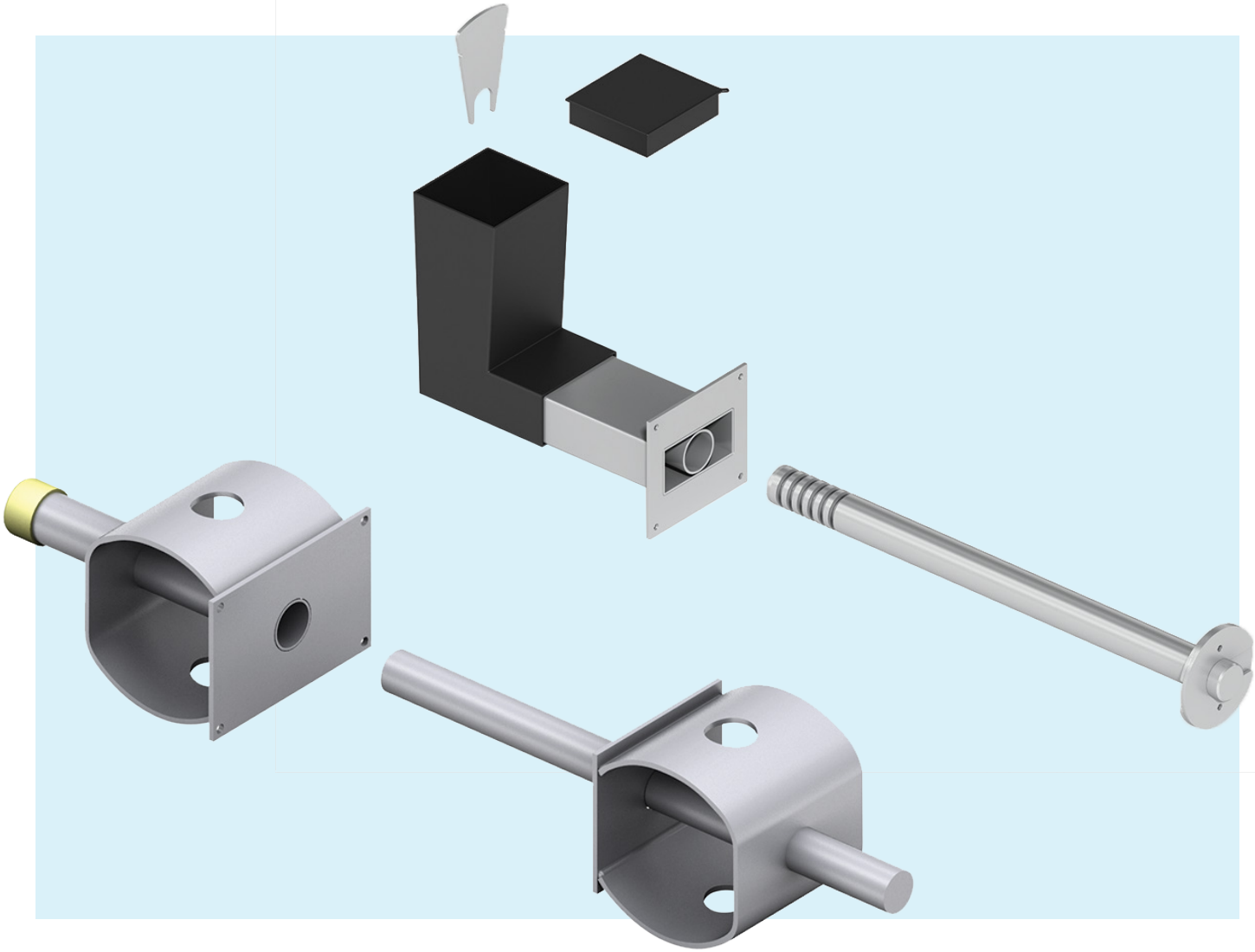
Structural Connections

Shear Load Connectors

Leviat®

Halfen HSD Shear Dowel Systems

for Temporary & Permanent Movement Joints in Concrete



Leviat is the home of:

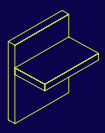
MeadowBurke HALFEN thermomass®

Imagine. Model. Make.

Leviat®

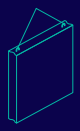
We design and manufacture innovative products and solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

Our areas of expertise:



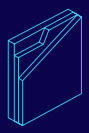
Structural Connections

Engineered systems to form robust, permanent connections between walls, slabs, columns, beams and balconies, providing critical structural integrity and enhanced overall performance.



Lifting & Bracing

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



Insulation

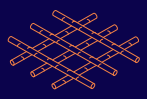
Energy-saving systems for the construction of insulated concrete sandwich panels and related building envelopes that feature proven long-term thermal, moisture, and acoustical performance.

Anchoring & Fixing

Precision, easy-to-use solutions for attaching secondary fixtures to concrete, including anchor channels, and bolts for a variety of applications.

Formwork & Site Accessories

Non-structural, temporary accessories that help keep the construction environment and especially the concrete casting processes operating safely and efficiently.



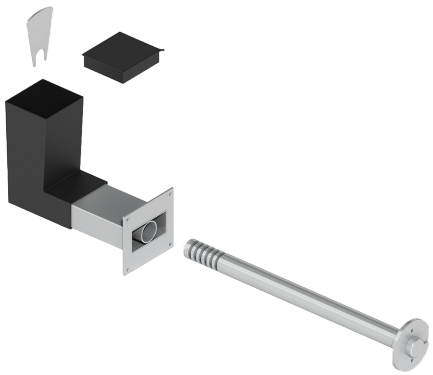
Reinforcing

Durable components that provide reliable support, spacing, and continuity for rebar and wire-mesh to ensure optimal placement and structural performance.

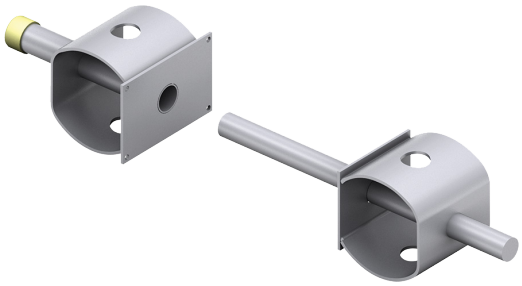
Leviat product ranges:

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

Contents



Halfen HSD-LD Lockable Dowel
Engineered connection eliminates pour strips



Halfen HSD-Ultra Shear Dowel
Engineered connection for expansion joints

Shear Dowel Systems

Leviat's innovative shear dowel systems offer substantial performance improvements over traditional labor-intensive concrete joints - such as corbels or keyed joints – which depend heavily on concrete geometry and workmanship to avoid common issues with uneven load distribution and cracking problems.

Easy Installation

Installation efficiency is another major advantage of modern shear dowels. Traditional joints can require time-consuming processes to ensure proper alignment and stability. In contrast, shear dowel systems arrive on the jobsite pre engineered and ready to install, eliminating complex formwork and multi stage pours.

Safer, More Efficient Construction

Space efficiency also distinguishes modern shear dowels from older methods. Corbels, block-outs, and pour strips occupy considerable structural volume, limit architectural freedom, and produce significant hazards. Modern shear dowels require minimal space while still enabling effective load transfer, making them ideal for buildings where structural depth or clearance is constrained.

Overall, Leviat shear dowels provide a combination of structural reliability, installation efficiency, design flexibility, and long term durability that traditional concrete joint solutions struggle to match. Streamlined construction, improved building performance, and standardized design approaches make shear dowels a superior choice for modern concrete structures.

Halfen HSD-LD Lockable Dowels

- Eliminate pour strips
- Reduce formwork
- Improve site access
- Faster, safer construction
- Proven performance

Overview

Halfen HSD-LD Lockable Dowels are 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 from taking place.

Benefits

The use of Lockable Dowels can save significant time and materials compared to other construction methods. Traditionally, concrete shrinkage has 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 propped, restricting site access and delaying project progress. Wide gaps in the slab also create a number of hazards for site workers, use additional formwork and can 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 propped 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.

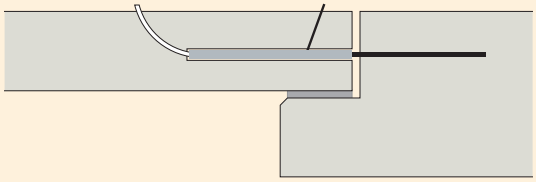
A Lockable Dowel also provides many advantages over the site-assembled arrangement of carbon steel reinforcing bar, galvanized or plastic ducting, vent tubes and a non-specific grout, which is sometimes used by contractors. In addition, engineers have found the Halfen HSD-LD Lockable Dowel to be the preferred design solution for pin-ended joints.

Pour Strips restrict site access, create hazards and delay progress on site.

Applications

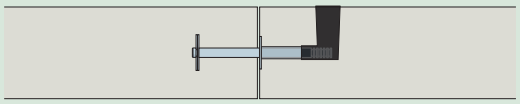
In most cases, Halfen Lockable Dowels can replace pour strips and other conditions at temporary movement joints in post-tensioned concrete frames. Standard Halfen systems are available for use at slab joints and retaining / core walls.

Slab-to-Slab



Various site-assembled components

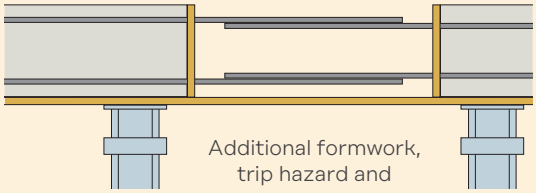
Unreliable performance, additional construction materials used and support corbel or prop required



Halfen Lockable Dowel

Proven performance
Minimal material usage

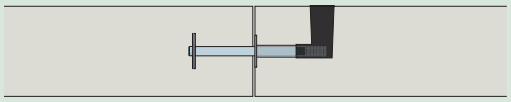
Slab-to-Slab



Pour strip in slab

Additional formwork, trip hazard and restricted access

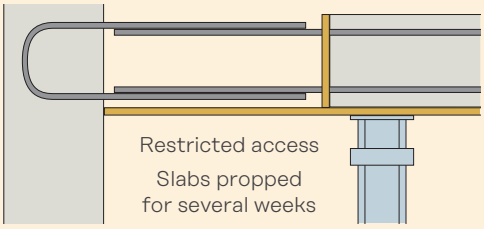
Slabs propped for several weeks



Halfen Lockable Dowel

Minimal formwork
Improved site access
Reduced propping time

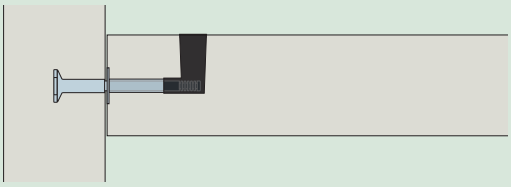
Slab-to-Wall



Restricted access

Slabs propped for several weeks

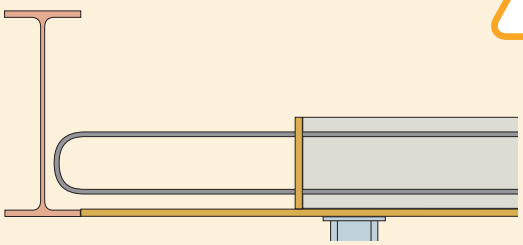
Pour strip at wall-to-slab junction



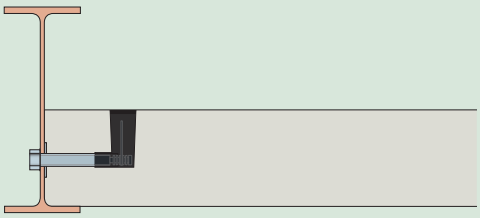
Halfen Lockable Dowel

Improved site access
Reduced propping time

Hybrid Construction



Pour strip at steel beam to concrete slab junction



Halfen Lockable Dowel, in conjunction with Halfen Weldable Coupler. Contact Leviat with details of your project requirements.

Slab to Slab Connections

Range of Halfen Lockable Dowels

Lockable Dowels allow initial shrinkage of the concrete to take place and then, after a pre-determined time period (generally 28-120 days), are locked in position with a mechanical plate and a controlled amount of epoxy resin. The Halfen Lockable Dowel portfolio includes three designs: HSD-LD 20, HSD-LD 30 and HSD-LD 20W.

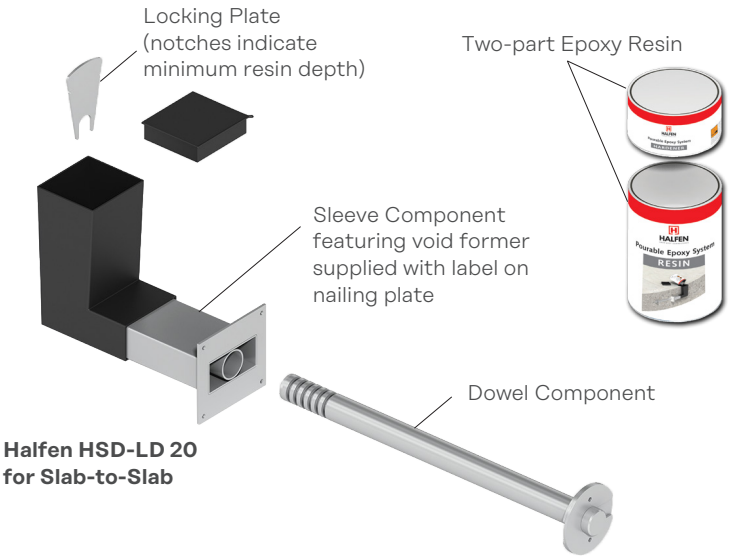
Slab-to-Slab Lockable Dowels

Halfen HSD-LD 20 dowels are manufactured from 30mm diameter stainless steel. One end features two fixed overlapping anchor discs and the other has a series of grooves to accept the Locking Plate. The cylindrical sleeve which accepts the dowel is contained within a box-section to allow lateral, longitudinal and some rotational movement. Epoxy resin is poured into the L-shaped void former. This product has a design shear capacity of up to 16 kip.

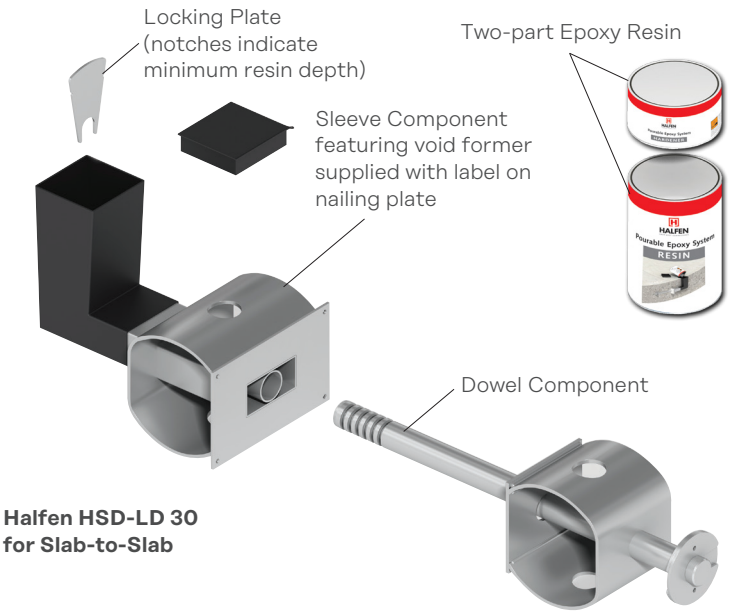
Reinforcement being located around HSD-LD 20 Sleeves

The HSD-LD 30 is a high load Lockable Dowel with a design shear capacity of up to 30.6 kip.

HSD-LD 30 Sleeve nailed to formwork



Halfen HSD-LD 20 for Slab-to-Slab



Halfen HSD-LD 30 for Slab-to-Slab

Example Specification Clause

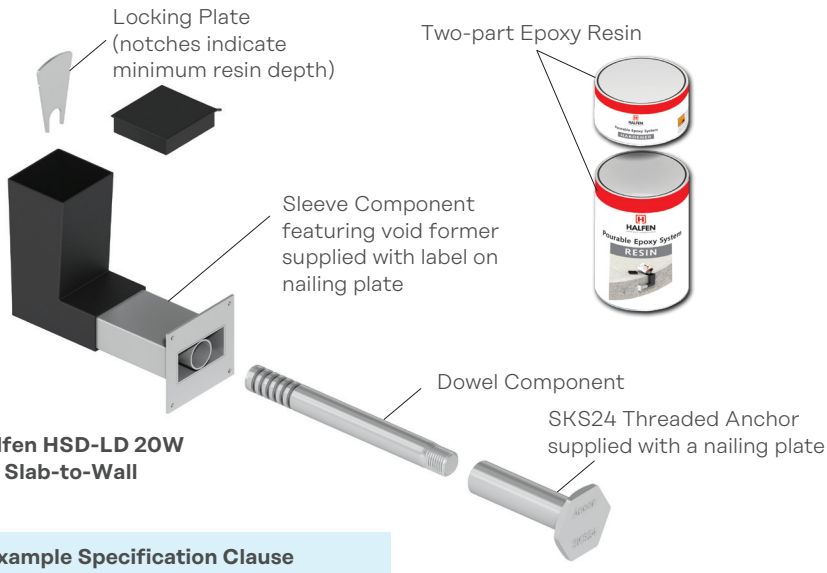
Delete/Amend blue text as appropriate

<HALFEN HSD-LD 20 or HALFEN HSD-LD 30>> lockable shear load connector comprising dowel, sleeve and locking components to be installed at the temporary movement joint between two slabs. Product to be positioned at <insert spacing>inch horizontal spacing at <the center line of the slab or XXX inch from the top of the slab>. The dowel is to be locked in position after <insert time period> using the locking plate and resin supplied. System should be installed in accordance with Leviat's instructions and engineer's drawings.

Slab to Wall Connections

Slab-to-Wall Lockable Dowel

HSD-LD 20W dowels feature 30mm diameter stainless steel and are shorter than the HSD-LD 20. One end of the dowel is designed to screw into the stainless steel SKS 24 Anchor, cast into the face of the concrete, and the other end offers a series of grooves to accept the Locking Plate. The sleeve component is the same as used in the HSD-LD 20.



Halfen HSD-LD 20W for Slab-to-Wall

Sleeve pushed over dowel component at core wall

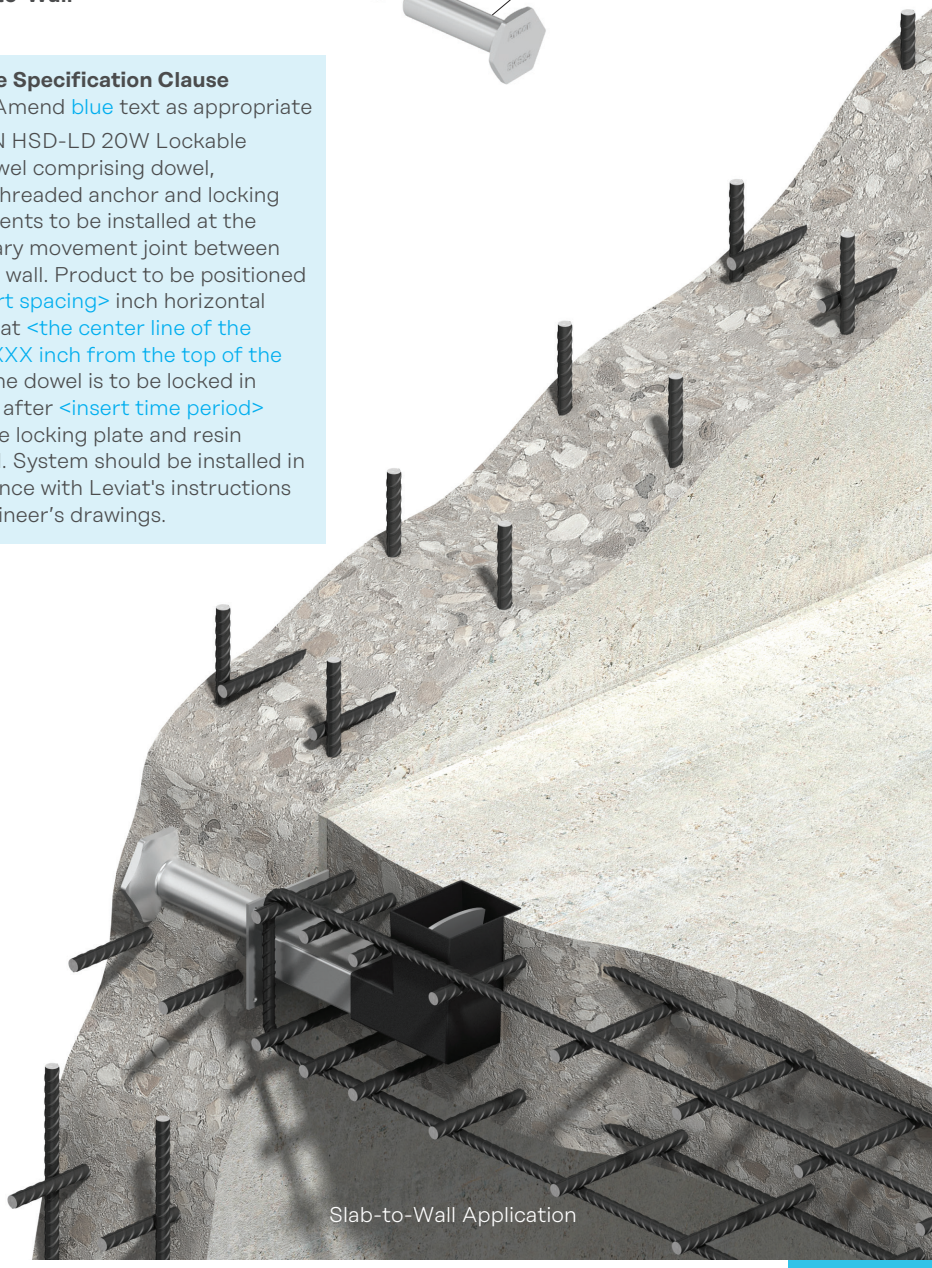
Void formers shown at Slab-to-Wall joint

Example Specification Clause
Delete/Amend blue text as appropriate

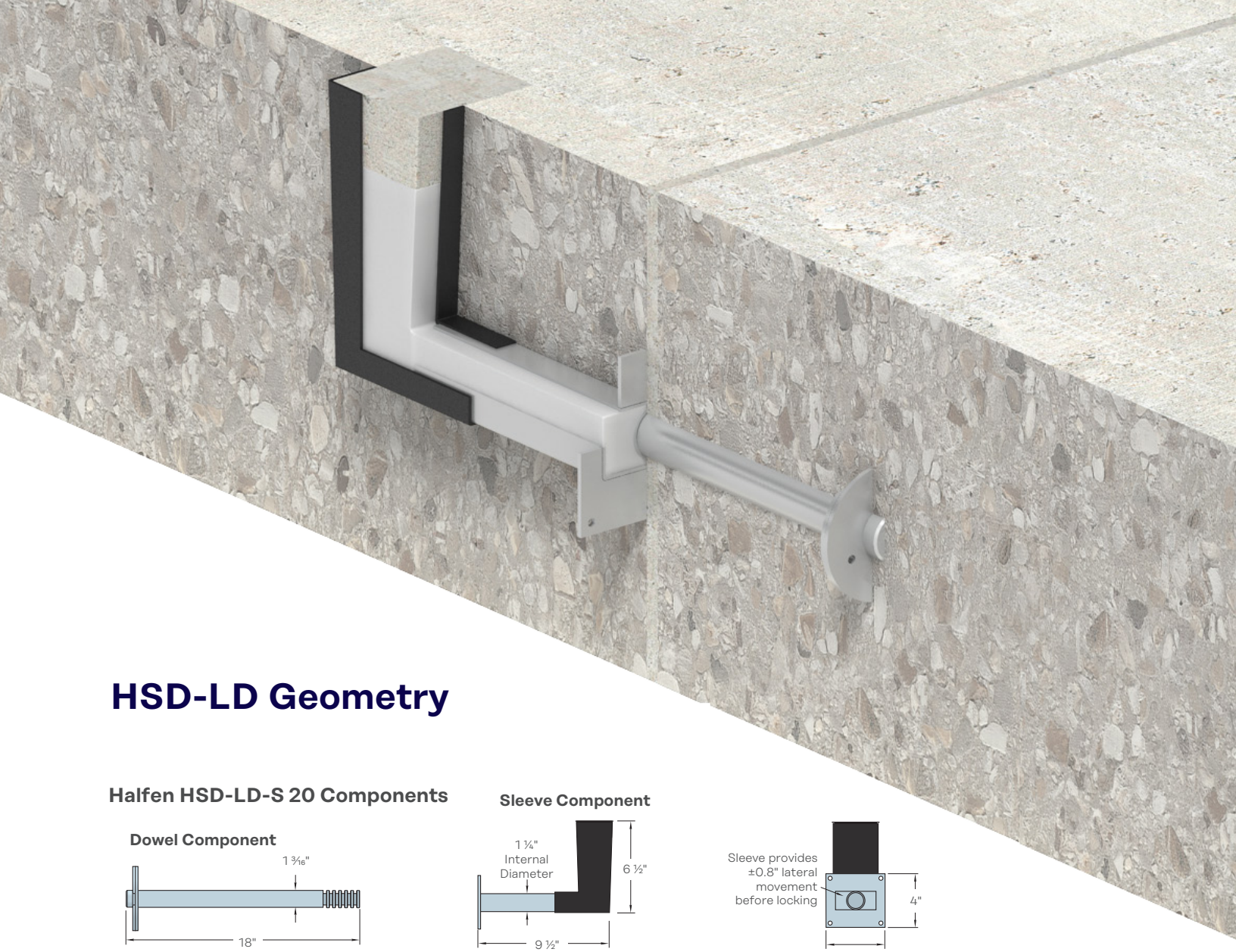
HALFEN HSD-LD 20W Lockable Wall Dowel comprising dowel, sleeve, threaded anchor and locking components to be installed at the temporary movement joint between slab and wall. Product to be positioned at <insert spacing> inch horizontal spacing at <the center line of the slab or XXX inch from the top of the slab>. The dowel is to be locked in position after <insert time period> using the locking plate and resin supplied. System should be installed in accordance with Leviat's instructions and engineer's drawings.

Epoxy Resin

Each dowel is locked after a pre-determined period (generally 28-120 days) with a high quality, two-part epoxy resin. The resin is mixed and poured into the L-shaped void former.



Slab-to-Wall Application

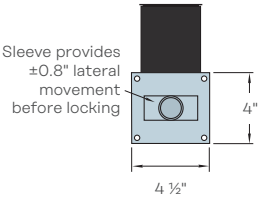


HSD-LD Geometry

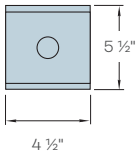
Halfen HSD-LD-S 20 Components

Dowel Component

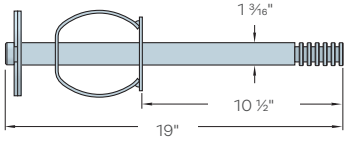
Sleeve Component



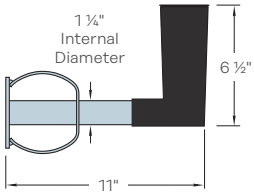
Halfen HSD-LD 30 Components

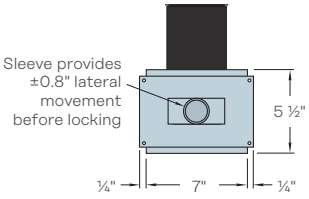


Dowel Component



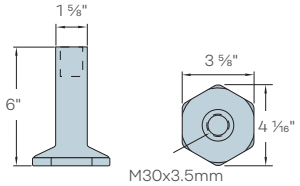
Sleeve Component



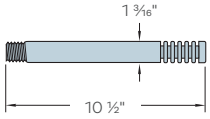


Halfen HSD-LD 20W Components

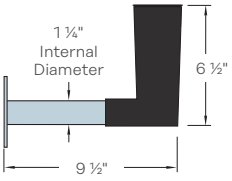
SKS24 Threaded Anchor

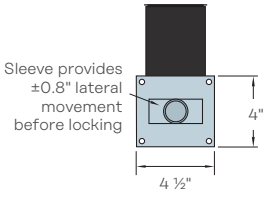


Dowel Component



Sleeve Component





HSD-LD Component Part Numbers

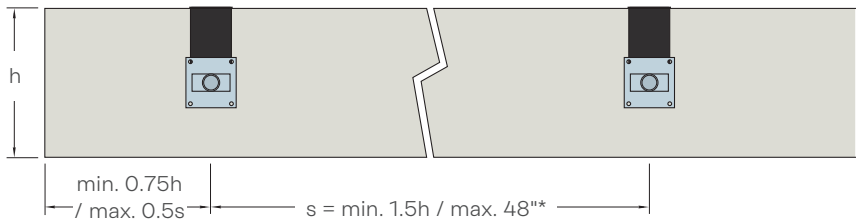
System	Part Number				
	Dowel (-D)	Sleeve (-S)	Locking Plate	Void Former Lid	Resin
HSD-LD 20	MBLDLLL	MBLDFFS	MBLDLP	MBLDGBL	MBFISC1500
HSD-LD 30	MBLDLL-L30	MBLDFFS-L30	MBLDLP	MBLDGBL	MBFISC1500

HSD-LD W Component Part Numbers

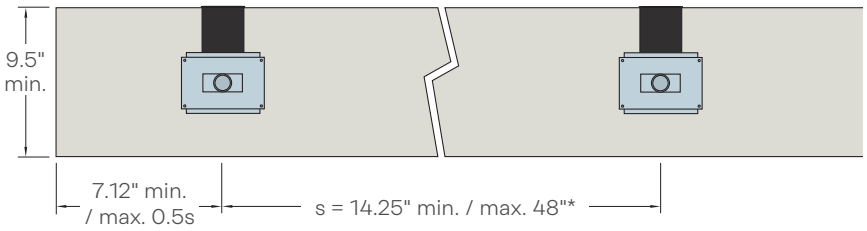
System	Part Number						
	Threaded Dowel (-D)	Threaded Anchor	Nailing Plate	Sleeve (-S)	Locking Plate	Void Former Lid	Resin
HSD-LD 20W	MBLDLLS	MBLDSKS24	MBLDPXNP30	MBLDFFS	MBLDLP	MBLDGBL	MBFISC1500

Edge Distance and Spacings

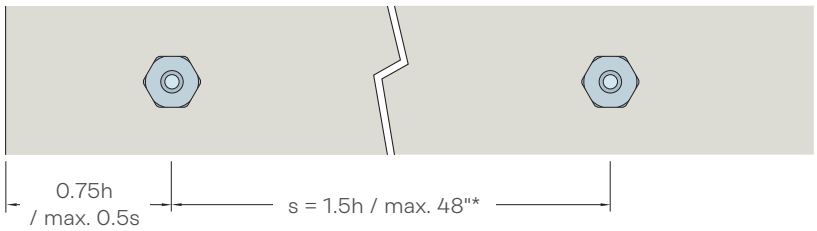
For dowels working at or near their maximum capacity, the minimum spacing should be 1.5 times the slab thickness. Where the design load of the connector could be used in a thinner slab, a spacing of 1.5 times the thinner slab thickness can be used.



HSD-LD 20 Edge Distance and Spacing



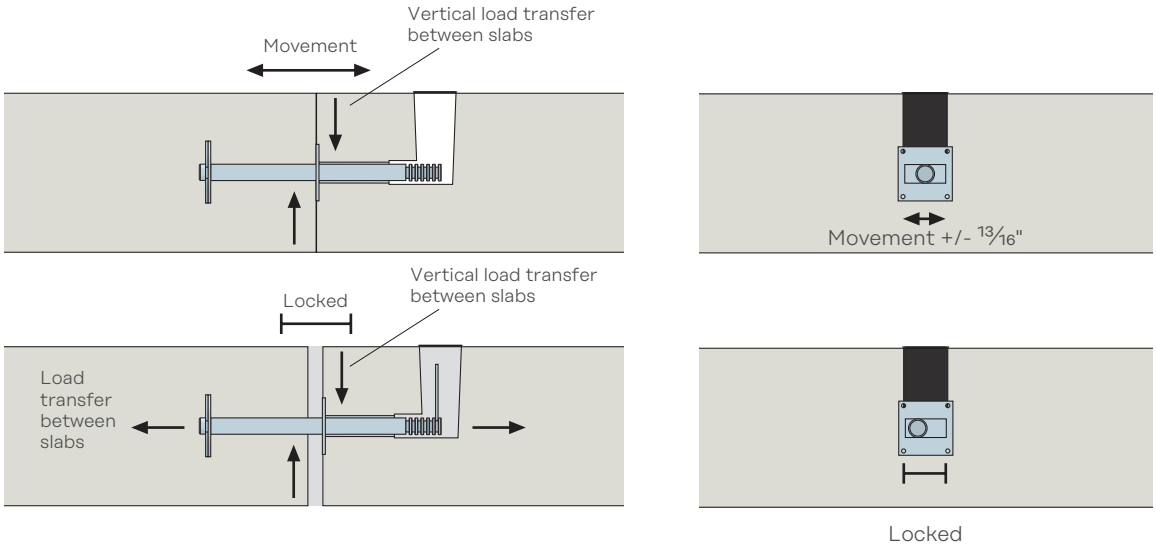
HSD-LD 30 Edge Distance and Spacing



HSD-LD 20W Edge Distance and Spacing. h = depth of adjoining slab

*Greater spacing can be achieved if designer reviews slab behavior in-between connectors.

Performance Data



HSD-LD 20 Lockable Dowels (slab-to-slab)

Slab Thickness	Longitudinal Design Strength [kip]	Vertical Design Strength [kip] for Various Design Joint Widths in 4500 psi Concrete					
		¼"	½"	¾"	1"	1 ¼"	1 ½"
6 ¼"	10	2.7	2.7	2.7	2.7	2.7	2.7
6 ½"	11	3.4	3.4	3.4	3.4	3.4	3.4
7"	14	5.2	5.2	5.2	5.2	5.2	5.2
7 ½"	16	7.3	7.3	7.3	7.3	7.3	7.3
8"	18	9.5	9.5	9.5	9.5	9.5	9.5
8 ½"	22	11.4	11.4	11.4	11.4	11.4	11.4
9"	22	12.8	12.8	12.8	12.8	12.8	12.1
10"	22	15.4	15.3	14.4	13.6	12.8	12.1
11" and above	22	16.0	15.3	14.4	13.6	12.8	12.1

HSD-LD 30 Lockable Dowels (slab-to-slab)

Slab Thickness	Longitudinal Design Strength [kip]	Vertical Design Strength [kip] for Various Design Joint Widths in 4500 psi Concrete					
		¼"	½"	¾"	1"	1 ¼"	1 ½"
9 ½" and above	22	30.6	30.6	30.6	30.6	30.6	27.4

HSD-LD 20W Lockable Dowels (slab-to-wall)

Slab Thickness	Longitudinal Design Strength [kip]	Vertical Design Strength [kip] for Various Design Joint Widths in 4500 psi Concrete					
		¼"	½"	¾"	1"	1 ¼"	1 ½"
6 ¼"	10	2.7	2.7	2.7	2.7	2.7	2.7
6 ½"	11	3.4	3.4	3.4	3.4	3.4	3.4
7"	14	5.2	5.2	5.2	5.2	5.2	5.2
7 ½"	16	7.3	7.3	7.3	7.3	7.3	7.3
8"	18	9.5	9.5	9.5	9.5	9.5	9.5
8 ½"	18	11.4	11.4	11.4	11.4	11.4	11.4
9"	18	12.8	12.8	12.8	12.8	12.8	12.1
10"	18	15.4	15.3	14.4	13.6	12.8	12.1
11" and above	18	16.0	15.3	14.4	13.6	12.8	12.1

Note for above tables:
Increasing concrete strength will not improve the performance of the dowel.

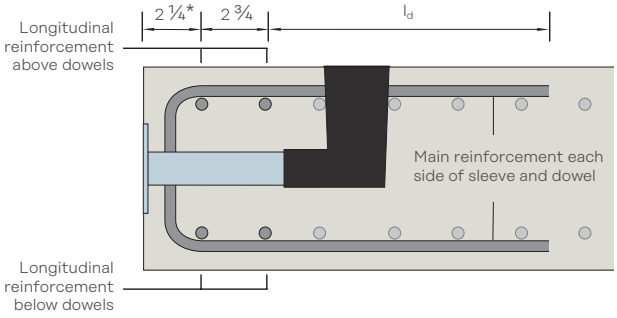
Joint Filler / Fire Protection
Leviat can provide information on a suitable joint filler and also recommend fire resistant material which could be used as part of an overall fire protection system.

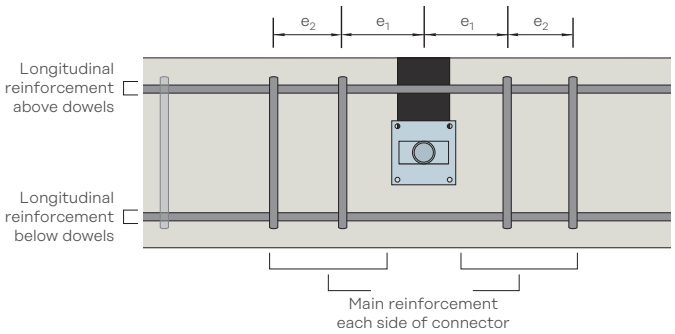
Reinforcement Details
Local reinforcement is required around each Halfen Lockable Dowel to guarantee that the forces are transferred between connectors and the concrete.

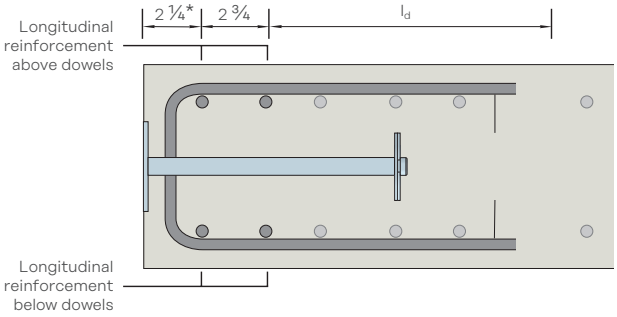
Reinforcement Details

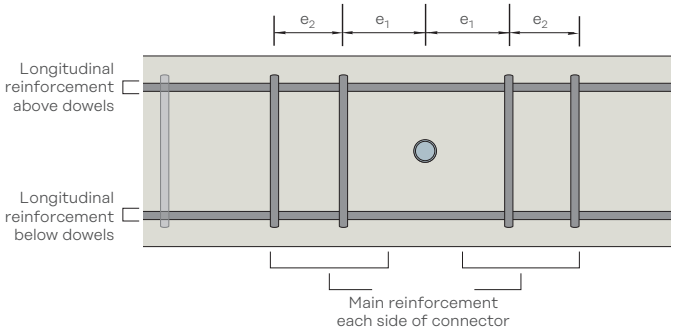
Local reinforcement is required around each Halfen Lockable Dowel to guarantee the forces are transferred between the connectors and the concrete. Correct detailing in accordance with appropriate design codes and the recommendations provided here will ensure the dowels attain their full capacity. The tables show the main reinforcement required, together with details of reinforcement above and below the dowels. The reinforcement configurations for the HSD-LD 20, HSD-LD 30, and HSD-LD 20W are shown below.

HSD-LD 20 & HSD-LD 30









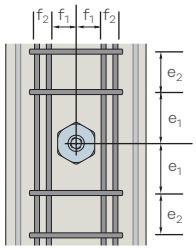
*For minimum slab thickness, the longitudinal bars will be further from the slab edge due to limited space. For thicker slabs, the longitudinal bars should be within the bend of the U-bar.

Reinforcement Data

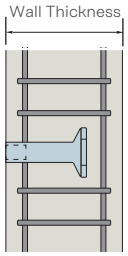
Dowel	No. U-bars Dowel Side (Sleeve Side)	No. Longitudinal Bars top and bottom Dowel Side (Sleeve Side)	Position e_1 Dowel Side (Sleeve Side)	Position e_2 Dowel Side (Sleeve Side)
HSD-LD 20	2 # 4 (2 #4)	2 # 4 (2 #4)	1 ¼" (2")	1 ½" (2 ½")
HSD-LD 30	2 # 5 (2 #5)	2 # 5 (2 #5)	2 ¾" (3 ¾")	1 ½" (1 ¼")

Minimum longitudinal bars are based on dowel centers of (5*h). If spacing greater than this is adopted, the longitudinal bars are to be designed assuming slab edge acts as a beam spanning between the dowels.

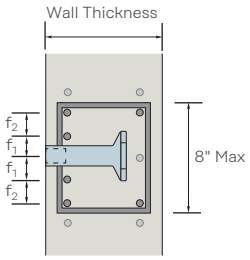
HSD-LD 20W



Wall Elevation



Wall Section View



Spacing of Main Reinforcement

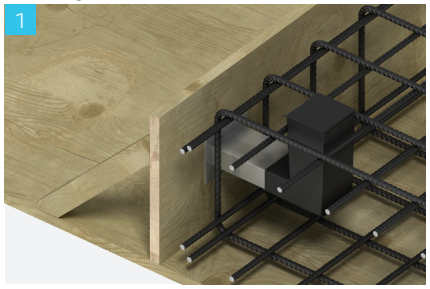
Dowel	No. Stirr-ups top and bottom of dowel	No. Vertical Bars each side of dowel	Position e_1	Position e_2	Position f_1	Position f_2
HSD-LD 20W (Wall >9")	2 # 4	2 # 4	2"	1 ½"	1 ½"	1 ½"
HSD-LD 20W (Wall >11")	2 # 5	2 # 5	2"	1 ½"	1 ½"	1 ½"

Halfen HSD-LD Installation Guide

Installation Slab-to-Slab

Although installation is shown for the HSD-LD 20, the procedure is the same for the HSD-LD 30.

1



Nail the sleeve to the formwork either central in the slab or as otherwise indicated by the specifying engineer. For thicker slabs, it may be necessary to extend the void former using rigid foam. Do not remove the label over the nailing plate as this prevents ingress of concrete into the sleeve. Fix the local reinforcement, in accordance with Leviat's HSD-LD minimum reinforcement details, or as otherwise directed by the specifying engineer.

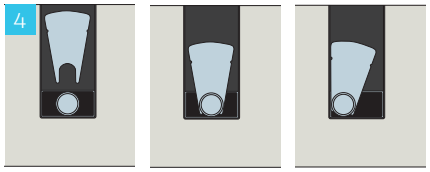
2

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 approximately ½" from the back of the void former.

3

Fix the local reinforcement around the dowel component in accordance with Leviat's HSD-LD minimum reinforcement details, or as otherwise directed by the specifying engineer, and pour the concrete.

4



After a predetermined time period, as directed by the specifying engineer, when movement between the slabs has stabilised the dowel is ready to be locked.

Fit the Locking Plate on a groove in the center of the void former. The fan-shaped Locking Plate allows the dowel to be locked in any position.

5

Mix the two-part epoxy resin and pour into the void former. It is essential the resin flows along the stainless steel box section towards the joint and reaches the notches on the locking plate, which indicate minimum resin depth.

6

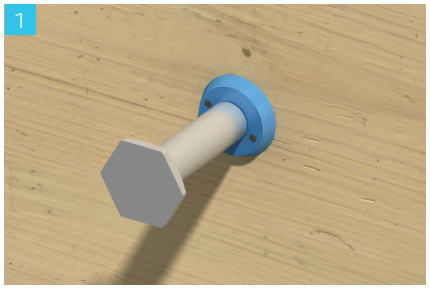
After 24 hours the void former can be filled with cementitious material, level with the top of the slab, to complete the installation.

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

If required, fill the joint per the Architects recommendation.

Slab-to-Wall

1



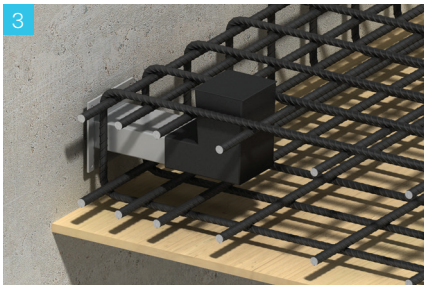
Nail the threaded anchor to the formwork so the dowel will be central in the adjoining slab or as otherwise indicated by the specifying engineer. Fix the local reinforcement in accordance with Leviat's HSD-LD minimum reinforcement details, or as otherwise directed by the specifying engineer, and cast the concrete.

2

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

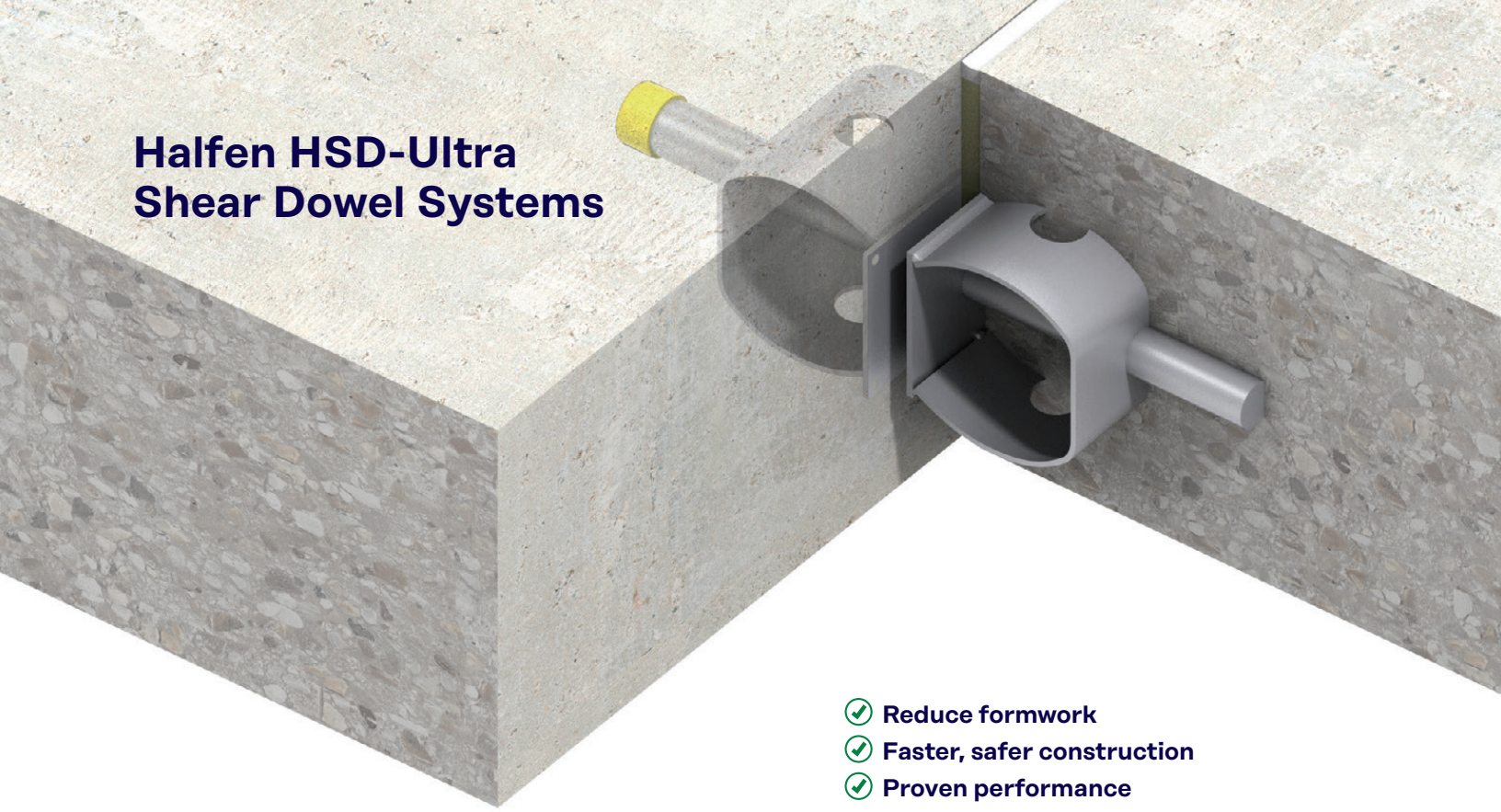
Notes: Where deep concrete pours are proposed, the installation will require further consideration. More robust fixing of the sleeve and dowel components will be necessary, to avoid displacement during casting of the concrete.

3



Puncture the label of the sleeve to reveal the cylindrical sleeve only. Push the sleeve over the dowel until it is flush with the concrete. For thicker slabs, it may be necessary to extend the void former using rigid foam. Fix the local reinforcement in accordance with Leviat's HSD-LD minimum reinforcement details, or as otherwise directed by the specifying engineer, and pour concrete. See Steps 4 to 6 above to complete installation.

Halfen HSD-Ultra Shear Dowel Systems



- **Reduce formwork**
- **Faster, safer construction**
- **Proven performance**

The HSD-Ultra System Efficiently transfers shear load across movement joints in concrete.

Joint Solutions

In most cases, conventional dowelled or keyed joints can be replaced by joints incorporating Halfen Shear Dowels. These dowels are more effective at transferring load and allowing movement to take place, easier to install on site, and often prove to be a more cost-effective solution.

Halfen Shear Dowels can be used for movement joints in floor slabs, suspended slabs, and for replacing double columns and beams at structural movement joints.

- **Quality control during insallation**
- **Simplified Forming**
- **Better load transfer and less cracks**

The Ultra Solution

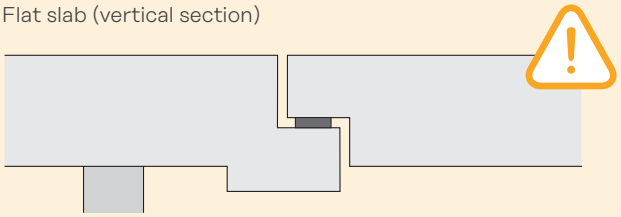
Each Halfen Shear Dowel is a two-part assembly compromising a sleeve and a dowel component. Installation is a fast and accurate process, drilling of formwork is not required. The sleeve is simply nailed to the formwork ensuring subsequent alignment with the dowel, essential for effective movement.

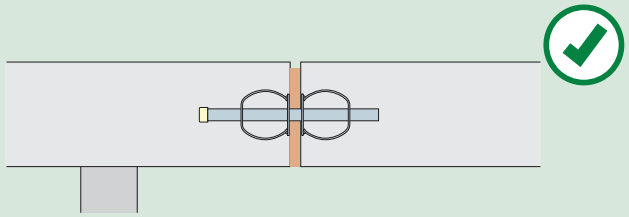
HSD-Ultra systems are manufactured from a stainless steel to ensure a high degree of corrosion resistance with no requirement for additional protection.

Applications

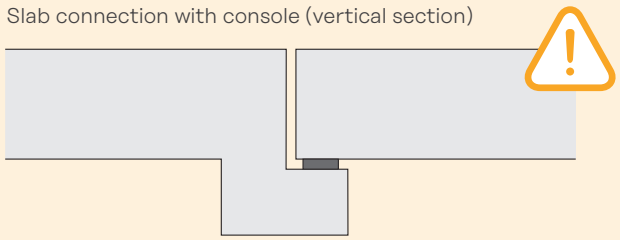
There are many applications for Halfen HSD-Ultra Shear Dowels in all types of reinforced concrete constructions – both building and infrastructure projects.

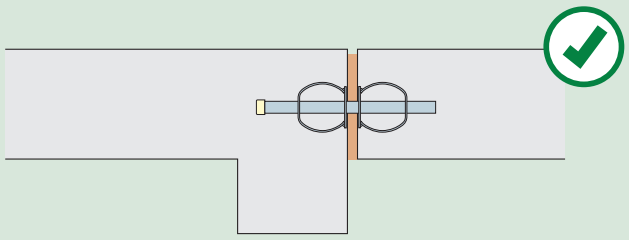
Flat slab (vertical section)



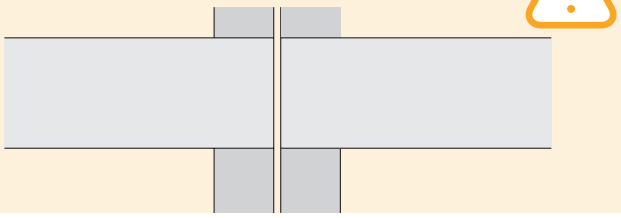


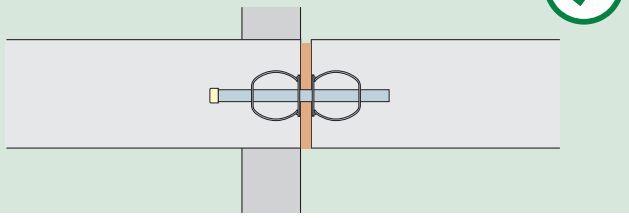
Slab connection with console (vertical section)



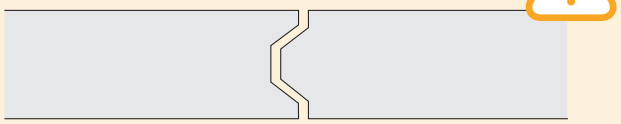


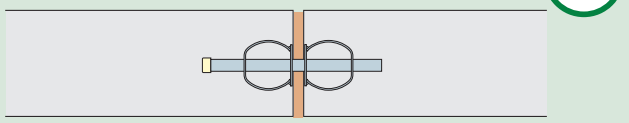
Double column replaced by a single column (vertical section)



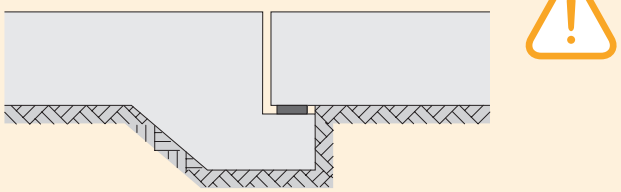


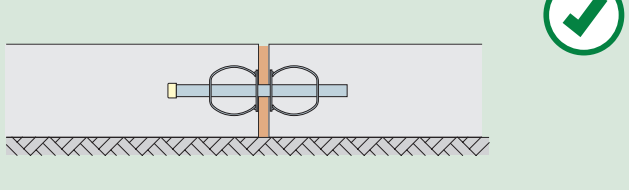
Connection in a supporting wall (horizontal section)



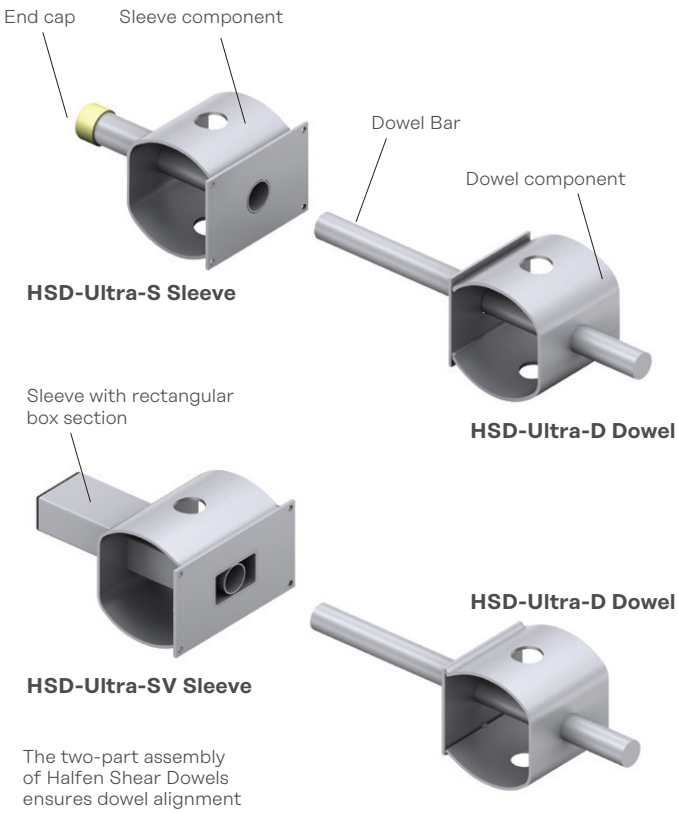


Expansion joint in a floor slab (vertical section)





HSD-Ultra Geometry



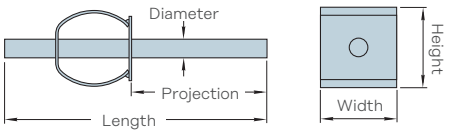
Halfen HSD-Ultra / Ultra-V

The Halfen HSD-Ultra is a shear dowel system for high loads. The steel plates in the area around the dowel and the sleeve distribute the load in the concrete and allow higher loads than conventional shear dowels.

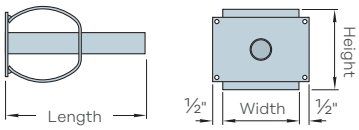
Halfen HSD-Ultra shear dowels come in two parts. The set always consists of the dowel (HSD-Ultra-D) and the corresponding sleeve (HSD-Ultra-S and HSD-Ultra-SV, respectively). The HSD-Ultra does not allow any movement perpendicular to the dowel.
The HSD-Ultra-V allows lateral movement in one direction. Both, HSD-Ultra and HSD-Ultra-V allow movement in longitudinal direction.

Dimensions of the dowels and sleeves can be found on this page. Additional information like design strength and required supplementary reinforcement can be found on pages 15-16.

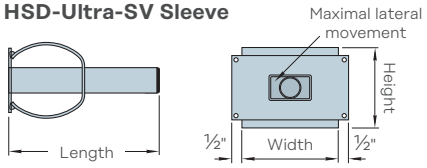
HSD-Ultra-D Dowel



HSD-Ultra-S Sleeve



HSD-Ultra-SV Sleeve



HSD-Ultra and HSD-Ultra-V – Dimensions

Name	Dowel HSD-Ultra-D					Sleeve HSD-Ultra-S			Sleeve HSD-Ultra-SV			
	Diameter	Length	Projection	Height	Width	Length	Height	Width	Length	Height	Width	"lat. movement"
HSD-ULTRA 18(-V)	1 1/16"	10 5/8"	5 7/8"	3"	2 3/4"	6 1/8"	3"	2 3/4"	6 3/4"	3"	3 7/8"	1"
HSD-ULTRA 22(-V)	7/8"	12 1/4"	6 1/4"	3 3/4"	3 1/2"	6 1/2"	3 3/4"	3 1/2"	6 7/8"	3 3/4"	4 1/2"	7/8"
HSD-ULTRA 24(-V)	15/16"	13"	6 3/4"	4 3/8"	3 7/8"	6 7/8"	4 3/8"	3 7/8"	7 1/8"	4 3/8"	4 3/4"	7/8"
HSD-ULTRA 30(-V)	1 3/16"	14 3/8"	7 1/4"	5 1/2"	4 1/2"	7 1/2"	5 1/2"	4 1/2"	8 1/4"	5 1/2"	6 3/8"	1 5/8"
HSD-ULTRA 35(-V)	1 3/8"	16 1/2"	8 1/4"	6 1/4"	5 1/4"	8 1/2"	6 1/4"	5 1/4"	9 1/4"	6 1/4"	6 3/4"	1 1/4"
HSD-ULTRA 42(-V)	1 5/8"	18 1/2"	9"	7 1/8"	6 7/8"	9 5/8"	7 1/8"	6 7/8"	9 5/8"	7 1/8"	8"	1 7/8"
HSD-ULTRA 52(-V)	2 1/16"	22 1/2"	11"	8 5/8"	8 1/4"	11 5/8"	8 5/8"	8 1/4"	11 5/8"	8 5/8"	9 5/8"	1 1/2"

HSD-Ultra and HSD-Ultra-V Component Part Numbers

System	Part Number		
	Dowel (-D)	Sleeve (-S)	Slotted Sleeve (-SV)
HSD-Ultra 18(-V)	MBSDU18*	MBSDU18SL	MBSDU18FQ*
HSD-Ultra 22(-V)	MBSDU22*	MBSDU22SL	MBSDU22FQ*
HSD-Ultra 24(-V)	MBSDU24	MBSDU24SL	MBSDU24FQ
HSD-Ultra 30(-V)	MBSDU30	MBSDU30SL	MBSDU30FQ
HSD-Ultra 35(-V)	MBSDU35	MBSDU35SL	MBSDU35FQ
HSD-Ultra 42(-V)	MBSDU42	MBSDU42SL	MBSDU42FQ
HSD-Ultra 52(-V)	MBSDU52	MBSDU52SL	MBSDU52FQ

* Stocked in North America. All other part numbers are imported at the time of order and will have extended lead times.

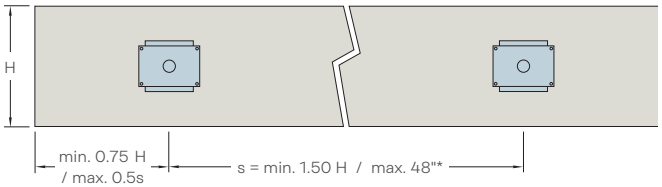
HSD-Ultra Performance Data

Edge Distance and Spacing

The minimum edge distance and spacing of the Halfen HSD-Ultra shear dowels 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.

Position of Connectors in Slab

The tabulated capacities below are based on the shear connector being located centrally in the slab-edge. When the connector is installed with an offset, the minimum distance from the connector center to the slab face shall be taken as H/2, with H corresponding to the design strength from the table.



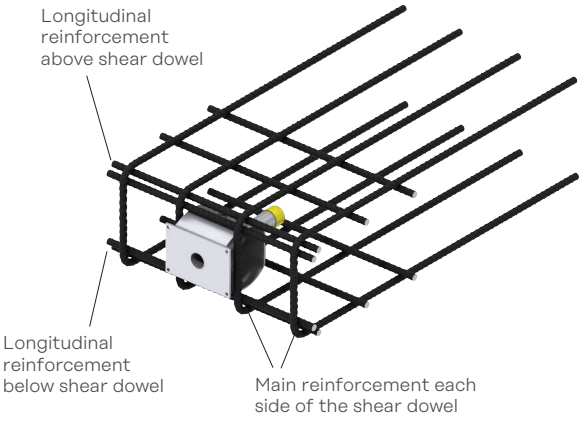
*Greater spacings can be achieved if designer reviews slab behavior in-between connectors.

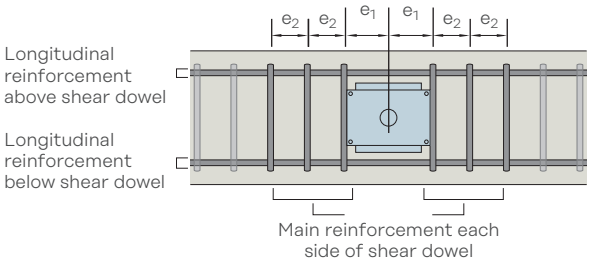
Halfen HSD-Ultra and HSD-Ultra-V (slab-to-slab or slab-to-wall)

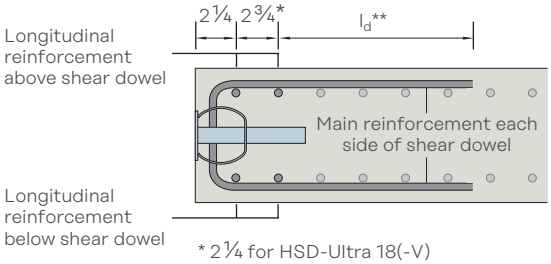
System	Vertical design strength F_{Rd} [kip] for various joint widths [Inch] in 4000/4500 psi concrete											
	Slab Thickness (H)	¼"		½"		1"		1 ½"		2"	
HSD-Ultra 18(-V)	6 ½	7.9	9.4	7.9	9.0	7.9	8.1	7.9	7.9	6.3	6.3
	7	8.7	10.6	8.3	10.1	7.9	9.2	7.9	7.9	6.3	6.3
	7 ½	9.9	11.9	9.6	11.5	9.0	10.3	7.9	7.9	6.3	6.3
	8	10.4	12.6	10.1	12.1	10.2	11.0	7.9	7.9	6.3	6.3
	9	11.2	13.5	10.7	12.8	10.8	11.7	7.9	7.9	6.3	6.3
	10	11.9	14.2	11.9	13.7	11.9	11.9	7.9	7.9	6.3	6.3
	11	13.1	14.8	12.3	13.7	11.9	11.9	7.9	7.9	6.3	6.3
HSD-Ultra 22(-V)	8	15.7	20.2	15.8	19.3	15.7	18.2	14.2	14.2	11.5	11.5
	9	18.1	21.8	18.1	21.1	18.0	19.8	14.2	14.2	11.5	11.5
	10	20.6	23.4	20.7	22.9	20.2	20.5	14.2	14.2	11.5	11.5
	11	23.9	25.2	23.8	24.3	20.2	20.5	14.2	14.2	11.5	11.5
	12	25.2	25.9	23.8	24.3	20.2	20.5	14.2	14.2	11.5	11.5
HSD-Ultra 24(-V)	9	19.4	23.6	19.1	23.2	19.1	21.8	18.4	18.4	14.8	14.8
	10	25.0	27.9	25.0	27.2	24.5	24.7	18.4	18.4	14.8	14.8
	11	28.8	29.9	27.7	28.3	24.5	24.7	18.4	18.4	14.8	14.8
	12	29.3	30.1	27.7	28.3	24.5	24.7	18.4	18.4	14.8	14.8
HSD-Ultra 30(-V)	10	30.0	33.9	30.0	33.9	29.7	33.5	29.7	30.1	25.0	25.0
	11	32.3	36.6	32.3	36.6	32.4	36.6	30.6	30.6	25.0	25.0
	12	35.2	39.8	35.3	39.8	35.3	38.7	30.6	30.6	25.0	25.0
	13	38.8	42.7	38.9	42.7	38.0	38.7	30.6	30.6	25.0	25.0
	14	44.3	45.6	42.3	43.4	38.0	38.7	30.6	30.6	25.0	25.0
HSD-Ultra 35(-V)	12	50.4	57.1	50.4	57.1	50.4	55.5	45.6	45.9	38.4	38.4
	14	62.3	64.1	60.1	61.4	54.6	55.5	45.6	45.9	38.4	38.4
HSD-Ultra 42(-V)	14	66.1	74.0	66.1	74.0	66.1	71.3	59.8	59.8	52.2	52.2
	16	82.7	82.7	78.9	78.9	71.3	71.3	59.8	59.8	52.2	52.2
HSD-Ultra 52(-V)	16	87.9	99.6	87.9	99.6	87.9	99.6	97.9	94.6	86.3	87.5
	18	103.8	111.5	103.8	111.5	102.4	105.2	92.9	94.6	86.3	87.5
	20	111.4	115.6	108.5	112.2	102.4	105.2	92.9	94.6	86.3	87.5

Reinforcement Details

Local reinforcement is required around each sleeve and dowel to guarantee that the forces are transferred into the concrete. Correct detailing in accordance with appropriate design codes and the recommendations provided here in will ensure Halfen HSD-Ultra and Ultra-V shear dowels achieve their full capacity. The tables below show the minimum requirements for the type and spacing of the main reinforcement, together with details of reinforcement above and below the shear dowels.

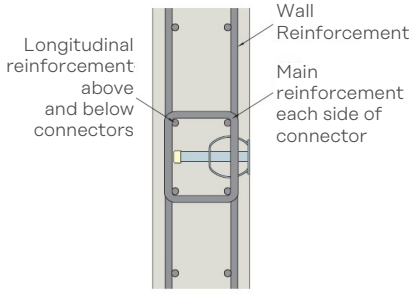






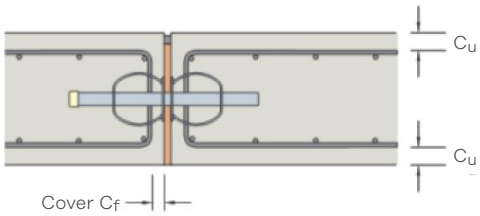
* 2¼ for HSD-Ultra 18(-V)
** l_d calculated in accordance with the latest edition of ACI 318

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



Cover

Minimum cover C_u to local reinforcement shall be in accordance with the latest edition of ACI 318.
Maximum cover C_f to face of slab is as shown below:



Cover Data

Ref HSD-Ultra(-V)	Max Cover to Face C_f
18	1.75"
22, 24, 30, 35, 42, 52	2"

Reinforcement Data

System	Local reinforcement around the dowels in 4000/4500 psi concrete			
	Main reinforcement			Longitudinal bars top and bottom
	U-bars each side of the dowel	Distance e_1	Distance e_2	
HSD-Ultra 18 [-V]	(2) No. 4	1¾" [2"]	4¼"	(2) No. 4
HSD-Ultra 22 [-V]	(3) No. 4	2¼" [2¾"]	2¼"	(2) No. 4
HSD-Ultra 24 [-V]	(5) No. 4	2¼" [2¾"]	1¾"	(2) No. 4
HSD-Ultra 30 [-V]	(5) No. 4	2¾" [2¾"]	2"	(3) No. 4
HSD-Ultra 35 [-V]	(4) No. 5	3" [4"]	4½"	(2) No. 5
HSD-Ultra 42 [-V]	(5) No. 5	3¾" [4½"]	3½"	(3) No. 5
HSD-Ultra 52 [-V]	(7) No. 5	4½" [5"]	2½"	(4) No. 5

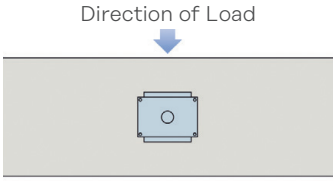
Minimum longitudinal bars are based on dowel centers of (5*h). If spacing greater than this is adopted, the longitudinal bars are to be designed assuming slab edge acts as a beam spanning between the dowels.

Halfen HSD-Ultra Shear Dowel Installation Guide

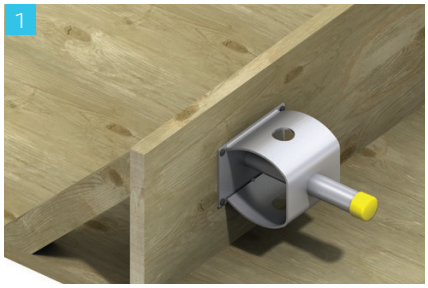
Installation Procedure

The two-part assembly of all Halfen Shear Dowels removes the need for drilling formwork on site, supporting dowel bars and fitting debond-ing sleeves and end caps. The installation is a fast and accurate process.

HSD-Ultra Shear Dowels normally transfer vertical loads across a joint. The face marked 'Top' on both the sleeve and the dowel should be uppermost. For applications where the load is not vertical, the face marked 'Top' will need to be in the same direction as the load.



1



Nail the sleeve component to the formwork ensuring that the sleeve is correctly orientated for the direction of the load. Check that the minimum and maximum 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.

2

Fix the local reinforcement in position around the sleeve component in accordance with Leviat's HSD-Ultra minimum reinforcement details, or as otherwise directed by the specifying engineer. Ensure that the correct cover to the reinforcement is maintained. Pour the concrete to complete the installation of the sleeve component.

3

When the concrete has achieved sufficient strength, strike the form work. Peel off or puncture the label to reveal the hole for the dowel. Where HSD-Ultra-V are being used, the label should only be punctured enough to allow the dowel into the cylindrical sleeve.

4

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

5

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 dis-location when the concrete is vibrated.

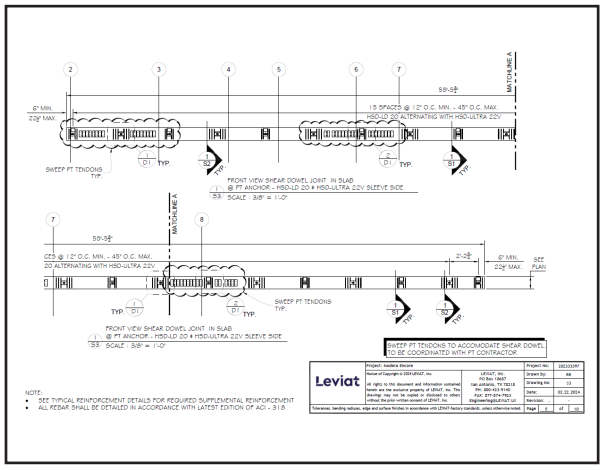
6

Fix the local reinforcement in position around the dowel component in accordance with Leviat's HSD-Ultra minimum reinforcement details, or as otherwise directed by the specifying engineer. Ensure that the correct cover to the reinforcement is maintained. Pour the concrete to complete the installation of the shear connector.

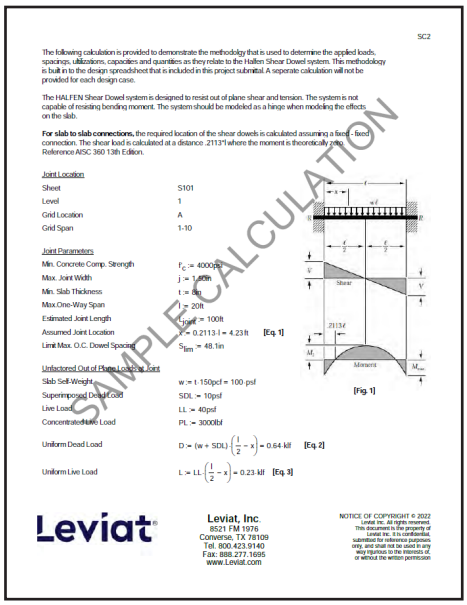
7

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 pouring of the concrete.

Halfen HSD Shear Dowel Design Support



Sample Drawing



Sample Calculation

Leviat provides project-specific support to designers and installers for Halfen HSD-LD and HSD-Ultra systems. Our team ensures correct product selection, minimum and maximum spacings, reinforcement detailing, and guidance for final installation.

Design Assistance

Leviat offers free design assistance to help convert traditional pour strips or expansion joints into Halfen HSD dowel joints. Our support includes:

- Calculation of load demand (assuming a one-way slab system)
- Product selection and spacing requirements
- Reinforcement details for the most economical solution

Alternatively, the project's Engineer of Record can model a lockable dowel joint or expansion joint as a hinge and submit factored reactions for review. We then provide product selection, spacing requirements, and reinforcement details to optimize performance and cost.

Optimized Layout Solutions

Detailed dowel placement drawings—including reinforcement details and spacing limits—are available for an additional charge to simplify coordination with post-tensioning and other trades.

PE-Sealed Documentation

Licensed engineers on staff can seal calculations and layout drawings for an additional charge, providing confidence and compliance for critical projects.

Virtual Pre-Construction Meetings

We offer virtual sessions to walk field teams through interpreting our drawings and installing the system correctly, reducing errors and ensuring smooth execution.

The HSD-LD 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 us it!

Mahmoud Farawi | Skanska USA | Raleigh, NC

Leviat®

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