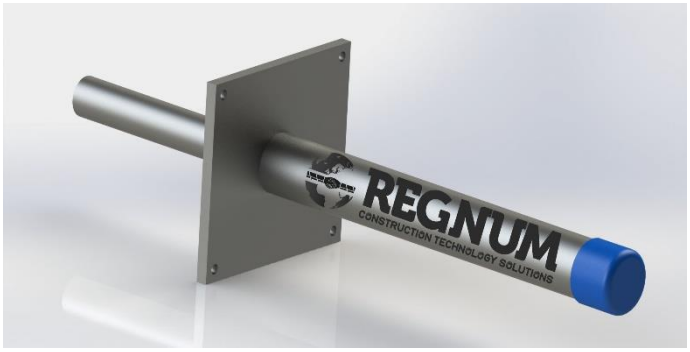
CONSTRUCTION TECHNOLOGY

SHEAR PIN

PROPERTIES

- Simple geometry of the formation of the joint
- Simple formwork and time saving installation
- Simple reinforcement layout gain in space through avoidance of double supports
- Cost saving and gain in space through staged erection of the construction elements
- High shear force transfer
- Fire protection coating (optional)
- Epoxy coated (optional)



The concrete structures are designed with expansion and contraction joints to enable the movements. The Shear Pin is used to transfer the slip load across these joints. For the correct operation of the overall design of the structure, design of the joint is important.

Regbar Shear Load Connector provides considerable benefits over straight dowel rods. In load transfer and compromise motions, they are more efficient and simpler to install owing to their two-piece structure.

By using Regbar Shear Pin, the shear forces are transferred to the reinforced concrete construction with the option of uniaxial or bi-axial displacement from joints of construction element.

Regbar Shear Pin components enable sliding in the direction of the member axis. They are normally used to transfer shear loads in any direction. Movable connections prevent taking place of uncontrolled cracks and resulting damage.

In the shear pin system, non-corrosive grade steels are used as per (No. 1.4571, 1.4462, EN 10088-5). This system also includes a one-piece plastic cover. No official approval is required for the Regbar Shear Pin System.

There are two types of Shear Pin Connectors produced by Regbar Construction:

1) Regbar Double Shear Dowel (DSD)

2) Regbar Single Shear Dowel (SSD)

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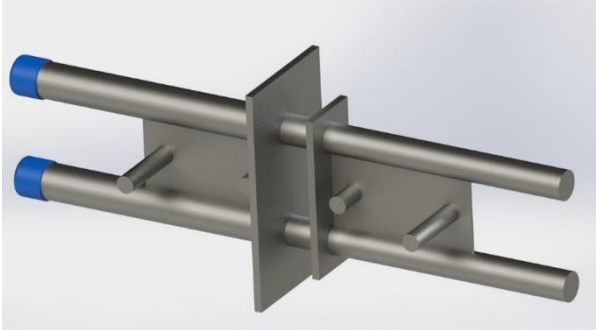
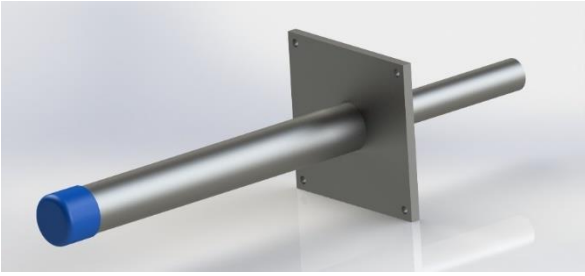
The Regbar DSD is the original two-part, double dowel, shear load connector. The two dowels are Duplex stainless steel bar. To accommodate motion, the dowel element can move longitudinally inside the sleeve. The connector is available in ten standardized dimensions and has design resistance from approximately 20kN to more than 950kN. It is possible to use the larger connectors in joints up to 60 mm wide. The use of special dowels can accommodate larger joints.





The Regbar SSD 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 stainless steel bar.

SIMPLE INSTALLATION

The two-part assembly of all Regbar shear connectors eliminates 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.

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Following steps of installation is same for all types of Regbar Shear Connectors:

1- Nail the sleeve element to the shuttering to ensure that the sleeve is properly oriented towards the load direction.
2- 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.

3- When the concrete has achieved sufficient strength, strike the shuttering. Peel off or puncture the label to reveal the holes for the dowels.

4- 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.

5- 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 finish the installation of the shear connector.

DETAILING AND DESIGN RESISTANCE OF REGBAR SSD CONNECTOR

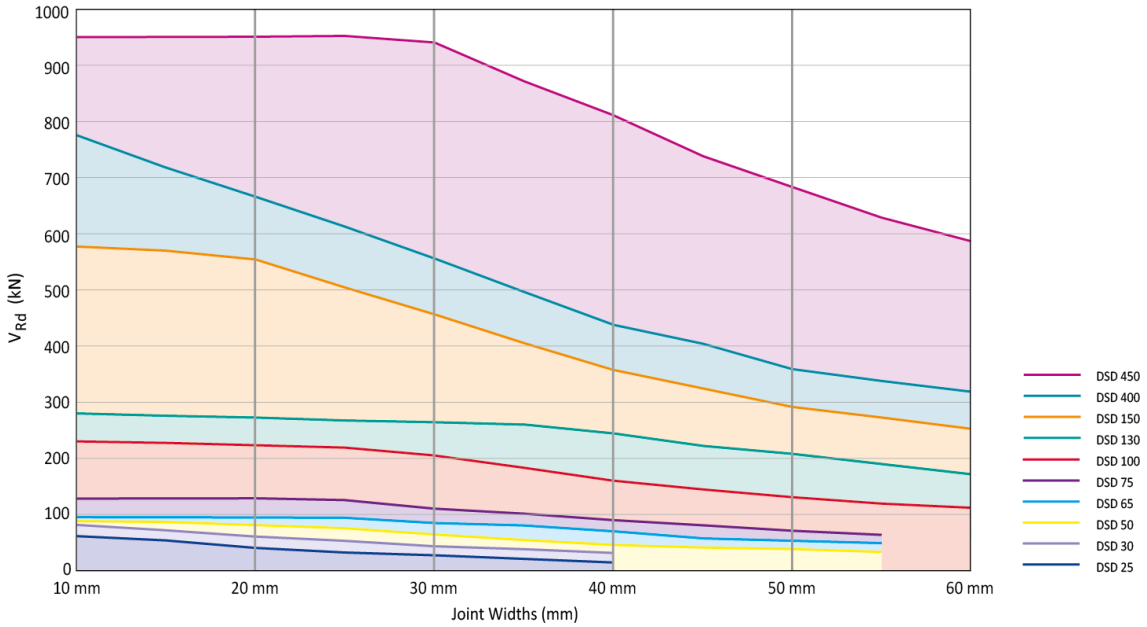
To ensure that the forces are transferred between the connectors and the concrete, local reinforcement is required around each connector. Correct detailing will guarantee Regbar DSD in accordance with suitable design codes, and connectors will achieve their complete ability.
To choose the correct product that the structure needs, engineers may use the following calculations steps. There are tables in the following pages to make the choosing of product easier.

DSD Design Example

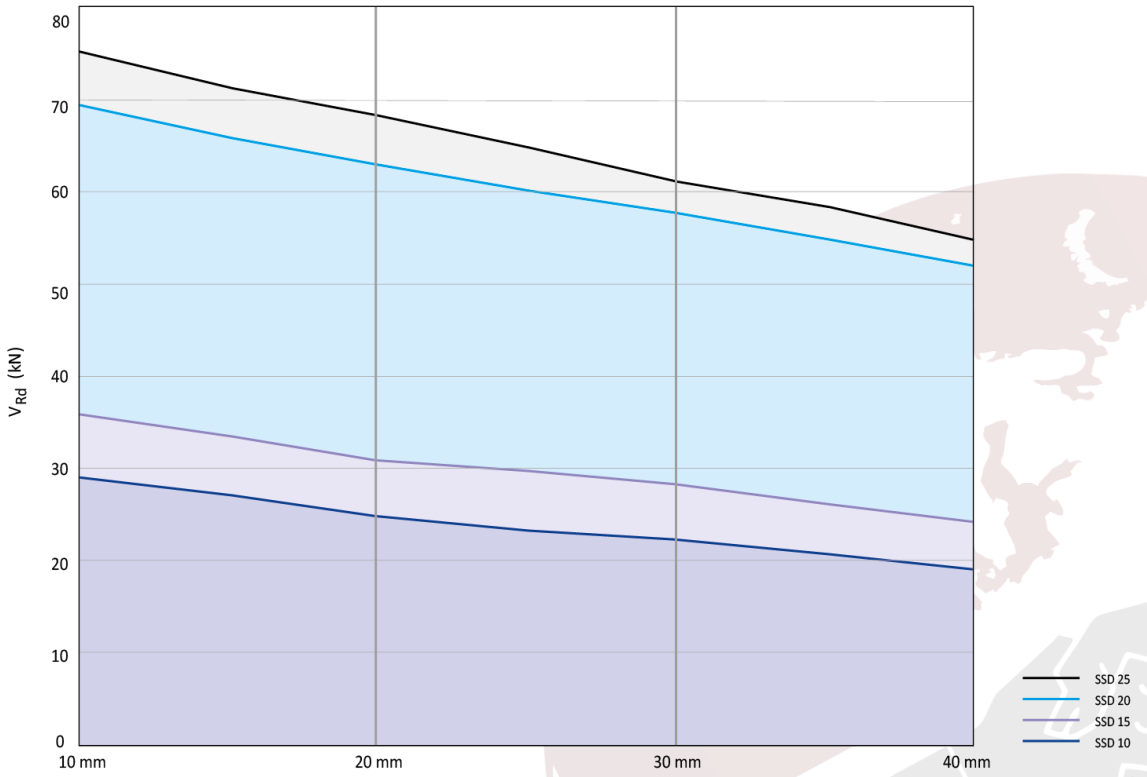
Slab Thickness	= 400mm	
Maximum width of joint	= 30mm	
Concrete strength	= C30/C37	
Characteristic dead load	= 100kN/m	γ_G = 1.35*
Characteristic imposed load	= 120kN/m	γ_Q = 1.5*
Design load	= (100 x 1.35) + (120 x 1.5) = 315kN/m	
V_{Rd} (Design resistance)	Maximum centers	*Either connector would be acceptable, although using DSD130s at 700mm centers would minimize the number of connectors to be installed.*
DSD100 = 203.9kN	= 203.9 / 315 = 0.647m use 600mm	
DSD130 = 225.0kN	= 225.0 / 315 = 0.714m use 700mm	

**The partial safety factors of 1.35 (γ_G) and 1.5 (γ_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.*

Regbar DSD V_{Rd} Design Resistance (kN) for Various Joint Widths (mm) at the Maximum Slab Thickness (mm) in C30/37 Concrete (See the following pages for details)



Regbar SSD V_{Rd} Design Resistance (kN) for Various Joint Widths (mm) at the Maximum Slab Thickness (mm) in C30/37 Concrete (See the following pages for details)



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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*	DSD25	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*	DSD30	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*	DSD50	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*	DSD65	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	64.6	64.6	67.7	55.4	-
300		93.0	93.0	87.1	67.7	55.4	-
240*	DSD75	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*	DSD100	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*	DSD130	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	238.8	206.5	176.1
450*	DSD150	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*	DSD400	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*	DSD450	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

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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*	DSD25	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*	DSD30	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*	DSD50	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*	DSD65	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	57.1	67.7	55.4	-
300		105.5	105.5	87.1	67.7	55.4	-
240*	DSD75	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*	DSD100	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*	DSD130	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*	DSD150	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*	DSD400	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*	DSD450	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

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DETAILING AND DESIGN RESISTANCE OF REGBAR SSD CONNECTOR

To ensure that the forces are transferred between the connectors and the concrete, local reinforcement is required around each connector. Correct detailing will guarantee Regbar SSD in accordance with suitable design codes, and connectors will achieve their complete ability.

To choose the correct product that the structure needs, engineers may use the following calculations steps. There are tables in the following pages to make the choosing of product easier.

SSD Design Example

Slab Thickness	= 220mm	
Maximum width of joint	= 30mm	
Concrete strength	= C30/C37	
Characteristic dead load	= 20kN/m	γ_G = 1.35*
Characteristic imposed load	= 26kN/m	γ_Q = 1.5*
Design load	= (20 x 1.35) + (26 x 1.5) = 66kN/m	
V_{Rd} (Design resistance)	Maximum centers	*Any of the three connectors would be acceptable, although using ESD20s at 800mm centers would minimize the number of connectors to be installed*
SSD10 = 22.4kN	= 22.4 / 66 = 0.339m use 330mm	
SSD15 = 28.1kN	= 28.1 / 66 = 0.426m use 400mm	
SSD20 = 53.6kN	= 53.6 / 66 = 0.812m use 800mm	

**The partial safety factors of 1.35 (γ_G) and 1.5 (γ_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.*

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*	SSD10	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*	SSD15	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*	SSD20	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*	SSD25	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

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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*	SSD10	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*	SSD15	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*	SSD20	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*	SSD25	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

Regbar Construction
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http://tiny.cc/regbarct

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