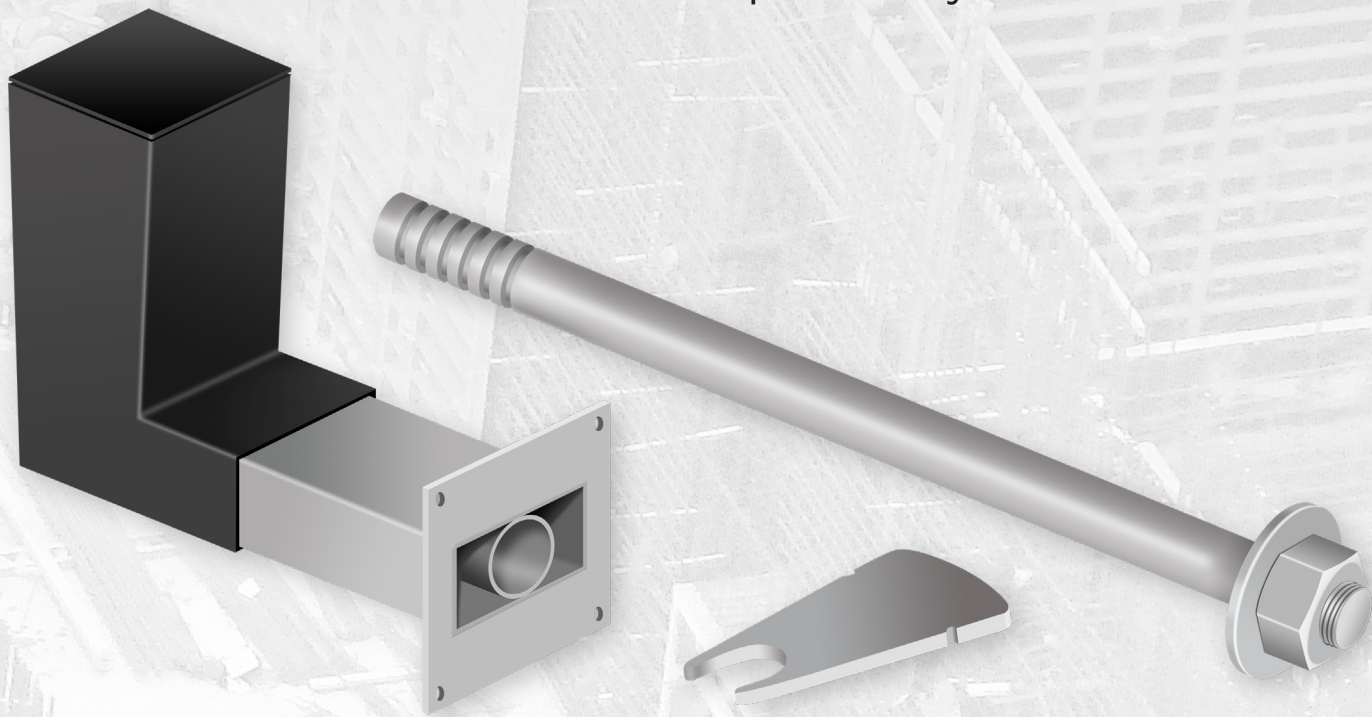


Leviat
A CRH COMPANY

- Eliminates Pour Strips
- Considerable Savings in Time and Material
- Improves Safety



MB MeadowBurke®

Lockable Dowel

Revolutionizing Temporary Movement Joints

Commonly found in closure strips of post-tension concrete projects



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We are Leviat.

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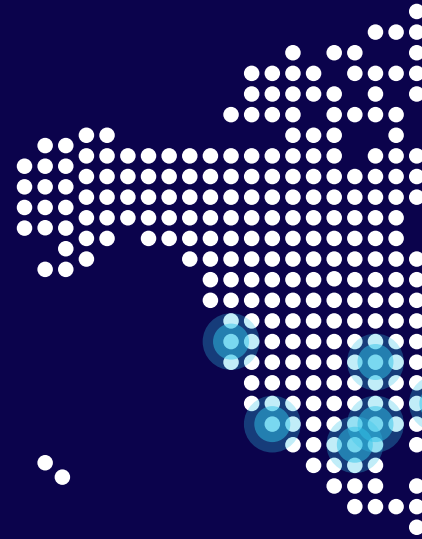
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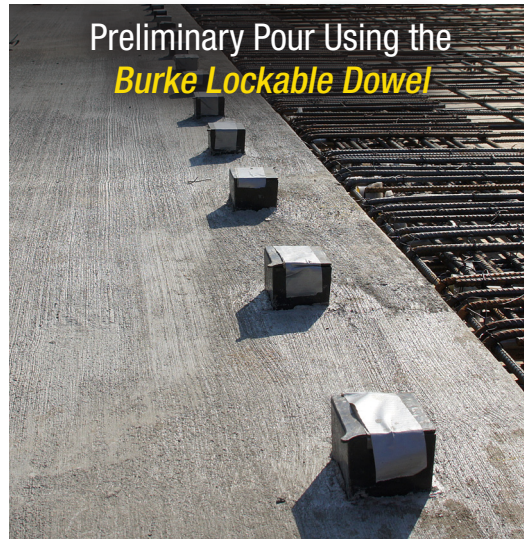
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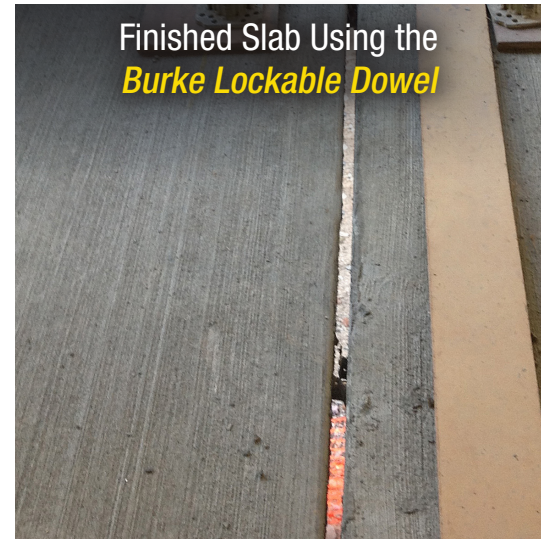
REVOLUTIONIZING POST-TENSIONED PRECAST CONCRETE



Traditional Pour Strip



Preliminary Pour Using the *Burke Lockable Dowel*



Finished Slab Using the *Burke Lockable Dowel*

LOCKABLE DOWELS

The Burke Lockable Dowel has been designed for use at temporary movement joints, most commonly found in post-tensioned concrete frames.

These dowels allow initial shrinkage of the concrete to take place and are then locked in position with a mechanical plate and a controlled amount of epoxy resin. The locked dowels continue to transfer shear, but prevent further movement taking place.

ADVANTAGES

The use of Burke Lockable Dowels can save a significant amount of time and materials over other construction methods. Concrete shrinkage has traditionally been accommodated by leaving gaps in the slab called “pour strips” or “closure strips.” These strips are filled once movement has stabilized, however until they are filled the slabs must be shored, restricting site access and delaying site progress. Gaps in the slab also create a hazard for site workers, use additional formwork and leave the soffit face marked.

Lockable Dowels improve site access, minimize formwork requirements and accelerate the rate of construction. With a Lockable Dowel, there is less requirement for the slabs to be shored or a support corbel to be constructed, as shear load is transferred by the dowel. The time saved by early removal of slab props can be significant.

A Lockable Dowel also provides many advantages over the site-assembled arrangement of carbon steel reinforcing bar, galvanized or plastic ducting, vent tubes and a non-specific grout, which is sometimes used by contractors.

In addition, engineers have found the Burke Lockable Dowel to be the preferred design solution for pin-ended joints. Although it is customary for practical reasons to use U-bars or other rebar continuity systems at these connections, these options do not truly act as hinges and so rotation of the slab under load can induce cracking at the wall-to-slab interface with potential integrity issues.

The Lockable Dowel is closer to a true pin-ended joint and, being manufactured from stainless steel, provides additional corrosion protection over systems using carbon steel reinforcement.

MIP
most innovative products
AT WORLD OF CONCRETE

2017 AWARD WINNER

Meadow Burke Burke Lockable Dowel
Materials for Concrete Construction Editor's Choice

MeowBurke
Revolutionizing Post Tensioned Concrete

hanleywood CONCRETE CONSTRUCTION Masonry Concrete Producer Concrete SURFACES DAILY NEWS

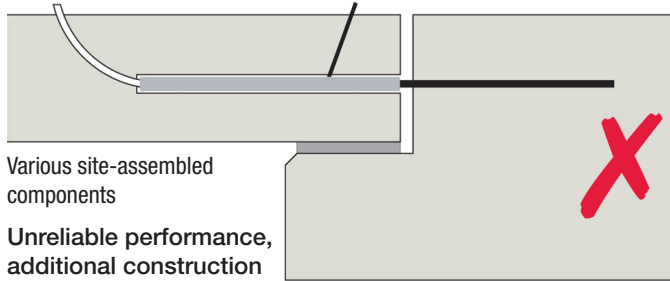
APPLICATIONS

In most cases, Burke Lockable Dowels can be used to replace pour strips at temporary movement joints in post-tensioned concrete frames. Burke Lockable Dowels and DSD Shear Load Connectors (see Page 10) are available for use at slab joints and retaining / core walls.

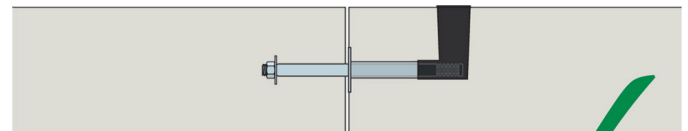
“Due to the long length of the parking structure’s concrete floor system, planning for volumetric changes due to elastic shortening, creep and shrinkage was essential. Meadow Burke’s Lockable Dowel ESDQ-L20 provided an innovative means to a traditional closure strip pour by providing a temporary slip connection with the added benefit of reducing the total number of permanent joints in the concrete floor system.”

Josh B. Hamby, PE, LEED AP
Kimley-Horn and Associates, Inc.

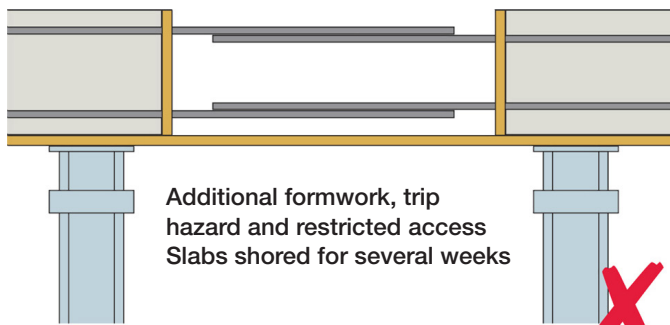
SLAB-TO-SLAB



Unreliable performance, additional construction materials used and support corbel required

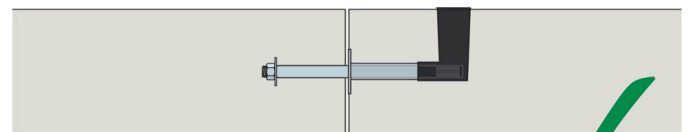


Burke Lockable Dowel
Proven performance
Minimal material usage



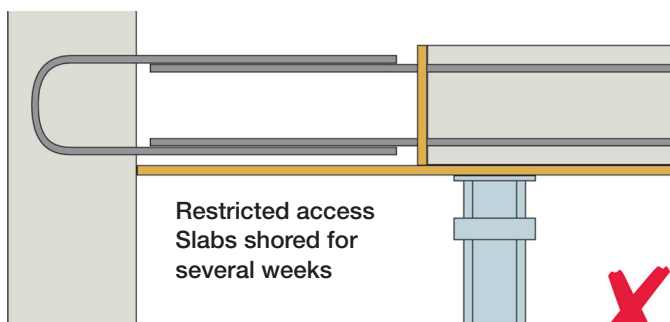
Pour strip in slab

Additional formwork, trip hazard and restricted access
Slabs shored for several weeks



Burke Lockable Dowel
Proven performance
Minimal material usage
Simple installation
Improved on-site safety

SLAB-TO-WALL

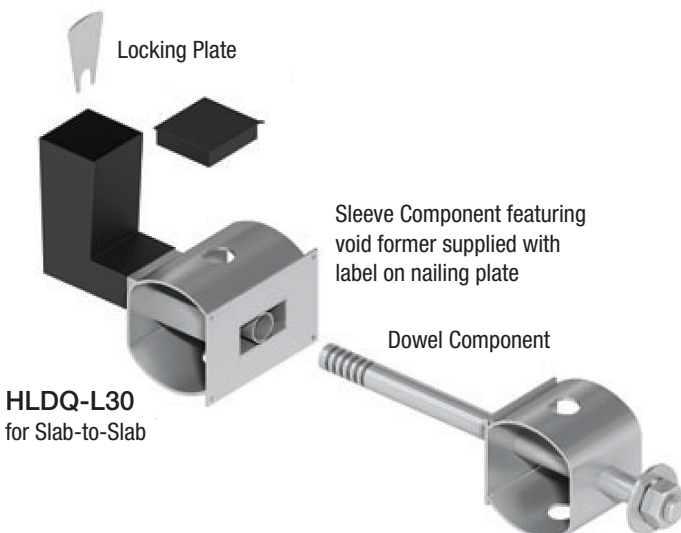
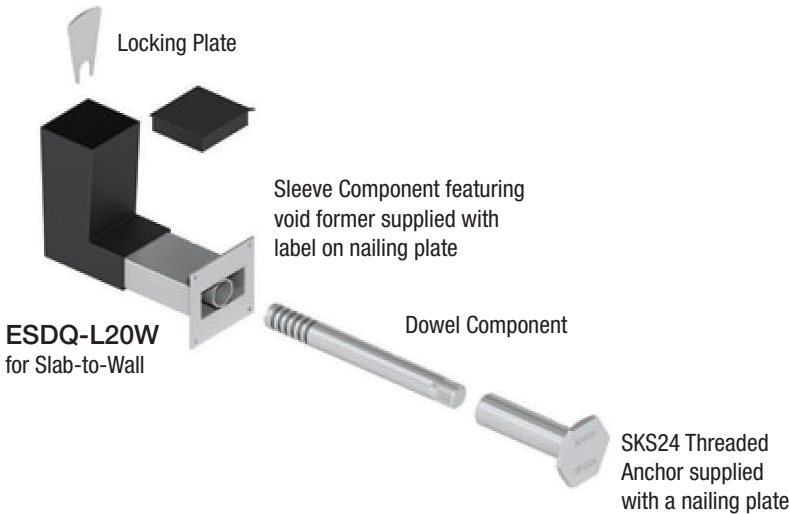
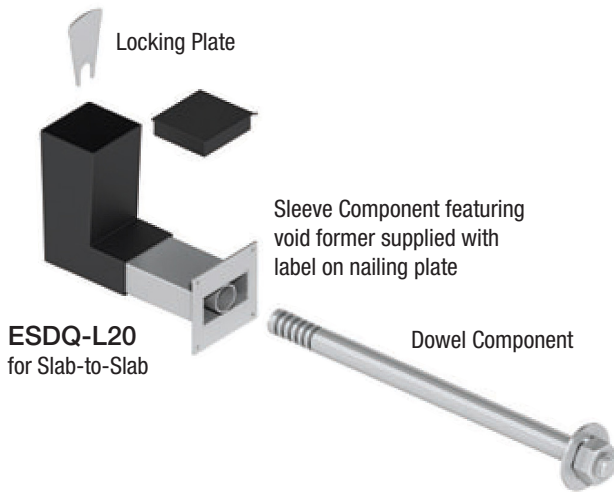


Pour strip at wall-to-slab junction

Restricted access
Slabs shored for several weeks



Burke Lockable Dowel
Improved site access
Reduced shoring time
Simple installation
Eliminates framework obstacles



RANGE OF LOCKABLE DOWELS

A Lockable Dowel allows initial shrinkage of the concrete to take place and then, after a predetermined time period (generally 30 to 90 days), is locked in position with a mechanical plate and a controlled amount of epoxy resin. The range comprises three products; ESDQ-L20, HLDQ-L30 and ESDQ-L20W.

SLAB-TO-SLAB LOCKABLE DOWELS ESDQ-L20

The dowel component is manufactured from 30mm diameter stainless steel; one end is threaded with a fixed nut and washer, and the other features a series of grooves to accept the Locking Plate. The cylindrical sleeve which accepts the dowel component is contained within a box-section to allow lateral, longitudinal and some rotational movement. The epoxy resin is poured into the L-shaped void former. This product has a design capacity of almost two quarts.

SLAB-TO-WALL LOCKABLE DOWEL ESDQ-L20W

The dowel component is manufactured from 30mm diameter stainless steel, but is shorter than the ESDQ-L20 dowel. One end of the dowel is designed to thread into the stainless steel Burke SKS24 Threaded Anchor cast into the face of the concrete and the other end features a series of grooves to accept the Locking Plate. The sleeve component is the same as used in the ESDQ-L20. See pages 6-9 for full technical details.

HLDQ-L30

The HLDQ-L30 is a high load Lockable Dowel with a design capacity of up to 30.6 kips.

Lockable Dowel

EPOXY RESIN

Each dowel is locked after a pre-determined time period (generally 3-4 weeks) with a high quality, two-part epoxy resin. The resin is mixed and poured into the L-shaped void former. Each dowel requires 1,500g of resin which can be supplied either in a single can for one application or bulk packaging for locking multiple dowels.



"The Burke Lockable Dowel is a very clean system compared to pour strips. Pour strips are a nightmare! Pour strips are a mess with all the shoring, safety concerns, cables, cleaning, fill up, and conduit problems. Any extra money spent on the Lockable Dowel is well worth the benefit. The Lockable Dowel saved about 3 weeks with this project. The Lockable Dowel is so clean no one noticed there was a pour strip.

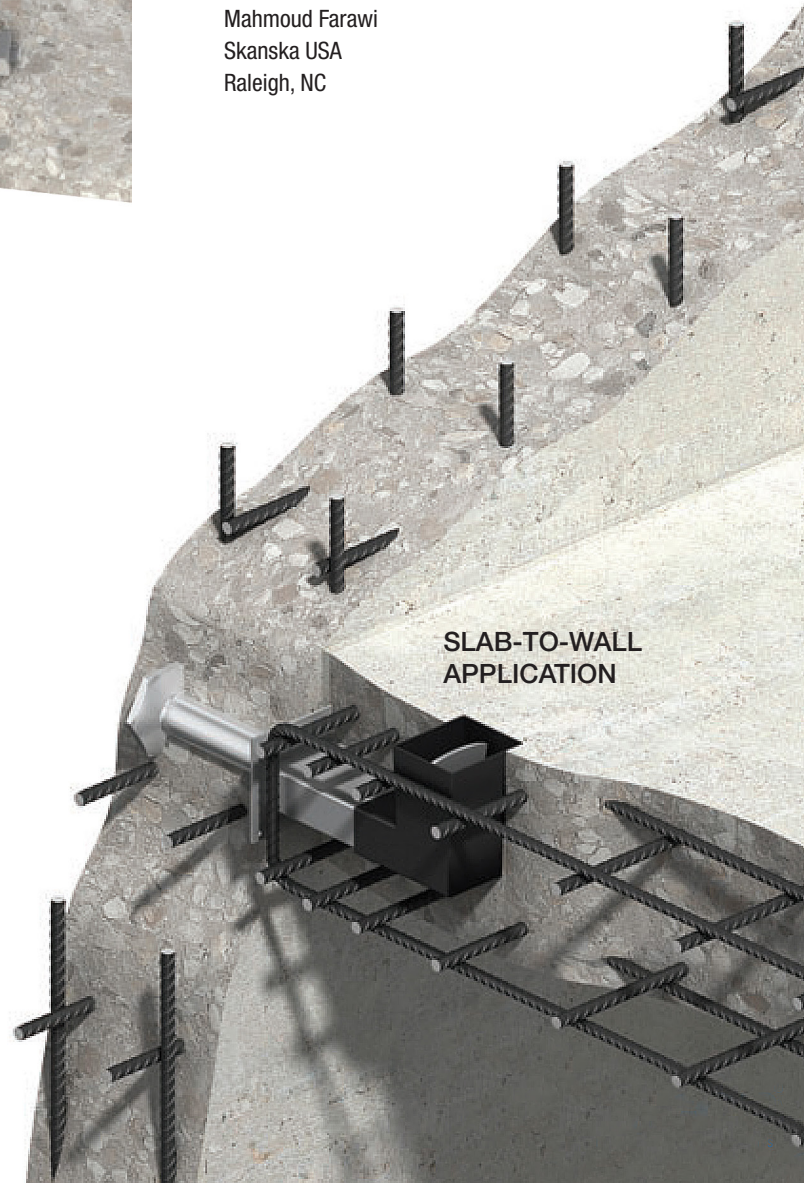
If you have encountered pour strips before, the Lockable Dowel is a no brainer.

You would be crazy not to use it!"

Mahmoud Farawi
Skanska USA
Raleigh, NC

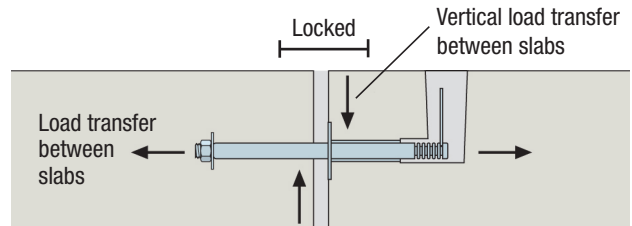
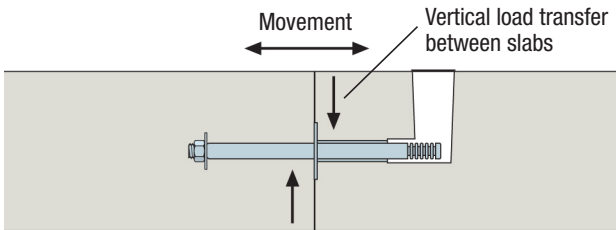
Two-part Epoxy Resin
supplied with:

ESDQ-L20
ESDQ-L20W
HLDQ-L30



**SLAB-TO-WALL
APPLICATION**

PERFORMANCE DATA



ESDQ-L20 LOCKABLE DOWEL (SLAB-TO-SLAB)

Slab Thickness In.	Design Strength Logitudinal Load Kip	Vertical Design Strength (kip) for Various Design Joint Widths in 4000 psi Concrete						
		¼"	½"	¾"	1"	1¼"	1½"	2"
6¼	10.0	2.7	2.7	2.7	2.7	2.7	2.7	2.7
6½	10.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4
7	14.6	5.1	5.1	5.1	5.1	5.1	5.1	5.1
7½	14.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
8	18.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
8⅝	22.5	12.0	12.0	12.0	12.0	12.0	12.0	10.8
9	22.5	13.0	13.0	13.0	12.8	12.2	11.8	10.8
10	22.5	14.0	14.0	14.0	14.0	13.6	13.0	12.4
11 & Above	22.5	15.7	15.7	14.9	14.2	13.6	13.0	12.5

ESDQ-L20W LOCKABLE DOWELS (SLAB-TO-WALL)

Slab Thickness In.	Design Strength Logitudinal Load Kip	Vertical Design Strength (kip) for Various Design Joint Widths in 4000 psi Concrete						
		¼"	½"	¾"	1"	1¼"	1½"	2"
6¼	10.0	2.7	2.7	2.7	2.7	2.7	2.7	2.7
6½	10.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4
7	14.6	5.1	5.1	5.1	5.1	5.1	5.1	5.1
7½	14.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
8	18.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
8⅝	18.0	12.0	12.0	12.0	12.0	12.0	12.0	10.8
9	18.0	13.0	13.0	13.0	12.8	12.2	11.8	10.8
10	18.0	14.0	14.0	14.0	14.0	13.6	13.0	12.4
11 & Above	18.0	15.7	15.7	14.9	14.2	13.6	13.0	12.5

HLDQ-L30 LOCKABLE DOWELS (SLAB-TO-SLAB)

Slab Thickness In.	Design Strength Logitudinal Load Kip	Vertical Design Strength (kip) for Various Design Joint Widths in 4000 psi Concrete						
		¼"	½"	¾"	1"	1¼"	1½"	2"
9.50 & Above	22.5	30.6	30.6	30.6	30.6	30.6	30.6	30.6

All values in the tables above are design load capacities (LRFD) and have to be compared to factored loads.

ESDQ-L20 EXAMPLE

Slab Thickness = 10"

Joint Width = ¾"

Concrete Strength = 4,000 psi

Actual Load = 6,000 lbf/ft

Allowable Vertical Design Load = 14.0 kip (10" slab ¾" joint)

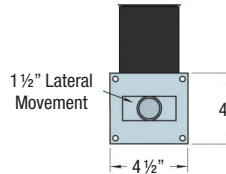
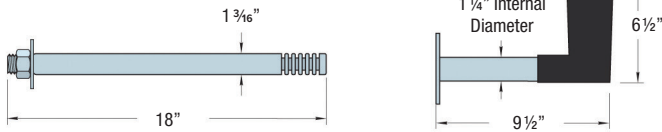
Therefore Centers for Vertical Load = 14.0 / 6.0 = 2.33' use 28" centers

Each dowel will in addition provide an allowable tension across the joint of 22.5 kip (for slab to wall this is 18.0 kip), therefore the total allowable tension in the direction of the dowel = 22.5 kip / (28/12) = 9.6 kip/ft (for slab-to-wall 18.0 kip / (28/12) = 7.7 kip/ft).

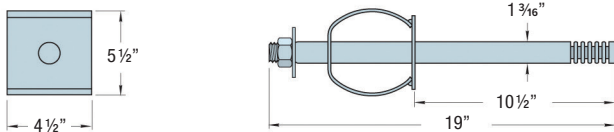
If this is insufficient, the dowel centers can be reduced to a minimum of 1.5 x slab thickness to increase the allowable tension across the joint, in this example it would increase to 22.5 / (15/12) = 18.0 kip/ft (for slab-to-wall 18.0 kip / (15/12) = 14.4 kip/ft).

DIMENSIONS

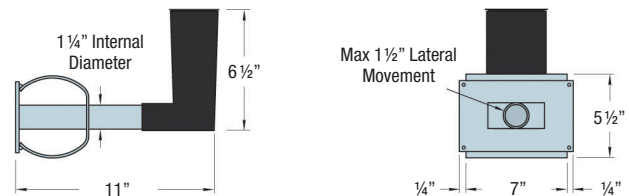
ESDQ-L20 COMPONENTS



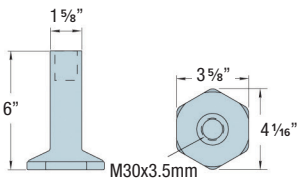
HLDQ-L30 COMPONENTS



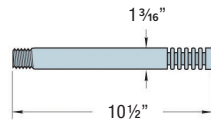
SLEEVE COMPONENT



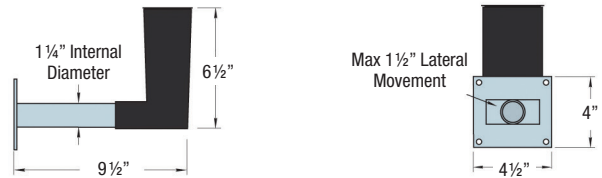
ESDQ-L20W COMPONENTS



DOWEL COMPONENT



SLEEVE COMPONENT



EDGE DISTANCE AND SPACINGS

For connectors working at or near their maximum capacity, the minimum spacing should be 1.5 times the slab thickness. Where the design load of the connector could be used in a thinner slab, a spacing of 1.5 times the thinner slab thickness can be used. The minimum end distance is always 0.5 times the spacing.

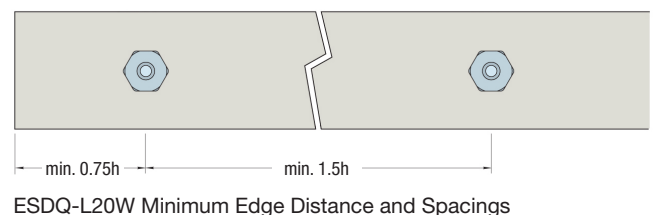
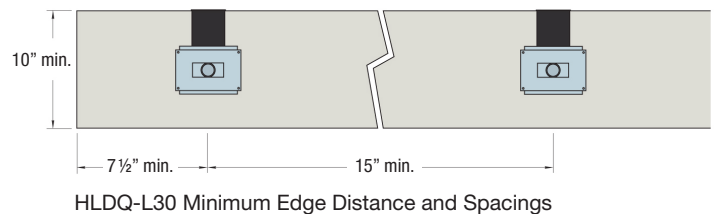
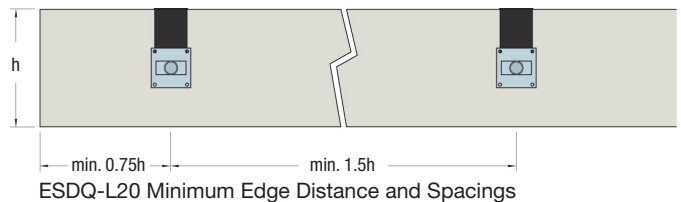
ESDQ-L20 EXAMPLE

- Slab Thickness = 12"
- Joint Width = 1"
- Concrete Strength = 4,000 psi
- Allowable Load/Connector = 14.2 kip/ft (based on slabs 10" and above)
- Spacing for Max. Load $12" \times 1.5 = 18"$
- End Distance for Max. Load $18" \times 0.5 = 9"$
- Allowable Load/Foot = $14.2 \text{ kip} / (18/12) = 9.5 \text{ kip/ft}$

As an ESDQ L20 can be used in a 7" slab for a reduced allowable load per connector of up to 9,500 lbf, the spacing can be based on a 7" slab.

Therefore:

- Reduced Spacing $7" \times 1.5 = 10 1/2"$
- Reduced End Distance $10 1/2" \times 0.5 = 5 1/4"$
- Allowable Load/Foot $9.5 \text{ kip} / (10 1/2" / 12) = 10.8 \text{ kip/ft}$



REINFORCEMENT DETAILS

Local reinforcement is required around each Burke Lockable Dowel 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 the dowels attain their full capacity. The tables

show the main reinforcement required, together with details of reinforcement above and below the connectors. Although only the sleeve components are illustrated, the same reinforcement is required around the dowel component.

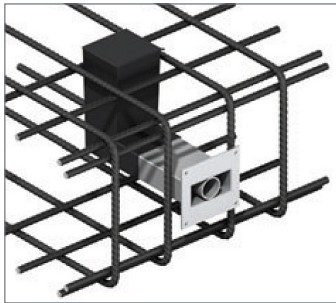
OPTIONS FOR MAIN REINFORCEMENT

Lockable Dowel Reference	No. of U-bars each Side	
	#4	#5
ESDQ-L20	2	-
HLDQ-L30	4	3

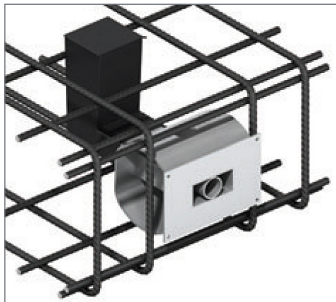
OPTIONS FOR LONGITUDINAL REINFORCEMENT

Lockable Dowel Reference	No. of Bars Top and Bottom	
	#4	#5
ESDQ-L20	2	-
HLDQ-L30	2	2

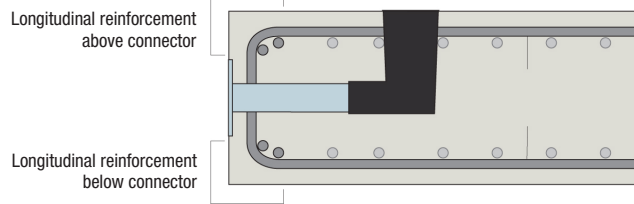
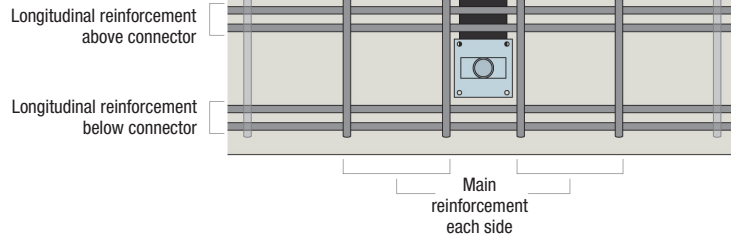
ESDQ-L20



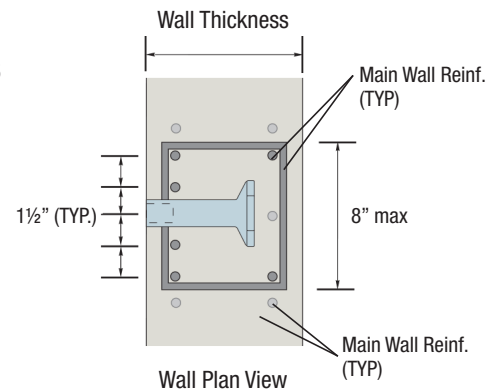
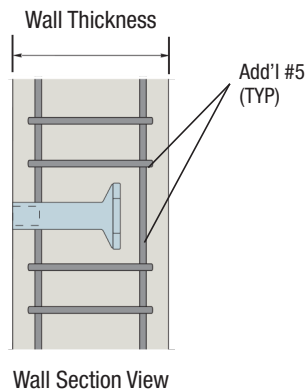
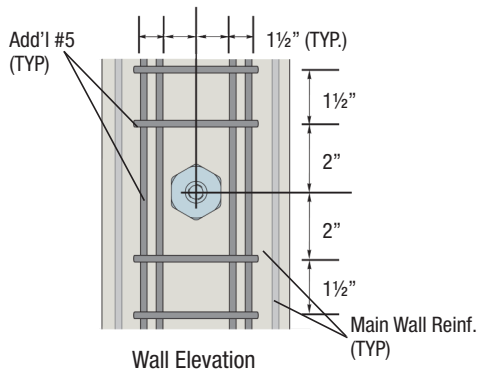
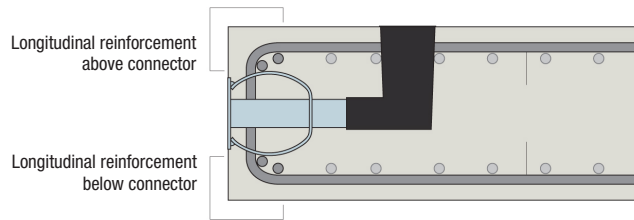
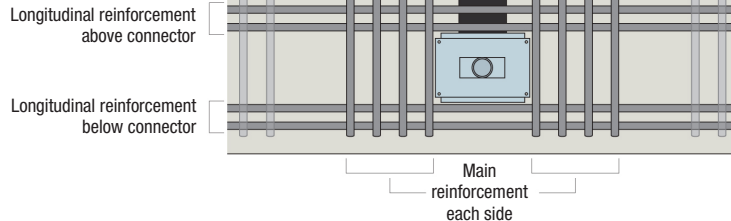
HLDQ-L30



ESDQ-L20



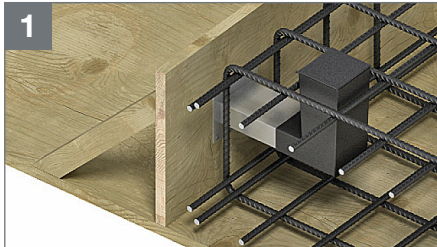
HLDQ-L30



Vertical additional #5 rebar to be 4' - 0", centered on dowel

INSTALLATION

SLAB-TO-SLAB: Although installation is shown for the ESDQ-L20, the procedure is the same for the HLDQ-L30.



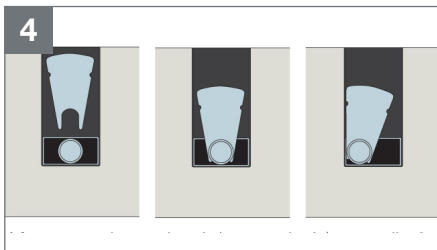
Nail the sleeve to the formwork either central in the slab or for slab depths over 12" so the top of the grout box is level with the top of the slab. Do not remove the label over the nailing plate as this prevents ingress of concrete into the sleeve. Fix the local reinforcement.



Pour the concrete, and when of sufficient strength, strike the formwork. Puncture the label to reveal the cylindrical sleeve only and insert the dowel until it is completely installed to the back of the grout box.



Fix the local reinforcement around the dowel component and pour the concrete.



After a predetermined time period (generally 60-120 days), when movement between the slabs has stabilized and the joint between the slabs has been filled, the dowel is ready to be locked. Fit the Locking Plate on a groove in the center of the grout box. The fan-shaped Locking Plate allows the dowel to be locked in any position.



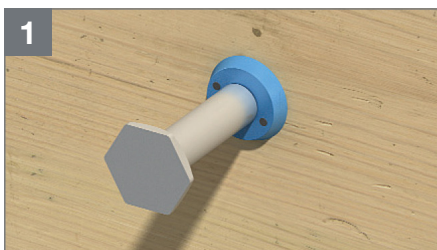
Mix the two-part epoxy resin and pour into the grout box, ensuring it flows along the stainless steel box section towards the joint.



After 24 hours the grout box can be filled with cementitious material, level with the top of the slab, to complete the installation.

The locked dowel continues to transfer vertical load between the slabs, but movement can no longer take place.

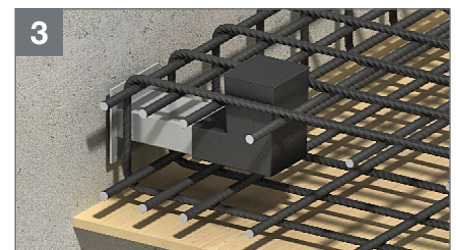
SLAB-TO-WALL



Nail the threaded anchor to the formwork so the dowel will be central in the adjoining slab or within 6" of the top of slabs over 12". Fix the local reinforcement and cast the concrete.

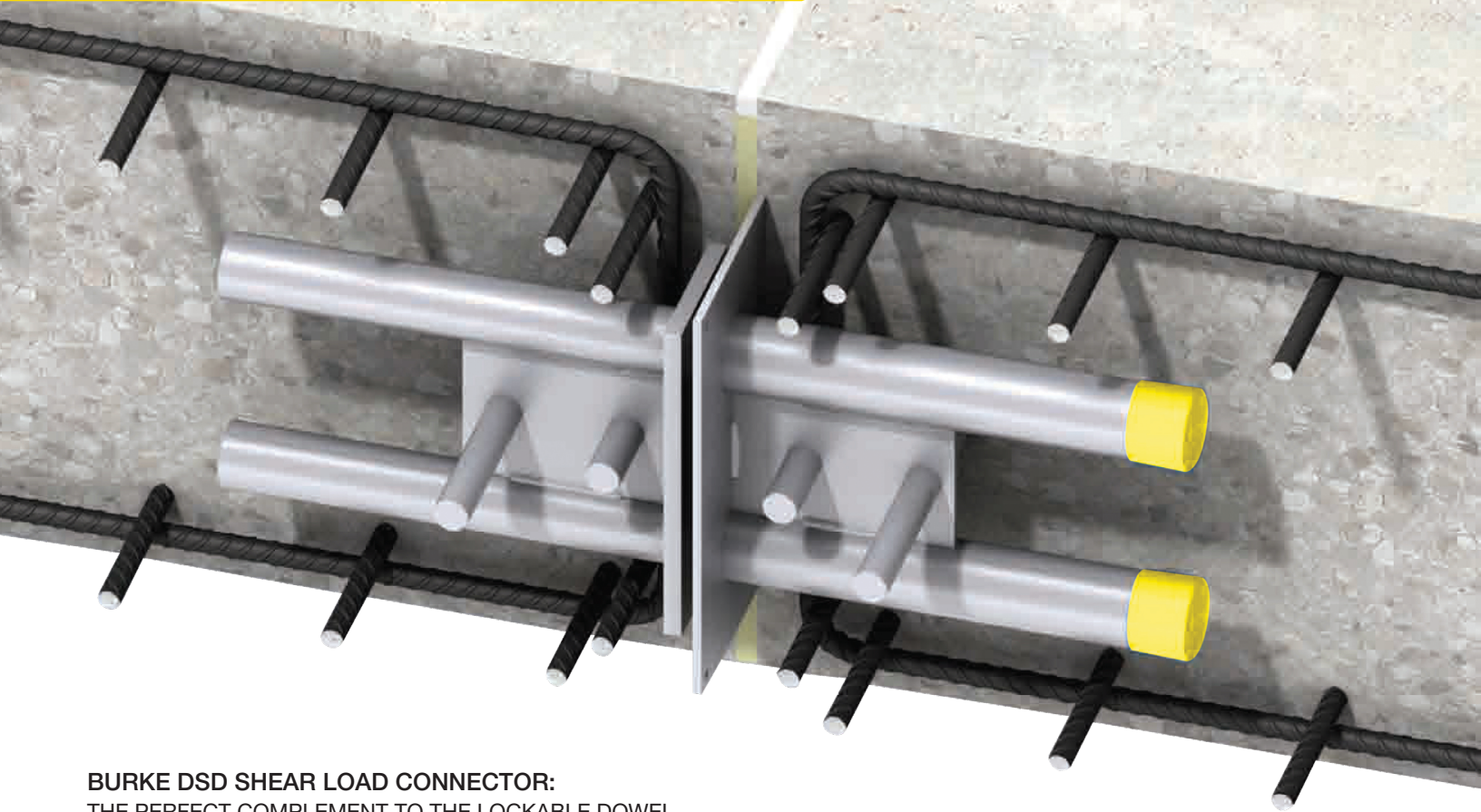


When concrete reaches sufficient strength, strike the formwork and remove nailing plate. Screw the dowel into the anchor.



Puncture the label of the sleeve to reveal the cylindrical sleeve only. Push the sleeve over the dowel until the sleeve front is touching the wall. Tie sleeve to reinforcement and pour concrete.

Notes: 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 casting of the concrete.



BURKE DSD SHEAR LOAD CONNECTOR: THE PERFECT COMPLEMENT TO THE LOCKABLE DOWEL

The Burke DSD allows permanent joint movement. It works flawlessly in beams crossing the intended pour strips. By utilizing the Burke DSD, the pour strip is reduced across the entire depth of the slab.

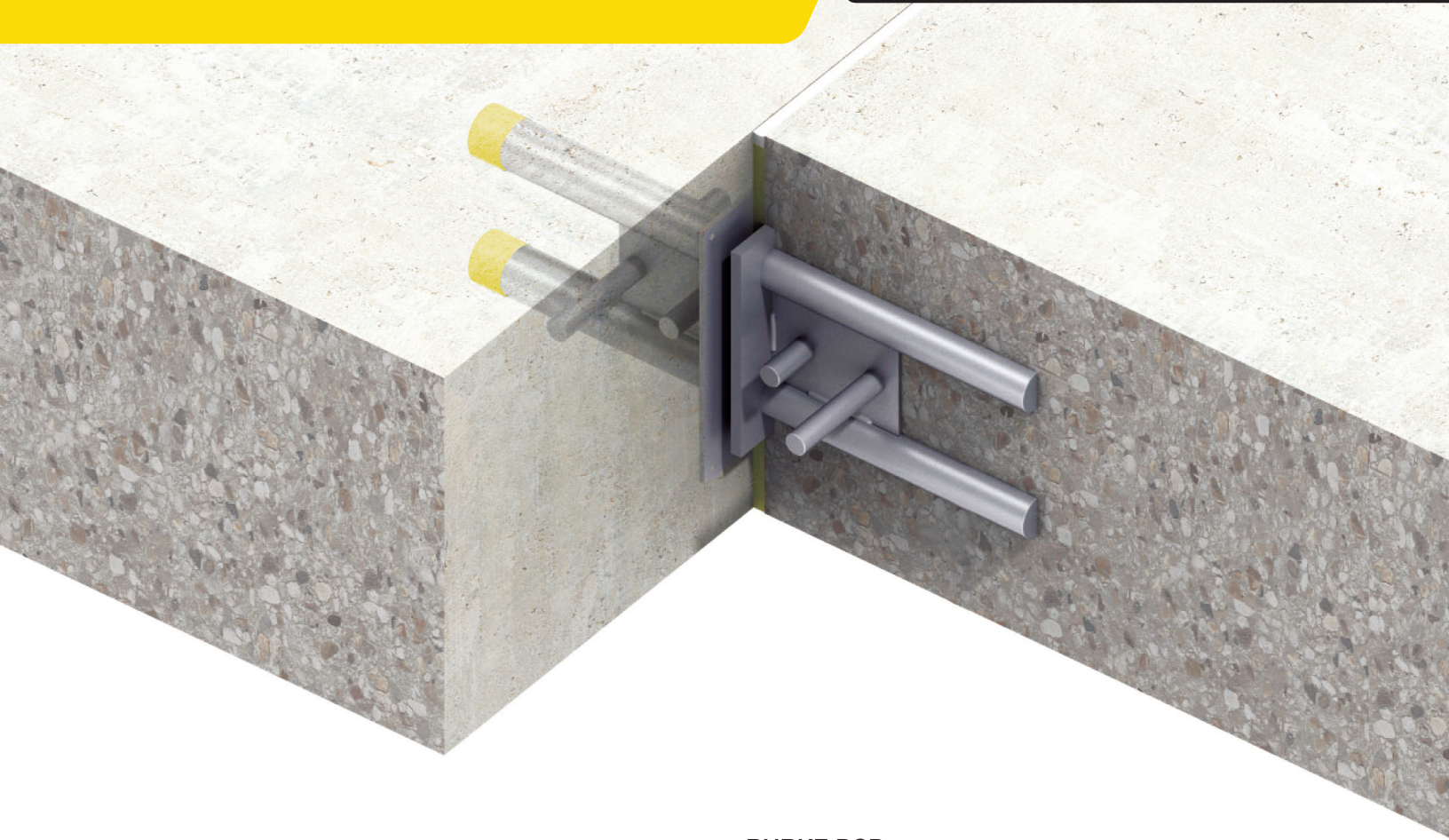
Reinforced concrete is an important construction material. It offers strength, durability and can be formed into a variety of shapes. Concrete structures are designed with expansion and contraction joints to allow movement to take place. Dowels are used to transfer shear load across these joints.

The Burke DSD Shear Load Connector, is the perfect complement to the Lockable Dowel. The Burke DSD offers significant advantages over plain dowel bars. They are more effective at transferring load and accommodating movement and, due to their two-part construction, are more simple to install. Meadow Burke offers solutions for many issues encountered in cast-in-place construction.

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 and drilling of either formwork or concrete is not required. The sleeve is simply nailed to the formwork ensuring subsequent alignment with the dowel, which is essential for effective movement.

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





Dowels are used to transfer shear 11 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 breaking of the concrete.

Where dowels are used across expansion and contraction joints, half the length of the bar is de-bonded 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.

BURKE DSD

The Burke DSD is the original two-part, double dowel, shear load connector with the two dowels manufactured from Duplex stainless steel bar. The dowel component can move longitudinally within the sleeve to accommodate movement. The connector is available in 10 standard sizes and has design capacities from approximately 4,500 lbs to more than 214,000 lbs. The larger connectors can be used in joints up to 60mm wide, while larger joints can be accommodated using special dowels. Please contact Burke's Technical Department for further information.



Using Burke DSD's in Beams in conjunction with slab-to-slab Burke Lockable Dowels

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