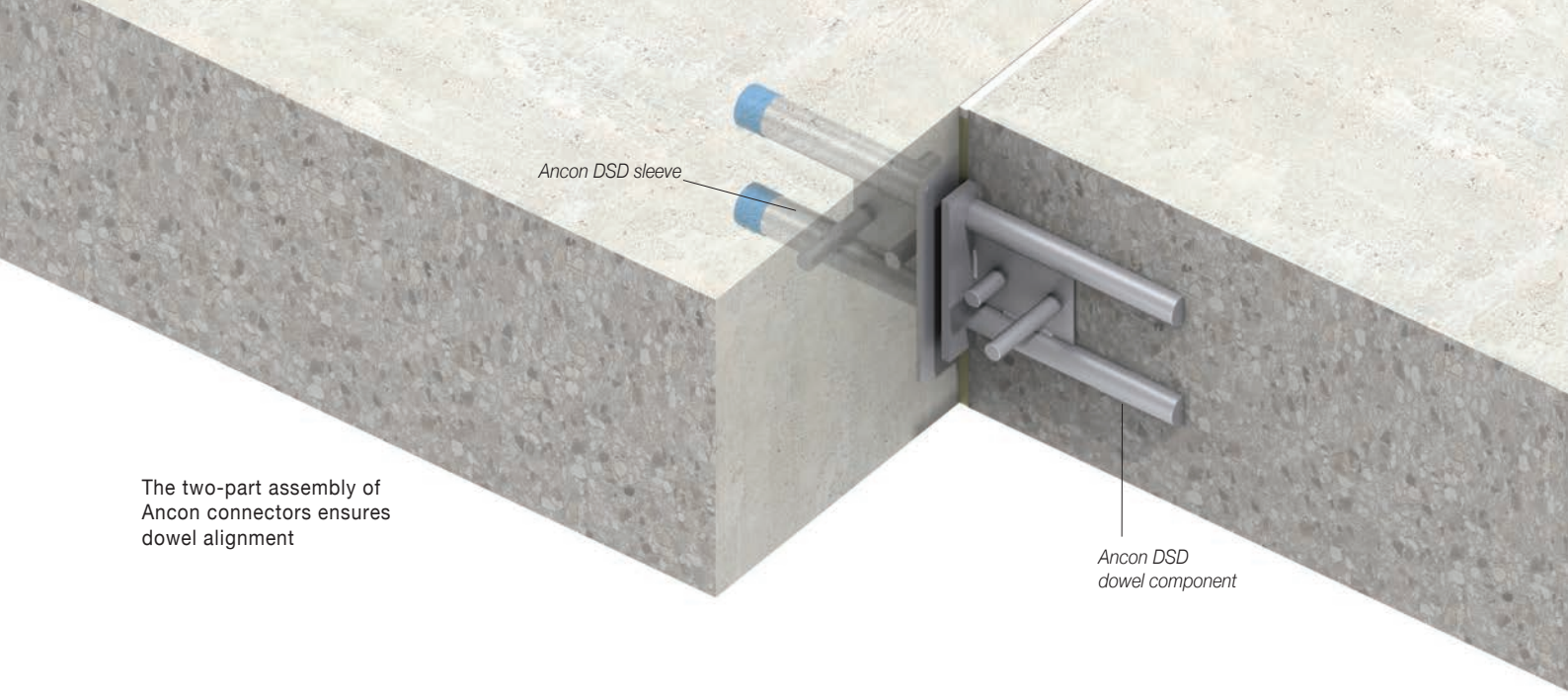
## Keyed Joints

Keyed joints require complicated formwork to create the tongue and groove. If the joint is not formed correctly, differential movement can take place. Load is transferred through the locally reduced section of the joint which can at times result in cracking.





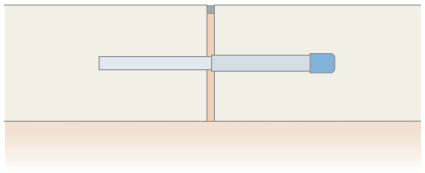

Misaligned dowels can result in cracking away from the expansion joint




The two-part assembly of Ancon connectors ensures dowel alignment

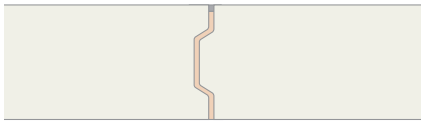
**Conventional Joints**

**Floor Slab**



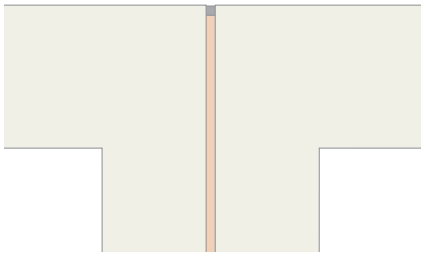
Dowel Bar

**Wall**



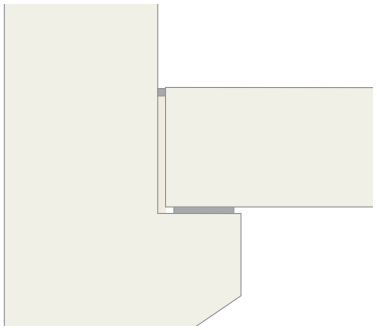
Keyed Joint

**Structural Movement Joint**



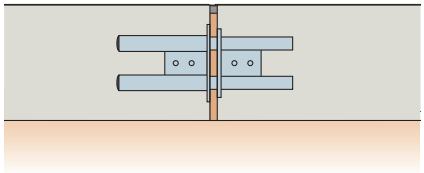
Double Columns

**Floor to Wall Connection**

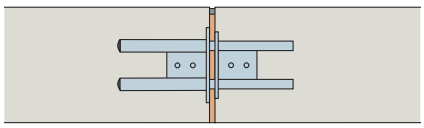


Corbel Support

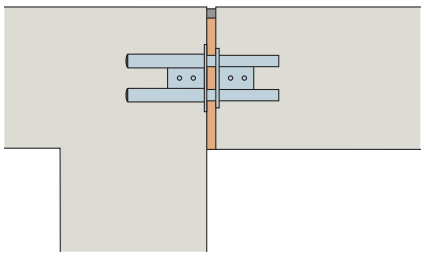
**Ancon Solutions**



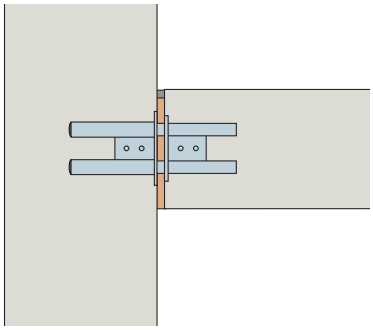
Ancon DSD



Ancon DSD



Ancon DSD



Ancon DSD

## Solutions to Joints

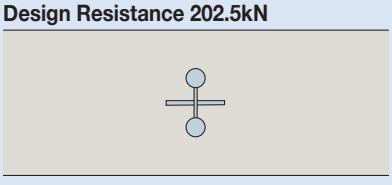
In most cases dowelled or keyed joints can be replaced by joints incorporating Ancon shear load connectors. These connectors are more effective at transferring load and allowing movement to take place, easier to fix on site and can prove a more cost-effective solution.

Ancon connectors can be used for movement joints in floor slabs, suspended slabs, and for replacing double columns and beams at structural movement joints. Applications in civil engineering include joints in bridge parapets, bridge abutments and diaphragm wall construction.

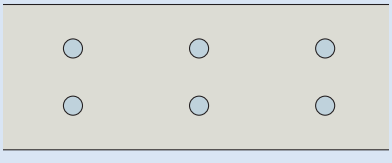
**Comparison of Performance with Plain Dowels**

| 400mm Thick Slab with Joint Width of 20mm | One Ancon DSD130 | Six 22mm Dia Dowel Bars |
|---|---|---|
| Dowel Diameters mm | 2 x 35 | 6 x 22 |
| Area of Dowels mm² | 1924 | 2281 |
| Design Resistance kN | 202.5 | 191.4 |

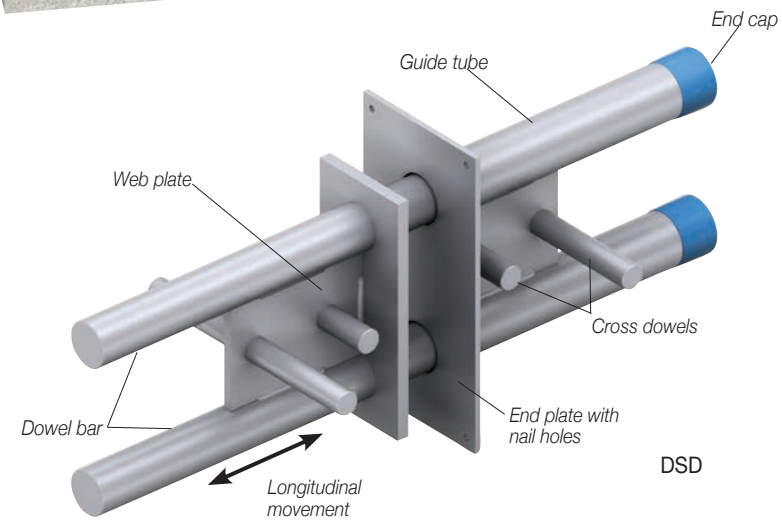
**1 Ancon DSD 130**
**Design Resistance 202.5kN**



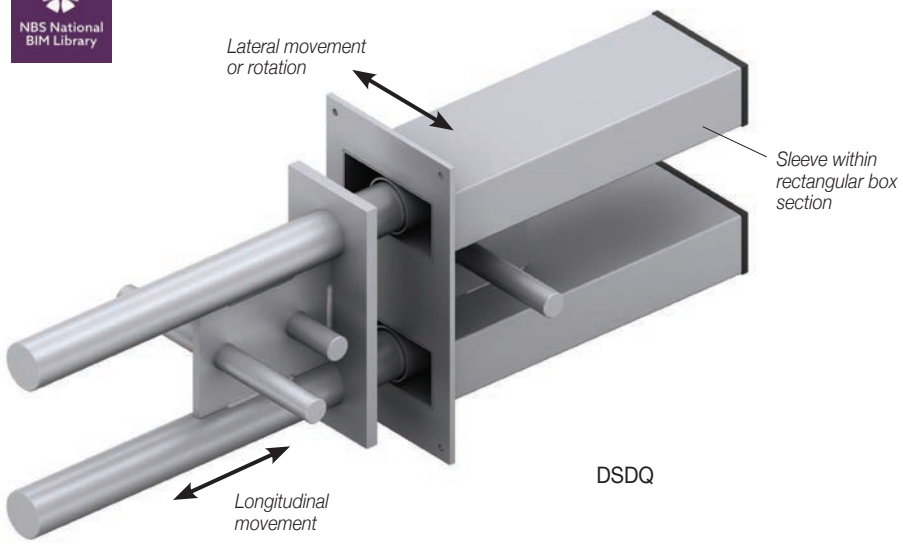
**6 Dowel Bars 22mm Diameter**
**Design Resistance 191.4kN**



# DSD/ESD Shear Load Connectors

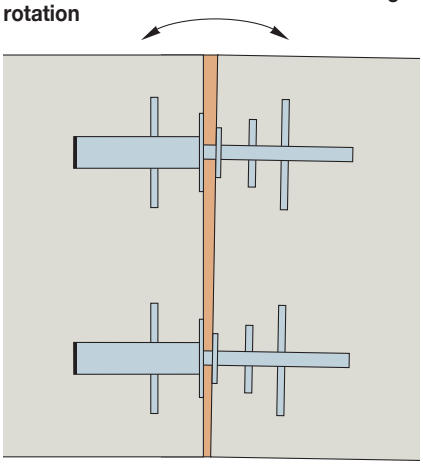



DSD



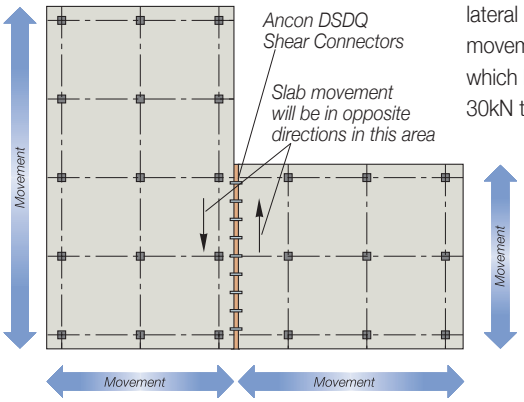

DSDQ

**Ancon DSDQ Shear Connectors allowing rotation**



Plan

**Ancon DSDQ Shear Connectors allowing movement in two directions**




## Ancon Shear Load Connectors

The DSD range of connectors offers significant advantages over plain dowels. Each connector is a two-part assembly comprising a sleeve and a dowel component. Installation is a fast and accurate process, drilling of either formwork or concrete is not required. The sleeve is simply nailed to the formwork ensuring subsequent alignment with the dowel, essential for effective movement.

They are manufactured from stainless steel to ensure a high degree of corrosion resistance with no requirement for additional protection.

Free software is available from us, which simplifies the design of movement joints in reinforced concrete. For a given application, Our design program will calculate the size and quantity of shear load connectors required, the edge distance and spacings at which they should be installed, and details of the local reinforcement.

### Ancon DSD

The Ancon DSD is the original two-part, double dowel, shear load connector. The two dowels are Duplex stainless steel bar. The dowel component can move longitudinally within the sleeve to accommodate movement. The connector is available in ten standard sizes and has design resistances from around 20kN to over 950kN. The larger connectors can be used in joints up to 60mm wide. Larger joints can be accommodated using special dowels. Please contact Leviat's Technical Department for further information.

### Ancon DSDQ

The Ancon DSDQ shear load connector uses the same dowel component as the Ancon DSD, but the cylindrical sleeve is contained within a rectangular box section to allow lateral movement in addition to the longitudinal movement. There are nine standard sizes which have design resistances from around 30kN to over 950kN.

### Building Information Modelling

BIM objects of the Ancon DSD and DSDQ are available from www.ancon.co.uk/BIM

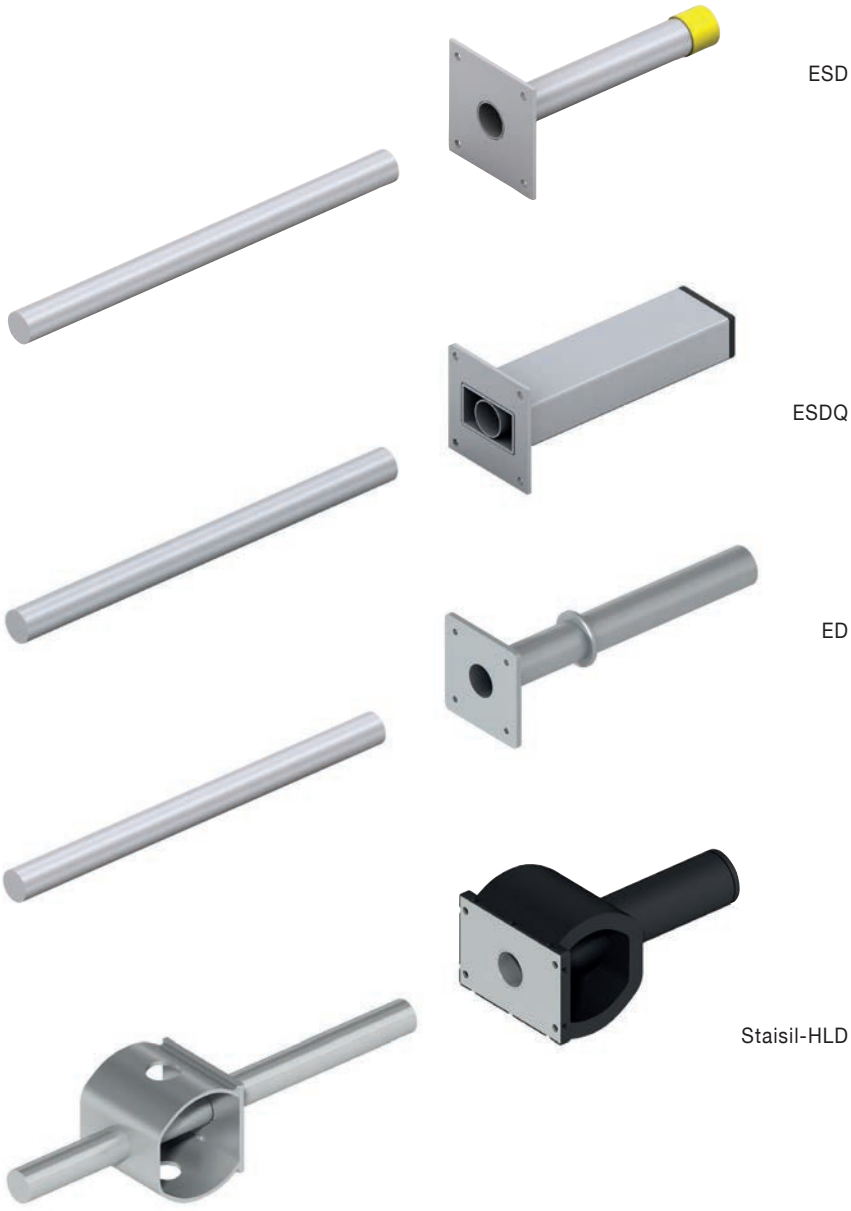
A range of stainless steel single dowel shear connectors is also available.

**Ancon ESD**
The Ancon ESD shear load connector is used where loads are small, but where alignment is critical. It is available in four sizes with each size available in two lengths. The dowel component is Duplex stainless steel bar.

**Ancon ESDQ**
The Ancon ESDQ shear load connector uses the same dowel as the ESD, but the cylindrical sleeve is contained within a rectangular box section to allow lateral movement or rotation in addition to longitudinal movement.

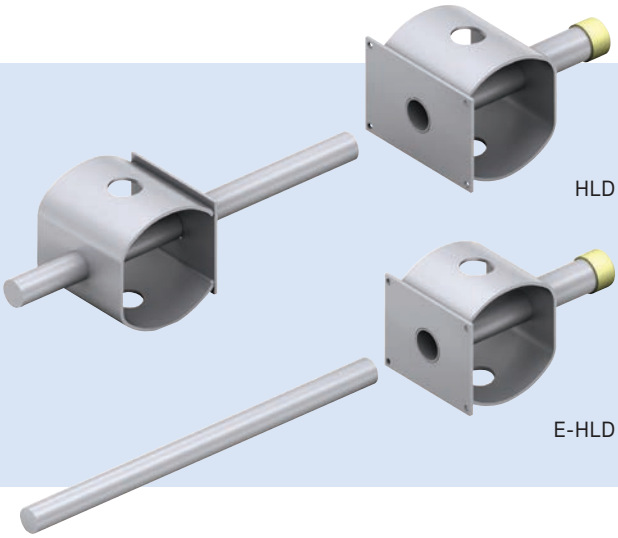
**Ancon ED**
The Ancon ED is a low cost dowel connector for use in floor slabs where alignment is important but loads are small. The single dowel shear connector is available in four sizes with each size available in two lengths. The sleeve component is made from a durable plastic and features an integral nail plate. The dowel component is Duplex stainless steel.

**Ancon Staisil-HLD Acoustic Dowel**
The Ancon Staisil-HLD features a 22mm diameter stainless steel dowel, located in a sound absorbing sleeve. It is designed to reduce the oscillation of impact sound through a building by isolating concrete components, such as stair landings from the main structural frame. A decoupled concrete configuration, featuring Staisil-HLDs, offers an 18dB impact sound reduction over a rigid concrete floor connection, verified by the Fraunhofer Institute.

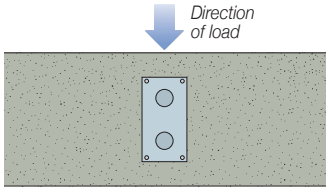



**Ancon HLD/HLDQ**
The Ancon HLD is a two-part, high load, shear connector for thinner slabs outside the application of the DSD range. The connector is available in seven sizes with design resistances from 24kN to over 500kN. The larger connectors can be used in joints up to 60mm wide.

**Ancon E-HLD**
The Ancon E-HLD joins new concrete slabs to existing concrete walls and comprises a stainless steel dowel and a high strength, stainless steel sleeve. It is designed to transfer shear load where new slabs are connected to diaphragm walls or secant pile walls in basement construction. The dowel component is resin-fixed into the wall. It is available in seven standard sizes and can be used in a slab thickness from 160mm and joints up to 60mm wide.

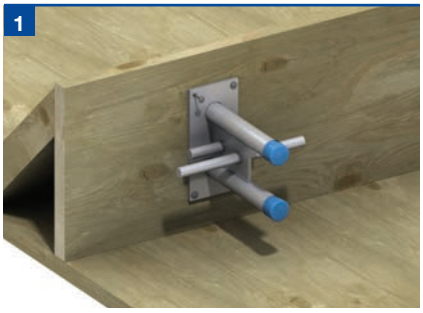


# DSD/ESD Shear Load Connectors

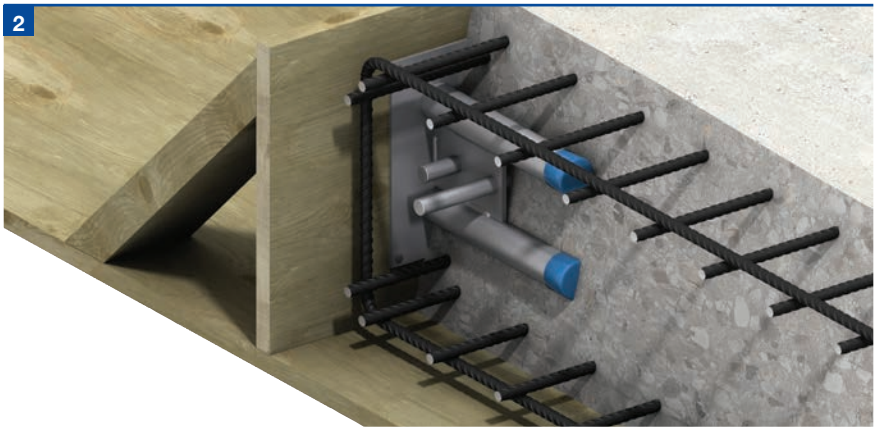



## Installation Procedure

The two-part assembly of all Ancon shear connectors removes the need for drilling formwork on site, supporting dowel bars and fitting debonding sleeves and end caps. The installation is a fast and accurate process.




Nail the sleeve component to the shuttering ensuring that the sleeve is correctly orientated for the direction of the load. Check that the minimum spacing and edge distances are not exceeded. The label prevents debris from entering into the sleeve aperture and should not be removed at this stage.

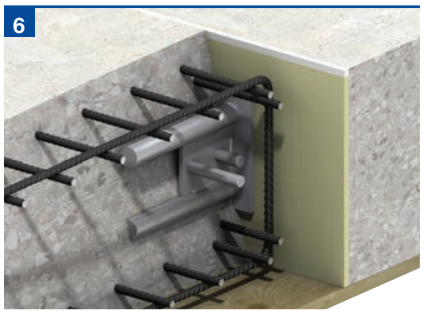



Fix the local reinforcement in position around the sleeve component together with any other reinforcement that is required, ensuring that the correct cover to the reinforcement is maintained. Pour the concrete to complete the installation of the sleeve component.

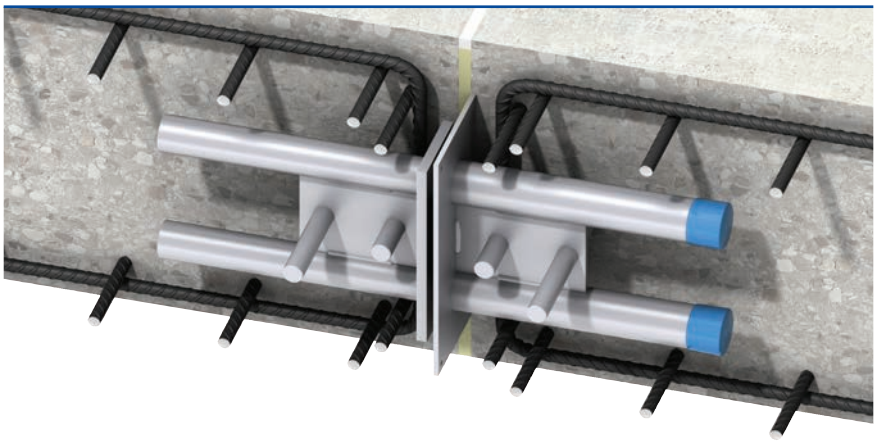

When the concrete has achieved sufficient strength, strike the shuttering. Peel off or puncture the label to reveal the holes for the dowels. Where 'Q' versions are being used, the label should only be punctured enough to allow the dowel into the cylindrical sleeve to prevent debris entering the box section.


Position compressible joint filler of the appropriate width, for applications where movement is expected between the two sections of concrete.


Push the dowel component through the joint filler (if applicable) until it is fully located in the sleeve component. It may be necessary to tap the dowel component to overcome the dimple which pinch holds the dowel in the sleeve and prevents dislocation when the concrete is vibrated.




Fix the local reinforcement in position around the dowel component together with any other reinforcement that is required, ensuring that the correct cover to the reinforcement is maintained. Pour the concrete to complete the installation of the shear connector.



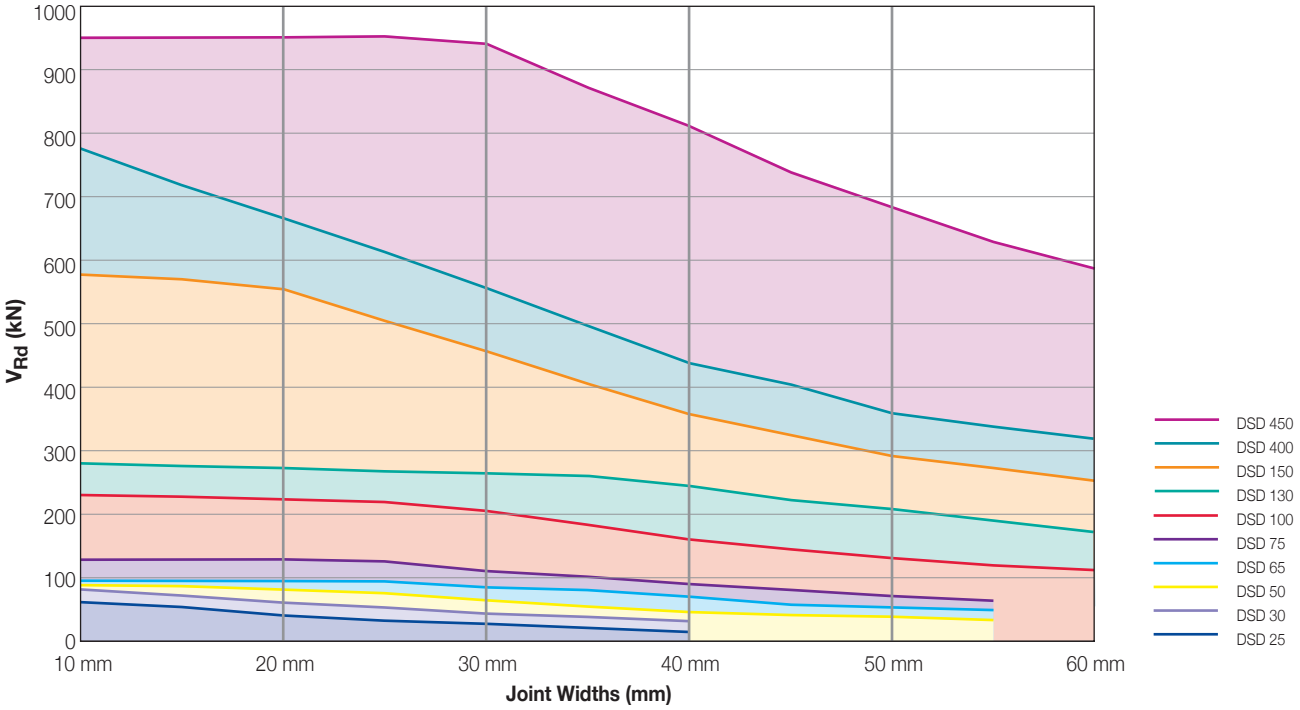
**Notes**:

*(i) Although installation is shown for Ancon DSD, the procedure is the same for all Ancon shear connectors.*

*(ii) Where deep concrete pours are proposed, the installation will require further consideration. More robust fixing of the sleeve and dowel components will be necessary to avoid displacement during placing of the concrete.*

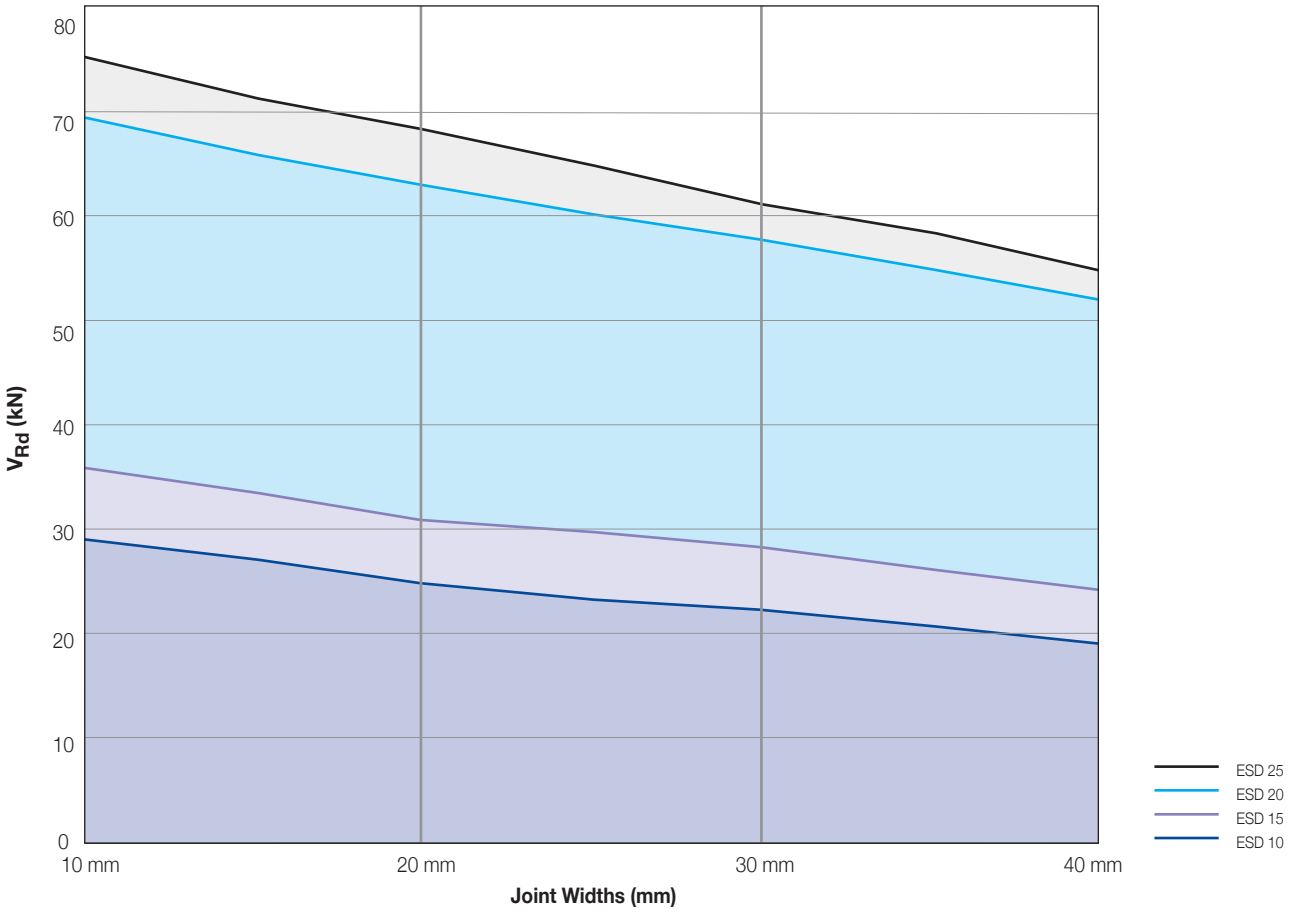
## Design Resistance

**Ancon DSD $V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) at the Maximum Slab Thickness (mm) in C30/37 Concrete**




**Note**: *For more detailed information please see page 11.*

**Ancon ESD $V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) at the Maximum Slab Thickness (mm) in C30/37 Concrete**




**Note**: *For more detailed information please see page 17.*

# DSD/ESD Shear Load Connectors

## DSD and DSDQ Shear Connectors

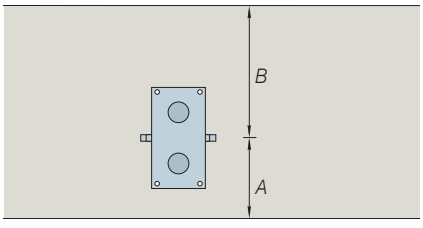
**$V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) and Slab Thickness (mm) using C25/30 Concrete**

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| 180* | DSD 25 | 39.5 | 39.5 | 29.9 | 23.2 | - | - |
| 200 | | 45.7 | 41.8 | 29.9 | 23.2 | - | - |
| 220 | | 52.3 | 41.8 | 29.9 | 23.2 | - | - |
| 240 | | 59.3 | 41.8 | 29.9 | 23.2 | - | - |
| 260 | | 66.7 | 41.8 | 29.9 | 23.2 | - | - |
| 280 | | 69.6 | 41.8 | 29.9 | 23.2 | - | - |
| 180* | DSD/DSDQ 30 | 42.7 | 42.7 | 42.7 | 34.7 | - | - |
| 200 | | 49.2 | 49.2 | 44.6 | 34.7 | - | - |
| 220 | | 56.1 | 56.1 | 44.6 | 34.7 | - | - |
| 240 | | 63.4 | 62.4 | 44.6 | 34.7 | - | - |
| 260 | | 71.1 | 62.4 | 44.6 | 34.7 | - | - |
| 280 | | 79.1 | 62.4 | 44.6 | 34.7 | - | - |
| 180* | DSD/DSDQ 50 | 43.8 | 43.8 | 43.8 | 43.8 | 40.4 | - |
| 200 | | 50.3 | 50.3 | 50.3 | 49.4 | 40.4 | - |
| 220 | | 57.3 | 57.3 | 57.3 | 49.4 | 40.4 | - |
| 240 | | 64.6 | 64.6 | 63.5 | 49.4 | 40.4 | - |
| 260 | | 72.3 | 72.3 | 63.5 | 49.4 | 40.4 | - |
| 280 | | 80.4 | 80.4 | 63.5 | 49.4 | 40.4 | - |
| 200* | DSD/DSDQ 65 | 62.2 | 62.2 | 62.2 | 62.2 | 55.4 | - |
| 220 | | 64.3 | 64.3 | 64.3 | 64.3 | 55.4 | - |
| 240 | | 68.6 | 68.6 | 68.6 | 67.7 | 55.4 | - |
| 260 | | 76.4 | 76.4 | 76.4 | 67.7 | 55.4 | - |
| 280 | | 84.6 | 84.6 | 84.6 | 67.7 | 55.4 | - |
| 300 | | 93.0 | 93.0 | 87.1 | 67.7 | 55.4 | - |
| 240* | DSD/DSDQ 75 | 86.1 | 86.1 | 86.1 | 86.1 | 73.8 | - |
| 260 | | 89.1 | 89.1 | 89.1 | 89.1 | 73.8 | - |
| 280 | | 94.8 | 94.8 | 94.8 | 90.1 | 73.8 | - |
| 300 | | 104.0 | 104.0 | 104.0 | 90.1 | 73.8 | - |
| 320 | | 113.6 | 113.6 | 113.6 | 90.1 | 73.8 | - |
| 340 | | 123.4 | 123.4 | 115.9 | 90.1 | 73.8 | - |
| 320* | DSD/DSDQ 100 | 161.5 | 157.6 | 154.0 | 150.5 | 133.6 | 114.0 |
| 340 | | 166.5 | 162.6 | 158.8 | 155.2 | 133.6 | 114.0 |
| 360 | | 170.8 | 166.7 | 162.8 | 159.1 | 133.6 | 114.0 |
| 380 | | 183.2 | 178.9 | 174.7 | 161.4 | 133.6 | 114.0 |
| 400 | | 196.0 | 191.4 | 186.9 | 161.4 | 133.6 | 114.0 |
| 420 | | 209.1 | 204.2 | 199.4 | 161.4 | 133.6 | 114.0 |
| 360* | DSD/DSDQ 130 | 185.0 | 181.3 | 177.7 | 174.3 | 171.0 | 167.9 |
| 380 | | 193.4 | 189.5 | 185.8 | 182.2 | 178.8 | 175.5 |
| 400 | | 206.6 | 202.5 | 198.5 | 194.7 | 191.0 | 176.1 |
| 420 | | 220.2 | 215.8 | 211.5 | 207.5 | 203.6 | 176.1 |
| 440 | | 234.0 | 229.3 | 224.8 | 220.5 | 206.5 | 176.1 |
| 460 | | 248.2 | 243.2 | 238.4 | 233.8 | 206.5 | 176.1 |
| 450* | DSD/DSDQ 150 | 280.8 | 276.0 | 271.3 | 266.8 | 262.4 | 253.6 |
| 500 | | 308.2 | 302.8 | 297.7 | 292.8 | 288.0 | 253.6 |
| 550 | | 339.7 | 333.8 | 328.2 | 322.7 | 297.4 | 253.6 |
| 600 | | 380.5 | 373.9 | 367.6 | 359.3 | 297.4 | 253.6 |
| 700 | | 465.4 | 457.3 | 449.6 | 359.3 | 297.4 | 253.6 |
| 800 | | 485.6 | 477.2 | 451.2 | 359.3 | 297.4 | 253.6 |
| 600* | DSD/DSDQ 400 | 441.1 | 434.6 | 428.3 | 422.2 | 369.3 | 315.0 |
| 650 | | 485.1 | 478.0 | 471.0 | 441.8 | 369.3 | 315.0 |
| 700 | | 529.9 | 522.1 | 514.5 | 441.8 | 369.3 | 315.0 |
| 800 | | 620.9 | 611.8 | 554.1 | 441.8 | 369.3 | 315.0 |
| 900 | | 712.7 | 666.4 | 554.1 | 441.8 | 369.3 | 315.0 |
| 1000 | | 745.3 | 666.4 | 554.1 | 441.8 | 369.3 | 315.0 |
| 600* | DSD/DSDQ 450 | 485.1 | 485.1 | 485.1 | 485.1 | 485.1 | 485.1 |
| 650 | | 515.5 | 515.5 | 515.5 | 515.5 | 515.5 | 515.5 |
| 700 | | 561.4 | 561.4 | 561.4 | 561.4 | 561.4 | 561.4 |
| 800 | | 654.4 | 654.4 | 654.4 | 654.4 | 654.4 | 586.9 |
| 900 | | 747.9 | 747.9 | 747.9 | 747.9 | 684.7 | 586.9 |
| 1000 | | 840.1 | 840.1 | 840.1 | 811.4 | 684.7 | 586.9 |

* Refers to the minimum slab depth $H_{min}$ for each connector type.

**Position of connectors in slab**

The tables on pages 10 and 11 are based on the shear connector being located centrally in the slab edge. If the shear connector is offset from the centreline, the minimum distance between the connector centre and the slab face should be considered as H/2.




*A < B*
*Slab thickness to be considered in selecting the connector is 2 x A. Minimum values are shown in the table.*

| Product Reference | Minimum Slab Depth $H_{min}$ | Minimum Depth 'A' |
|---|---|---|
| DSD 25 | 180mm | 90mm |
| DSD/DSDQ 30 | 180mm | 90mm |
| DSD/DSDQ 50 | 180mm | 90mm |
| DSD/DSDQ 65 | 200mm | 100mm |
| DSD/DSDQ 75 | 240mm | 120mm |
| DSD/DSDQ 100 | 320mm | 160mm |
| DSD/DSDQ 130 | 360mm | 180mm |
| DSD/DSDQ 150 | 450mm | 225mm |
| DSD/DSDQ 400 | 600mm | 300mm |
| DSD/DSDQ 450 | 600mm | 300mm |

## $V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) and Slab Thickness (mm) using C30/37 Concrete

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| 180* | DSD 25 | 44.7 | 41.8 | 29.9 | 23.2 | - | - |
| 200 | | 51.8 | 41.8 | 29.9 | 23.2 | - | - |
| 220 | | 59.3 | 41.8 | 29.9 | 23.2 | - | - |
| 240 | | 67.3 | 41.8 | 29.9 | 23.2 | - | - |
| 260 | | 69.6 | 41.8 | 29.9 | 23.2 | - | - |
| 280 | | 69.6 | 41.8 | 29.9 | 23.2 | - | - |
| 180* | DSD/DSDQ 30 | 48.3 | 48.3 | 44.6 | 34.7 | - | - |
| 200 | | 55.7 | 55.7 | 44.6 | 34.7 | - | - |
| 220 | | 63.6 | 62.4 | 44.6 | 34.7 | - | - |
| 240 | | 71.8 | 62.4 | 44.6 | 34.7 | - | - |
| 260 | | 80.5 | 62.4 | 44.6 | 34.7 | - | - |
| 280 | | 89.7 | 62.4 | 44.6 | 34.7 | - | - |
| 180* | DSD/DSDQ 50 | 49.6 | 49.6 | 49.6 | 49.4 | 40.4 | - |
| 200 | | 57.0 | 57.0 | 57.0 | 49.4 | 40.4 | - |
| 220 | | 64.9 | 64.9 | 63.5 | 49.4 | 40.4 | - |
| 240 | | 73.2 | 73.2 | 63.5 | 49.4 | 40.4 | - |
| 260 | | 82.0 | 82.0 | 63.5 | 49.4 | 40.4 | - |
| 280 | | 91.1 | 88.9 | 63.5 | 49.4 | 40.4 | - |
| 200* | DSD/DSDQ 65 | 70.5 | 70.5 | 70.5 | 67.7 | 55.4 | - |
| 220 | | 72.8 | 72.8 | 72.8 | 67.7 | 55.4 | - |
| 240 | | 77.8 | 77.8 | 77.8 | 67.7 | 55.4 | - |
| 260 | | 86.6 | 86.6 | 86.6 | 67.7 | 55.4 | - |
| 280 | | 95.8 | 95.8 | 87.1 | 67.7 | 55.4 | - |
| 300 | | 105.5 | 105.5 | 87.1 | 67.7 | 55.4 | - |
| 240* | DSD/DSDQ 75 | 97.6 | 97.6 | 97.6 | 90.1 | 73.8 | - |
| 260 | | 101.0 | 101.0 | 101.0 | 90.1 | 73.8 | - |
| 280 | | 107.4 | 107.4 | 107.4 | 90.1 | 73.8 | - |
| 300 | | 117.9 | 117.9 | 115.9 | 90.1 | 73.8 | - |
| 320 | | 128.7 | 128.7 | 115.9 | 90.1 | 73.8 | - |
| 340 | | 139.9 | 139.9 | 115.9 | 90.1 | 73.8 | - |
| 320* | DSD/DSDQ 100 | 183.0 | 178.7 | 174.5 | 161.4 | 133.6 | 114.0 |
| 340 | | 188.7 | 184.3 | 180.0 | 161.4 | 133.6 | 114.0 |
| 360 | | 193.5 | 188.9 | 184.5 | 161.4 | 133.6 | 114.0 |
| 380 | | 207.7 | 202.7 | 198.0 | 161.4 | 133.6 | 114.0 |
| 400 | | 222.2 | 216.9 | 203.9 | 161.4 | 133.6 | 114.0 |
| 420 | | 237.0 | 231.4 | 203.9 | 161.4 | 133.6 | 114.0 |
| 360* | DSD/DSDQ 130 | 209.7 | 205.5 | 201.4 | 197.6 | 193.8 | 176.1 |
| 380 | | 219.2 | 214.8 | 210.6 | 206.5 | 202.7 | 176.1 |
| 400 | | 234.2 | 229.5 | 225.0 | 220.7 | 206.5 | 176.1 |
| 420 | | 249.5 | 244.5 | 239.8 | 235.1 | 206.5 | 176.1 |
| 440 | | 265.2 | 259.9 | 254.8 | 249.5 | 206.5 | 176.1 |
| 460 | | 281.2 | 275.6 | 270.2 | 249.5 | 206.5 | 176.1 |
| 450* | DSD/DSDQ 150 | 318.2 | 312.8 | 307.5 | 302.3 | 297.4 | 253.6 |
| 500 | | 349.2 | 343.2 | 337.4 | 331.8 | 297.4 | 253.6 |
| 550 | | 385.0 | 378.3 | 371.9 | 359.3 | 297.4 | 253.6 |
| 600 | | 431.2 | 423.8 | 416.6 | 359.3 | 297.4 | 253.6 |
| 700 | | 527.4 | 518.3 | 451.2 | 359.3 | 297.4 | 253.6 |
| 800 | | 582.7 | 553.0 | 451.2 | 359.3 | 297.4 | 253.6 |
| 600* | DSD/DSDQ 400 | 499.9 | 492.5 | 485.4 | 441.8 | 369.3 | 315.0 |
| 650 | | 549.8 | 541.7 | 533.8 | 441.8 | 369.3 | 315.0 |
| 700 | | 600.5 | 591.7 | 554.1 | 441.8 | 369.3 | 315.0 |
| 800 | | 703.7 | 666.4 | 554.1 | 441.8 | 369.3 | 315.0 |
| 900 | | 778.7 | 666.4 | 554.1 | 441.8 | 369.3 | 315.0 |
| 1000 | | 778.7 | 666.4 | 554.1 | 441.8 | 369.3 | 315.0 |
| 600* | DSD/DSDQ 450 | 549.8 | 549.8 | 549.8 | 549.8 | 549.8 | 549.8 |
| 650 | | 584.2 | 584.2 | 584.2 | 584.2 | 584.2 | 584.2 |
| 700 | | 636.2 | 636.2 | 636.2 | 636.2 | 636.2 | 586.9 |
| 800 | | 741.7 | 741.7 | 741.7 | 741.7 | 684.7 | 586.9 |
| 900 | | 847.6 | 847.6 | 847.6 | 811.4 | 684.7 | 586.9 |
| 1000 | | 952.1 | 952.1 | 941.1 | 811.4 | 684.7 | 586.9 |

* Refers to the minimum slab depth $H_{min}$ for each connector type.

**DSD Design Example**

| | | |
|---|---|---|
| Slab thickness | = 400mm | |
| Maximum width of joint | = 30mm | |
| Concrete strength | = C30/37 | |
| Characteristic dead load | = 100kN/m | $\gamma_G$ = 1.35* |
| Characteristic imposed load | = 120kN/m | $\gamma_Q$ = 1.5* |
| Design load | = (100 x 1.35) + (120 x 1.5) = 315kN/m | |

| $V_{Rd}$ (Design resistance) | Maximum centres | |
|---|---|---|
| DSD100 = 203.9kN | = 203.9 / 315 = 0.647m use 600mm | *Either connector would be acceptable, although using DSD130s at 700mm centres would minimise the number of connectors to be installed.* |
| DSD130 = 225.0kN | = 225.0 / 315 = 0.714m use 700mm | |

**The partial safety factors of 1.35 ($\gamma_G$) and 1.5 ($\gamma_Q$) are those recommended in EN 1990 Eurocode: Basis for structural design. For designs to Eurocode 2, please refer to the national annex for the factors to be used in the country concerned.*

See local reinforcement requirements on page 12.

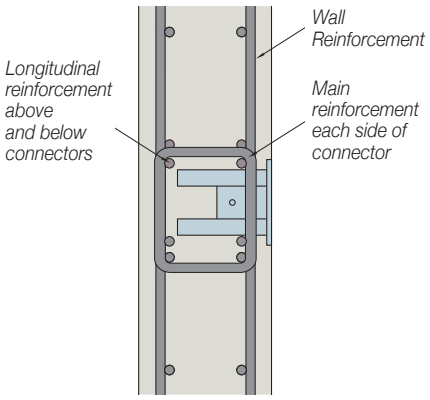
# DSD/ESD Shear Load Connectors

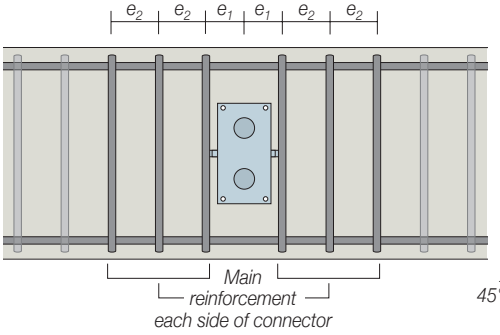
**DSD Reinforcement Details**

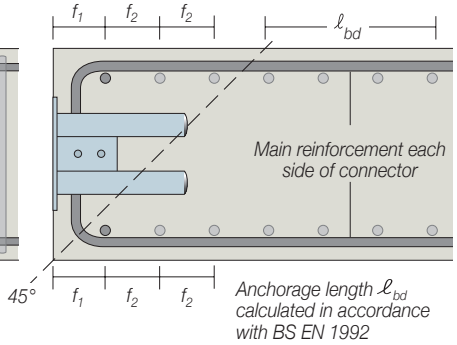
Local reinforcement is required around each connector to guarantee that the forces are transferred between the connectors and the concrete. Correct detailing in accordance with appropriate design codes and the recommendations provided here will ensure Ancon DSD and DSDQ connectors attain their full capacity.

The tables show proposals for the type and spacing of the main reinforcement, together with details of reinforcement above and below the connectors.

For walls, the reinforcement is repeated as in the tables but with links replacing the U-bars. Links should extend between the near face and the far face of the wall reinforcement.




**Based on C25/30 Concrete, maximum slab depth (see page 10), 20mm joint and 30mm cover**

| DSD/DSDQ | Options for Main Reinforcement (No. U bars each side) | Spacing (mm) |
|---|---|---|
| 25* | 2 H10 | $e_1$ = 50mm; $e_2$ = 98mm |
| 30 | 3 H10 | $e_1$ = 50mm; $e_2$ = 52mm |
| | 2 H12 | $e_1$ = 50mm; $e_2$ = 95mm |
| 50 | 4 H10 | $e_1$ = 50mm; $e_2$ = 35mm |
| | 3 H12 | $e_1$ = 50mm; $e_2$ = 48mm |
| 65 | 4 H10 | $e_1$ = 60mm; $e_2$ = 40mm |
| | 3 H12 | $e_1$ = 60mm; $e_2$ = 56mm |
| 75 | 5 H10 | $e_1$ = 60mm; $e_2$ = 39mm |
| | 4 H12 | $e_1$ = 60mm; $e_2$ = 50mm |
| 100 | 5 H12 | $e_1$ = 60mm; $e_2$ = 57mm |
| | 3 H16 | $e_1$ = 60mm; $e_2$ = 116mm |
| 130 | 4 H16 | $e_1$ = 60mm; $e_2$ = 84mm |
| 150 | 6 H16 | $e_1$ = 60mm; $e_2$ = 101mm |
| 400 | 7 H16 | $e_1$ = 60mm; $e_2$ = 114mm |
| 450 | 9 H16 | $e_1$ = 60mm; $e_2$ = 87mm |

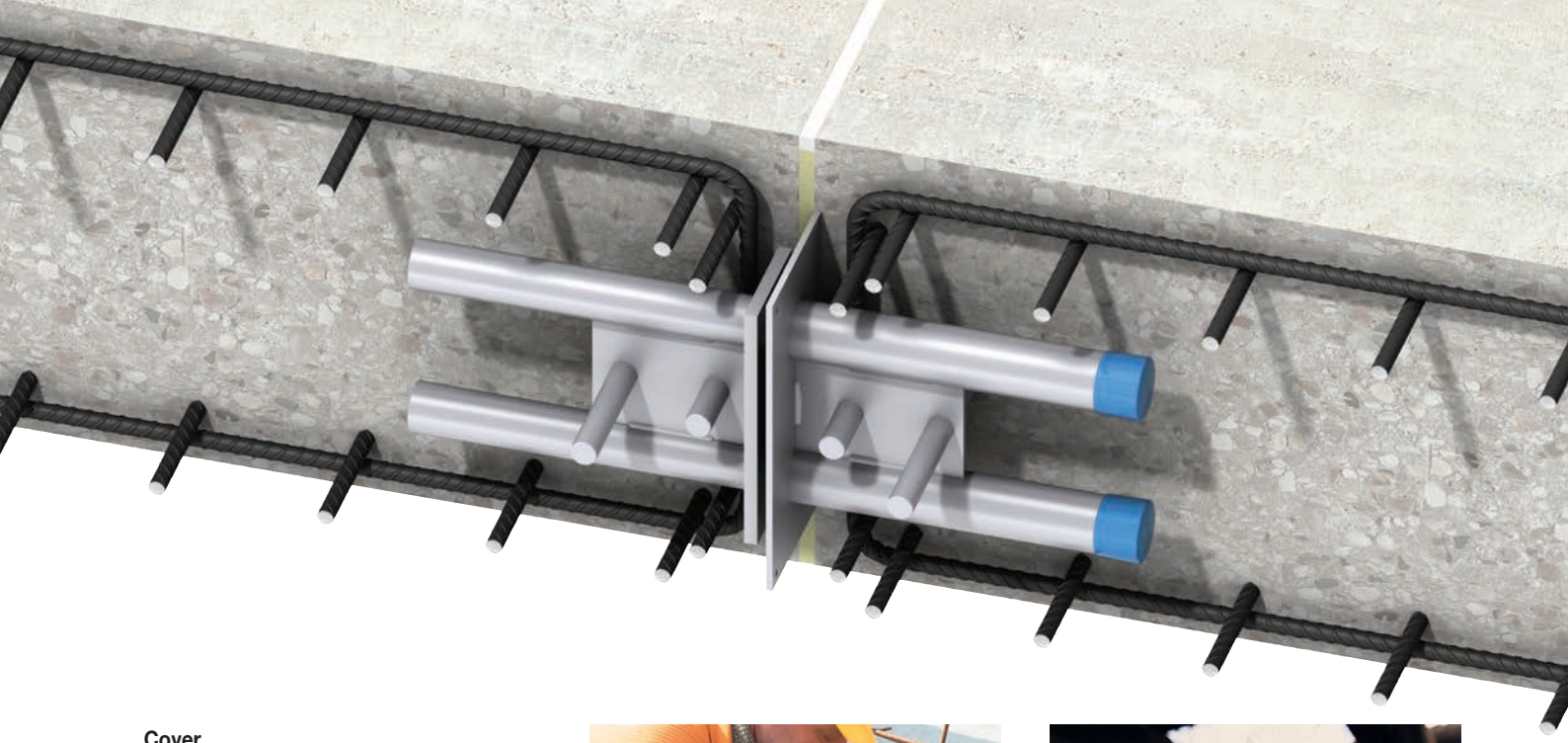
| DSD/DSDQ | Options for Longitudinal Bars (No. bars top and bottom) | Spacing (mm) |
|---|---|---|
| 25* | 1 H10 | $f_1$ = 60mm |
| 30 | 2 H10 | $f_1$ = 60mm; $f_2$ = 60mm |
| 50 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 65 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 75 | 3 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 100 | 3 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 130 | 3 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 150 | 4 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 400 | 5 H16 | $f_1$ = 60mm; $f_2$ = 100mm |
| 450 | 6 H16 | $f_1$ = 60mm; $f_2$ = 100mm |

**Based on C30/37 Concrete, maximum slab depth (see page 11) 20mm joint and 30mm cover**

| DSD/DSDQ | Options for Main Reinforcement (No. U bars each side) | Spacing (mm) |
|---|---|---|
| 25* | 2 H10 | $e_1$ = 50mm; $e_2$ = 98mm |
| 30 | 3 H10 | $e_1$ = 50mm; $e_2$ = 52mm |
| | 2 H12 | $e_1$ = 50mm; $e_2$ = 95mm |
| 50 | 4 H10 | $e_1$ = 50mm; $e_2$ = 35mm |
| | 3 H12 | $e_1$ = 50mm; $e_2$ = 48mm |
| 65 | 4 H10 | $e_1$ = 60mm; $e_2$ = 40mm |
| | 3 H12 | $e_1$ = 60mm; $e_2$ = 56mm |
| 75 | 5 H10 | $e_1$ = 60mm; $e_2$ = 39mm |
| | 4 H12 | $e_1$ = 60mm; $e_2$ = 50mm |
| 100 | 5 H12 | $e_1$ = 60mm; $e_2$ = 45mm |
| | 3 H16 | $e_1$ = 60mm; $e_2$ = 70mm |
| 130 | 4 H16 | $e_1$ = 60mm; $e_2$ = 81mm |
| 150 | 6 H16 | $e_1$ = 60mm; $e_2$ = 101mm |
| 400 | 7 H16 | $e_1$ = 60mm; $e_2$ = 114mm |
| 450 | 9 H16 | $e_1$ = 60mm; $e_2$ = 87mm |

| DSD/DSDQ | Options for Longitudinal Bars (No. bars top and bottom) | Spacing (mm) |
|---|---|---|
| 25* | 1 H10 | $f_1$ = 60mm |
| 30 | 2 H10 | $f_1$ = 60mm; $f_2$ = 60mm |
| 50 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 65 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 75 | 3 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| 100 | 3 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 130 | 4 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 150 | 4 H16 | $f_1$ = 60mm; $f_2$ = 70mm |
| 400 | 5 H16 | $f_1$ = 60mm; $f_2$ = 100mm |
| 450 | 6 H16 | $f_1$ = 60mm; $f_2$ = 100mm |

**DSD only*

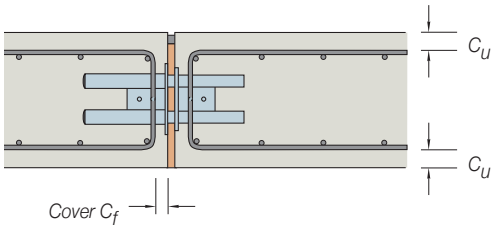


## Cover

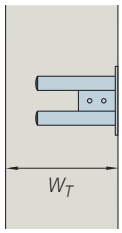
Minimum cover $C_u$ to local reinforcement is to the recommendations of BS EN 1992.

Maximum cover $C_f$ to face of slab is as shown below:

| Ref DSD | Max Cover to Face $C_f$ (mm) | Ref DSDQ | Max Cover to Face $C_f$ (mm) |
|---|---|---|---|
| 25 | 40 | - | - |
| 30 | 40 | 30 | 40 |
| 50 | 40 | 50 | 40 |
| 65 | 40 | 65 | 40 |
| 75 | 40 | 75 | 40 |
| 100 | 50 | 100 | 65 |
| 130 | 50 | 130 | 70 |
| 150 | 70 | 150 | 70 |
| 400 | 80 | 400 | 80 |
| 450 | 50 | 450 | 50 |



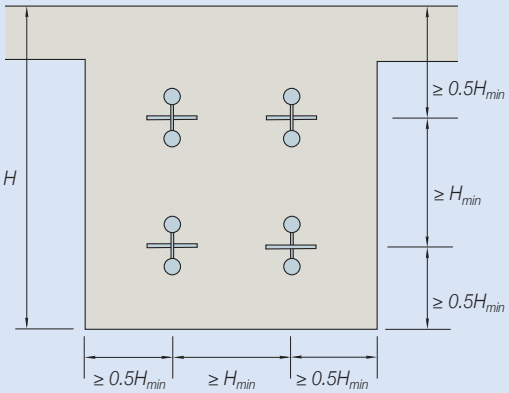

## Minimum Wall Thickness




| Ref DSD/DSDQ | Minimum Wall Thickness $W_T$ DSD | DSDQ |
|---|---|---|
| 25 | 180mm | - |
| 30 | 180mm | 190mm |
| 50 | 185mm | 210mm |
| 65 | 205mm | 225mm |
| 75 | 205mm | 225mm |
| 100 | 260mm | 290mm |
| 130 | 315mm | 340mm |
| 150 | 325mm | 355mm |
| 400 | 385mm | 405mm |
| 450 | 420mm | 455mm |

## Guidance on Specifying DSD at Beam Connections

The diagram and table show the minimum vertical and horizontal dowel spacings. For further guidance, and local reinforcement requirements, please contact us.




**Minimum Dowel Centres**

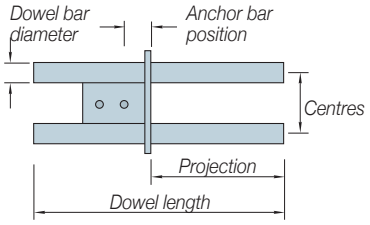
| DSD Type | $H_{min}$ |
|---|---|
| DSD25 | 180mm |
| DSD30 | 180mm |
| DSD50 | 180mm |
| DSD65 | 200mm |
| DSD75 | 240mm |
| DSD100 | 320mm |
| DSD130 | 360mm |
| DSD150 | 450mm |
| DSD400 | 600mm |
| DSD450 | 600mm |

# DSD/ESD Shear Load Connectors

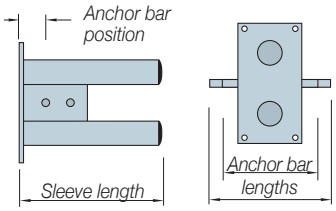
**Material Specifications**

| | |
|---|---|
| Dowel Bars: | 1.4462 to BS EN 10088 |
| Other Metal Components: | 1.4301 to BS EN 10088 |
| Plastic Sleeve: | Polypropylene, CnH2n |

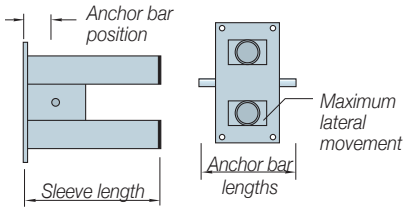
**Dowel Component**




**DSD Sleeve**




**DSDQ Sleeve**



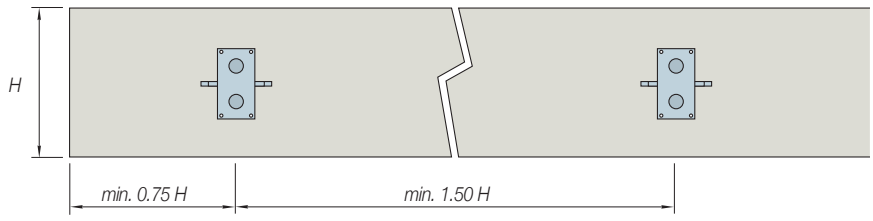

**Dimensions**

| Ref DSD DSDQ | Dowel Component | | | | | | DSD Sleeve | | | DSDQ Sleeve | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Overall Length | Dowel Dia | Dowel Centres | Dowel Projection | Anchor Bar Position | Anchor Bar Lengths | Overall Length | Anchor Bar Position | Anchor Bar Lengths | Overall Length | Anchor Bar Position | Anchor Bar Length | Lateral Mov't |
| 25* | 250 | 14 | 40 | 120 | 31 | 50/110 | 120 | 28 | 50/110 | - | - | - | - |
| 30 | 260 | 16 | 48 | 120 | 31 | 50/110 | 120 | 28 | 50/110 | 140 | 33 | 70 | +/-12.5 |
| 50 | 280 | 18 | 50 | 130 | 31 | 50/130 | 135 | 28 | 50/130 | 160 | 33 | 70 | +/-12.8 |
| 65 | 300 | 20 | 65 | 150 | 31 | 50/130 | 155 | 28 | 50/130 | 175 | 33 | 70 | +/-10.5 |
| 75 | 340 | 22 | 75 | 150 | 33 | 50/150 | 155 | 31 | 50/150 | 175 | 33 | 120 | +/-10.3 |
| 100 | 400 | 30 | 100 | 210 | 34 | 80/170 | 210 | 36 | 80/170 | 240 | 54 | 170 | +/-20.75 |
| 130 | 470 | 35 | 105 | 260 | 34 | 80/170 | 265 | 36 | 80/170 | 290 | 59 | 170 | +/-18.25 |
| 150 | 550 | 42 | 120 | 270 | 54 | 80/210 | 275 | 39 | 80/210 | 305 | 54 | 170 | +/-10.85 |
| 400 | 660 | 52 | 160 | 330 | 70 | 130/300 | 335 | 70 | 130/300 | 355 | 64 | 300 | +/-15.25 |
| 450 | 690 | 65 | 180 | 360 | 80 | 130/300 | 370 | 80 | 130/300 | 400 | 89 | 300 | +/-27.5 |

**Notes:** **DSD only. All dimensions are in millimetres (mm).*

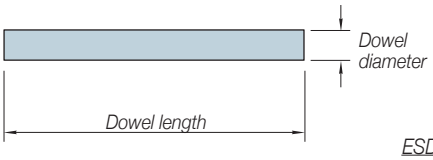
**Edge Distance and Spacing**

The minimum edge distance and spacing of Ancon DSD/DSDQ shear load connectors is determined by the depth of slab and is illustrated in the adjacent drawing. It is possible to reduce the spacing further with the absolute minimum being 1.5 $H_{min}$ (where $H_{min}$ is the minimum slab depth for each connector type), however the design resistances are then limited to those given for $H_{min}$ only.

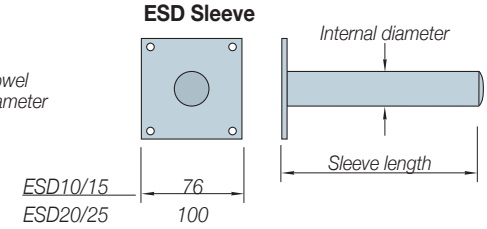


## Ancon ESD and ESDQ Shear Connectors

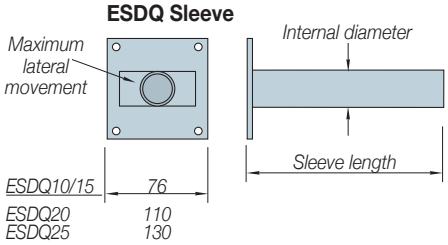
**Dowel Component**




**ESD Sleeve**




**ESDQ Sleeve**



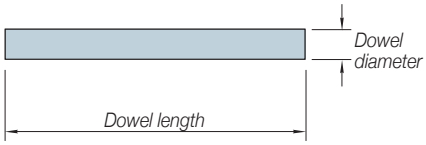

**Dimensions**

| Ref ESD ESDQ | Dowel Component | | ESD Sleeve | | ESDQ Sleeve | | |
|---|---|---|---|---|---|---|---|
| | Dowel Diameter | Dowel Length | Internal Diameter | Sleeve Length | Internal Diameter | Sleeve Length | Max. Lateral Movement |
| 10 300 | 20 | 300 | 21 | 170 | 21 | 170 | +/-10 |
| 10 400 | 20 | 400 | 21 | 220 | 21 | 220 | +/-10 |
| 15 300 | 22 | 300 | 23 | 170 | 23 | 170 | +/-10 |
| 15 400 | 22 | 400 | 23 | 220 | 23 | 220 | +/-10 |
| 20 300 | 30 | 300 | 31 | 170 | 31 | 170 | +/-20 |
| 20 400 | 30 | 400 | 31 | 210 | 31 | 210 | +/-20 |
| 25 350 | 35 | 350 | 36 | 195 | 36 | 195 | +/-18 |
| 25 470 | 35 | 470 | 36 | 265 | 36 | 285 | +/-18 |

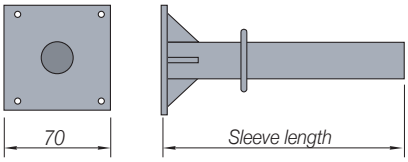
**Notes:** *Example Ref ESD10 300. All dimensions are in millimetres (mm).*

## Ancon ED Shear Connectors

**Dowel Component**




**ED Sleeve**

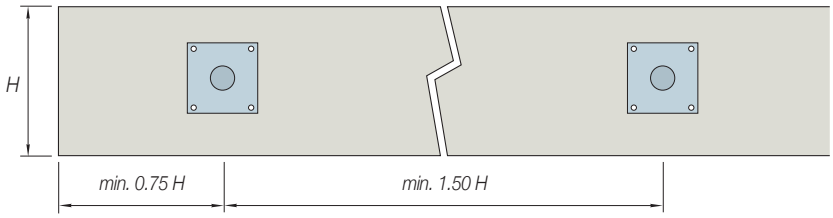



**Dimensions**

| Ref ED | Dowel Length | Dowel Diameter | Sleeve Length |
|---|---|---|---|
| 10 300 | 300 | 20 | 170 |
| 10 400 | 400 | 20 | 220 |
| 15 300 | 300 | 22 | 170 |
| 15 400 | 400 | 22 | 220 |
| 20 300 | 300 | 30 | 170 |
| 20 400 | 400 | 30 | 220 |
| 25 350 | 350 | 35 | 195 |
| 25 470 | 470 | 35 | 260 |

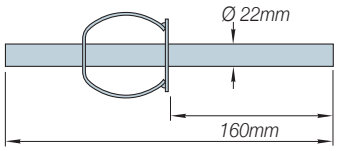
### Edge Distance and Spacing

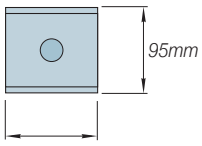
The minimum edge distance and spacing of Ancon ESD/ESDQ/ED shear load connectors is determined by the depth of slab and is illustrated in the adjacent drawing. It is possible to reduce the spacing further with the absolute minimum being 1.5 $H_{min}$ (where $H_{min}$ is the minimum slab depth for each connector type), however the design resistances are then limited to those given for $H_{min}$ only.



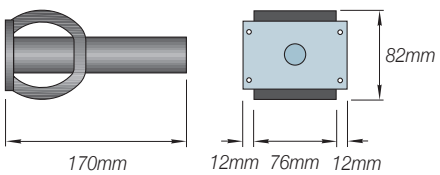

## Ancon Staisil-HLD Acoustic Shear Dowel

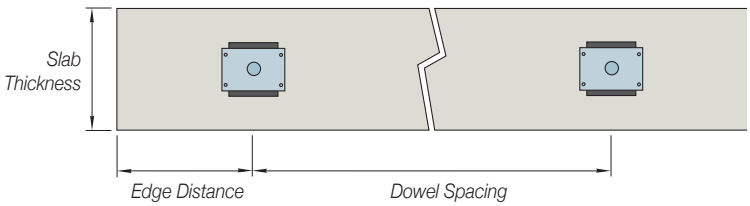
**Dowel Component**




**Sleeve**




**Minimum Dowel Spacing**

| Slab Thickness (mm) | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 |
|---|---|---|---|---|---|---|---|---|
| Minimum Edge Distance (mm) | 180 | 180 | 180 | 175 | 175 | 175 | 175 | 175 |
| Minimum Dowel Spacing (mm) | 360 | 360 | 360 | 350 | 350 | 350 | 350 | 350 |

# DSD/ESD Shear Load Connectors

**$V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) and Slab Thickness (mm) using C25/30 Concrete**

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 |
|---|---|---|---|---|---|
| 180* | ESD/ESDQ 10 | 25.6 | 25.6 | 22.4 | 19.7 |
| 200 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 220 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 240 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 260 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 280 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 180* | ESD/ESDQ 15 | 28.7 | 28.7 | 28.1 | 24.9 |
| 200 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 220 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 240 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 260 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 280 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 220* | ESD/ESDQ 20 | 47.3 | 47.3 | 47.3 | 47.3 |
| 240 | | 54.9 | 54.9 | 54.9 | 52.7 |
| 260 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 280 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 300 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 350 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 240* | ESD/ESDQ 25 | 56.8 | 56.8 | 56.8 | 55.7 |
| 260 | | 65.0 | 65.0 | 61.5 | 55.7 |
| 280 | | 73.7 | 68.0 | 61.5 | 55.7 |
| 300 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 350 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 400 | | 75.4 | 68.0 | 61.5 | 55.7 |

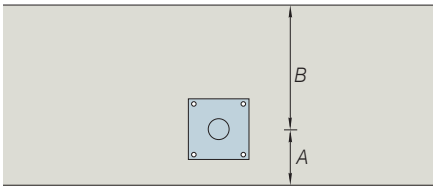
| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 |
|---|---|---|---|---|---|
| 180* | ED 10 | 25.6 | 25.6 | 22.4 | 19.7 |
| 200 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 220 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 240 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 260 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 280 | | 26.7 | 25.7 | 22.4 | 19.7 |
| 180* | ED 15 | 28.7 | 28.7 | 28.1 | 24.9 |
| 200 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 220 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 240 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 260 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 280 | | 32.3 | 31.9 | 28.1 | 24.9 |
| 220* | ED 20 | 47.3 | 47.3 | 47.3 | 47.3 |
| 240 | | 54.9 | 54.9 | 54.9 | 52.7 |
| 260 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 280 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 300 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 350 | | 60.0 | 60.0 | 57.8 | 52.7 |
| 240* | ED 25 | 56.8 | 56.8 | 56.8 | 55.7 |
| 260 | | 65.0 | 65.0 | 61.5 | 55.7 |
| 280 | | 73.7 | 68.0 | 61.5 | 55.7 |
| 300 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 350 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 400 | | 75.4 | 68.0 | 61.5 | 55.7 |

* Refers to the minimum slab depth $H_{min}$ for each connector type.

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| 180 | Staisil-HLD | 35 | 35 | 35 | 34 | 33 | 32 |
| 200 | | 37 | 37 | 37 | 37 | 37 | 37 |
| 220 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 240 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 260 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 280 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 300 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 320 | | 39 | 39 | 39 | 39 | 39 | 39 |

**Position of connectors in slab**

The tables on pages 16 and 17 are based on the shear connector being located centrally in the slab edge. If the shear connector is offset from the centreline, the minimum distance between the connector centre and the slab face should be considered as H/2.




*A < B*
*Slab thickness to be considered in selecting the connector is 2 x A. Minimum values are shown in the table.*

| Product Reference | Minimum Slab Depth $H_{min}$ | Minimum Depth 'A' |
|---|---|---|
| ESD/ESDQ 10 | 180mm | 90mm |
| ESD/ESDQ 15 | 180mm | 90mm |
| ESD/ESDQ 20 | 220mm | 110mm |
| ESD/ESDQ 25 | 240mm | 120mm |
| ED 10 | 180mm | 90mm |
| ED 15 | 180mm | 90mm |
| ED 20 | 220mm | 110mm |
| ED 25 | 240mm | 120mm |
| Staisil-HLD | 180mm | 90mm |

## $V_{Rd}$ Design Resistance (kN) for Various Joint Widths (mm) and Slab Thickness (mm) using C30/37 Concrete

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 |
|---|---|---|---|---|---|
| 180* | ESD/ESDQ 10 | 29.1 | 25.7 | 22.4 | 19.7 |
| 200 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 220 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 240 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 260 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 280 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 180* | ESD/ESDQ 15 | 32.6 | 31.9 | 28.1 | 24.9 |
| 200 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 220 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 240 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 260 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 280 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 220* | ESD/ESDQ 20 | 53.6 | 53.6 | 53.6 | 52.7 |
| 240 | | 62.2 | 62.2 | 57.8 | 52.7 |
| 260 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 280 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 300 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 350 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 240* | ESD/ESDQ 25 | 64.4 | 64.4 | 61.5 | 55.7 |
| 260 | | 73.7 | 68.0 | 61.5 | 55.7 |
| 280 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 300 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 350 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 400 | | 75.4 | 68.0 | 61.5 | 55.7 |

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 |
|---|---|---|---|---|---|
| 180* | ED 10 | 29.1 | 25.7 | 22.4 | 19.7 |
| 200 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 220 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 240 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 260 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 280 | | 29.6 | 25.7 | 22.4 | 19.7 |
| 180* | ED 15 | 32.6 | 31.9 | 28.1 | 24.9 |
| 200 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 220 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 240 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 260 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 280 | | 36.3 | 31.9 | 28.1 | 24.9 |
| 220* | ED 20 | 53.6 | 53.6 | 53.6 | 52.7 |
| 240 | | 62.2 | 62.2 | 57.8 | 52.7 |
| 260 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 280 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 300 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 350 | | 69.9 | 63.5 | 57.8 | 52.7 |
| 240* | ED 25 | 64.4 | 64.4 | 61.5 | 55.7 |
| 260 | | 73.7 | 68.0 | 61.5 | 55.7 |
| 280 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 300 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 350 | | 75.4 | 68.0 | 61.5 | 55.7 |
| 400 | | 75.4 | 68.0 | 61.5 | 55.7 |

* Refers to the minimum slab depth $H_{min}$ for each connector type.

| Slab Thickness (mm) | Product Reference | Maximum Width of Joint (mm) 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| 180 | Staisil-HLD | 35 | 35 | 35 | 34 | 33 | 32 |
| 200 | | 37 | 37 | 37 | 37 | 37 | 37 |
| 220 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 240 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 260 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 280 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 300 | | 39 | 39 | 39 | 39 | 39 | 39 |
| 320 | | 39 | 39 | 39 | 39 | 39 | 39 |

**ESD Design Example**

| | |
|---|---|
| Slab thickness | = 220mm |
| Maximum width of joint | = 30mm |
| Concrete strength | = C30/37 |
| Characteristic dead load | = 20kN/m |
| Characteristic imposed load | = 26kN/m |
| Design load | = (20 x 1.35) + (26 x 1.5) = 66kN/m |

$\gamma_G = 1.35^*$
$\gamma_Q = 1.5^*$

| $V_{Rd}$ (Design resistance) | Maximum centres |
|---|---|
| ESD10 = 22.4kN | = 22.4 / 66 = 0.339m use 330mm |
| ESD15 = 28.1kN | = 28.1 / 66 = 0.426m use 400mm |
| ESD20 = 53.6kN | = 53.6 / 66 = 0.812m use 800mm |

*Any of the three connectors would be acceptable, although using ESD20s at 800mm centres would minimise the number of connectors to be installed.*

**The partial safety factors of 1.35 ($\gamma_G$) and 1.5 ($\gamma_Q$) are those recommended in EN 1990 Eurocode: Basis for structural design. For designs to Eurocode 2, please refer to the national annex for the factors to be used in the country concerned.*

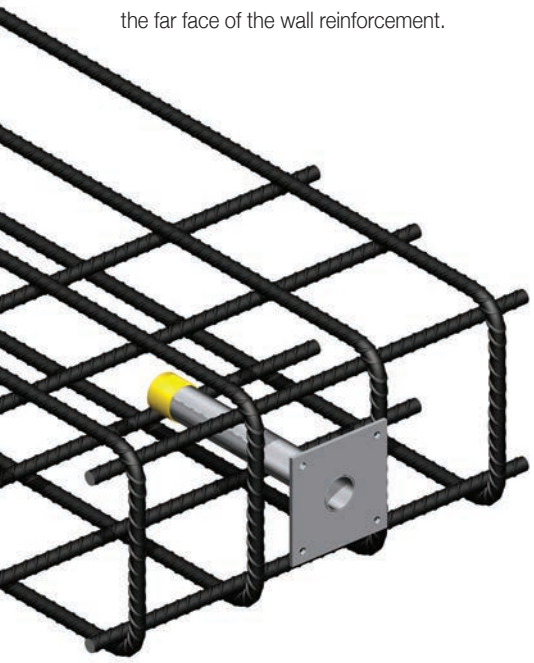
# DSD/ESD Shear Load Connectors

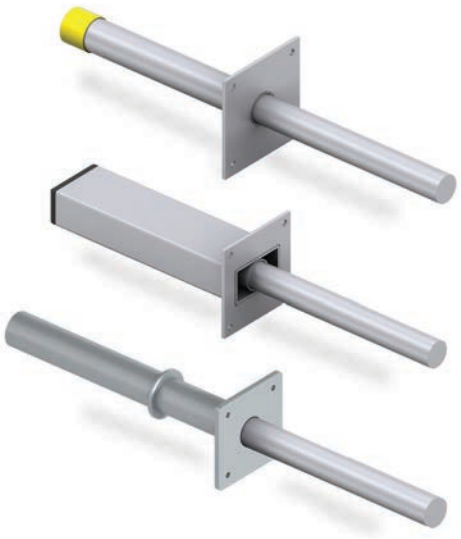
**ESD Reinforcement Details**

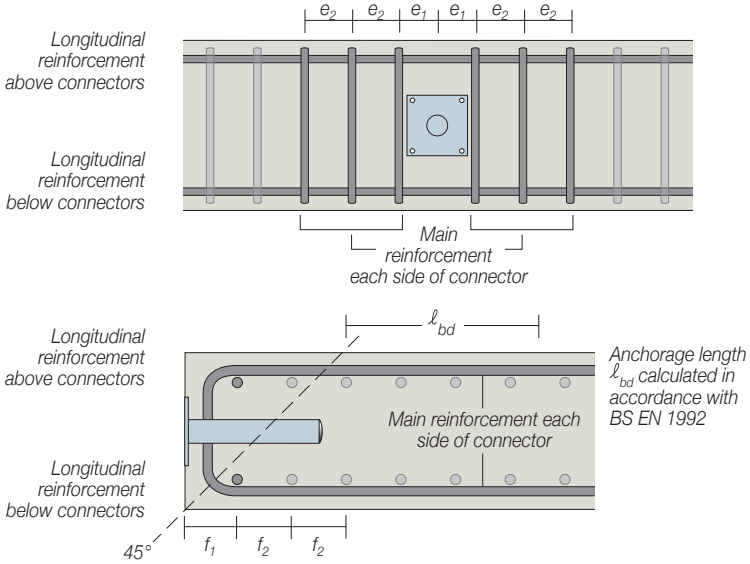
Local reinforcement is required around each connector to guarantee that the forces are transferred between the connectors and the concrete. Correct detailing in accordance with appropriate design codes and the recommendations provided here will ensure Ancon ESD, ESDQ, ED and Staisil connectors attain their full capacity.

The tables show proposals for the type and spacing of the main reinforcement, together with details of reinforcement above and below the connectors.

For walls, the reinforcement is repeated as in the tables but with links replacing the U-bars. Links should extend between the near face and the far face of the wall reinforcement.





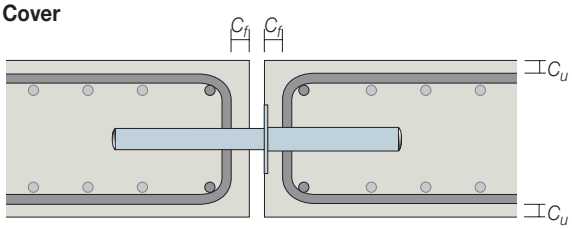



**Based on a minimum of C25/30 Concrete, maximum slab depth (see page 16) and 20mm joint**

| ED/ESD/ESDQ | Options for Main Reinforcement (No. U bars each side) | Spacing (mm) |
|---|---|---|
| 10 | 2 H10 | $e_1$ = 35mm; $e_2$ = 50mm |
| | 1 H12 | $e_1$ = 35mm |
| 15 | 2 H10 | $e_1$ = 50mm; $e_2$ = 40mm |
| | 2 H12 | $e_1$ = 50mm; $e_2$ = 40mm |
| 20 | 2 H12 | $e_1$ = 40mm; $e_2$ = 30mm |
| 25 | 3 H12 | $e_1$ = 45mm; $e_2$ = 45mm |
| Staisil-HLD | 3 H10 | $e_1$ = 70mm; $e_2$ = 74mm |
| | 2 H12 | $e_1$ = 70mm; $e_2$ = 139mm |

| ED/ESD/ESDQ | Options for Longitudinal Reinforcement (No. bars top and bottom) | Spacing (mm) |
|---|---|---|
| 10 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 1 H12 | $f_1$ = 60mm |
| 15 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 1 H12 | $f_1$ = 60mm |
| 20 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 1 H12 | $f_1$ = 60mm |
| 25 | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |
| | 2 H12 | $f_1$ = 60mm; $f_2$ = 70mm |
| Staisil-HLD | 2 H10 | $f_1$ = 60mm; $f_2$ = 70mm |

**Cover**




*Minimum cover Cu to local reinforcement is the recommendations of BS EN 1992*

| Reference | Minimum Cover to Face $C_f$ | Maximum Cover to Face $C_f$ |
|---|---|---|
| 10 | To be specified by engineer according to BS EN 1992 | 50mm |
| 15 | | 50mm |
| 20 | | 50mm |
| 25 | | 50mm |
| Staisil-HLD | | 50mm |

## Applications

Channel Tunnel Terminal, UK

Forum Shopping Centre, Algarve

Melbourne Cricket Ground, Australia

Scottish Widows, Edinburgh, UK

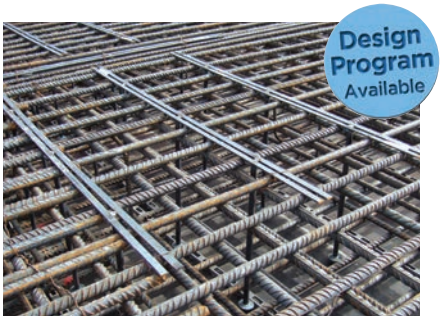
Olympic Stadium, Sydney, Australia

## Other Ancon Products

**Reinforcement Continuity Systems**
Ancon Eazistrip is approved by UK CARES and consists of bent bars housed in a galvanised steel casing. Once installed, the protective cover is removed and the bars are straightened, ready for joining to the slab reinforcement. Alternatively, Ancon KSN Anchors are cast into the wall and, when the formwork and thread protection are removed, Bartec Plus threaded rebars are simply screwed into the anchors.

**Reinforcing Bar Couplers**
The use of reinforcing bar couplers can provide significant advantages over lapped joints. Design and construction of the concrete can be simplified and the amount of reinforcement required can be reduced. Because the strength of a mechanical splice is independent of the concrete in which it is located, the joint can also remain unaffected by any loss of cover. The range includes parallel threaded, tapered threaded, mechanically bolted and grouted couplers.

**Punching Shear Reinforcement**
Used within a slab to provide additional reinforcement around columns, Ancon Shearfix is the ideal solution to the design and construction problems associated with punching shear. The system consists of double-headed studs welded to flat rails, positioned around the column. The shear load from the slab is transferred through the studs into the column.




**Insulated Balcony Connections**
Ancon thermally insulated connectors minimise heat loss at balcony locations while maintaining structural integrity. They provide a thermal break and, as a critical structural component, transfer moment, shear, tension and compression forces. Standard solutions are available for concrete-to-concrete, steel-to-concrete and steel-to-steel interfaces.

**Channels and Bolts for Fixing to Concrete**
Cast-in channels are used for fixing masonry support systems to the edges of concrete floors and beams. Channels are available in different sizes ranging from simple self anchoring channels for restraints, to large capacity channels with integral anchors. A selection of channels can also be supplied plain-backed for surface fixing. Stainless steel expansion bolts and resin anchors complete the range.

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