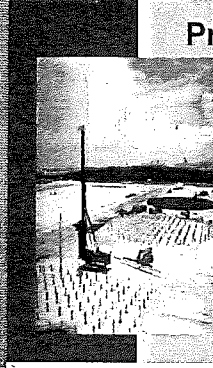


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TECHNICAL INFORMATION

**Leimet® ABB PLUS
Pile Joint**



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LEIMET

Piling Quality™

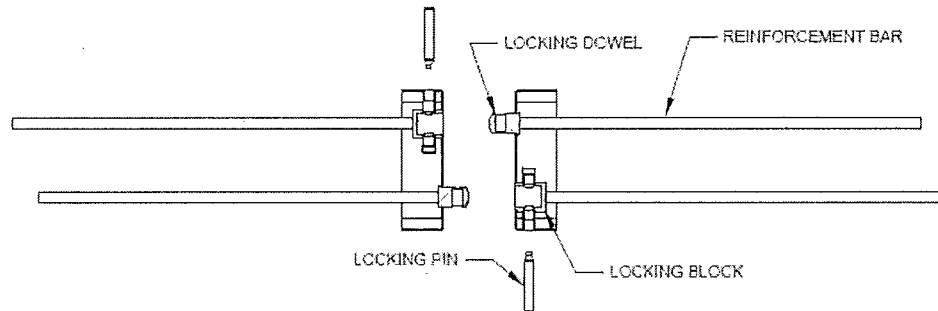
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1 FUNCTION OF PILE JOINTS

Pile joints are used to join precast reinforced concrete piles while providing high bending moment strength. The pile joints are placed in the mould before the pile is cast.

Figure 1: Leimet ABB Plus pile joint construction



During pile driving, eccentric forces may cause horizontal vibrations in the pile that threaten to remove the locking pins from the locking block. The patented lock mechanism of the ABB Plus joint ensures that the joint remains intact during pile driving.

2 MATERIALS AND STRUCTURE

2.1 Joint dimensions

Figure 2: ABB Plus pile joint dimensions

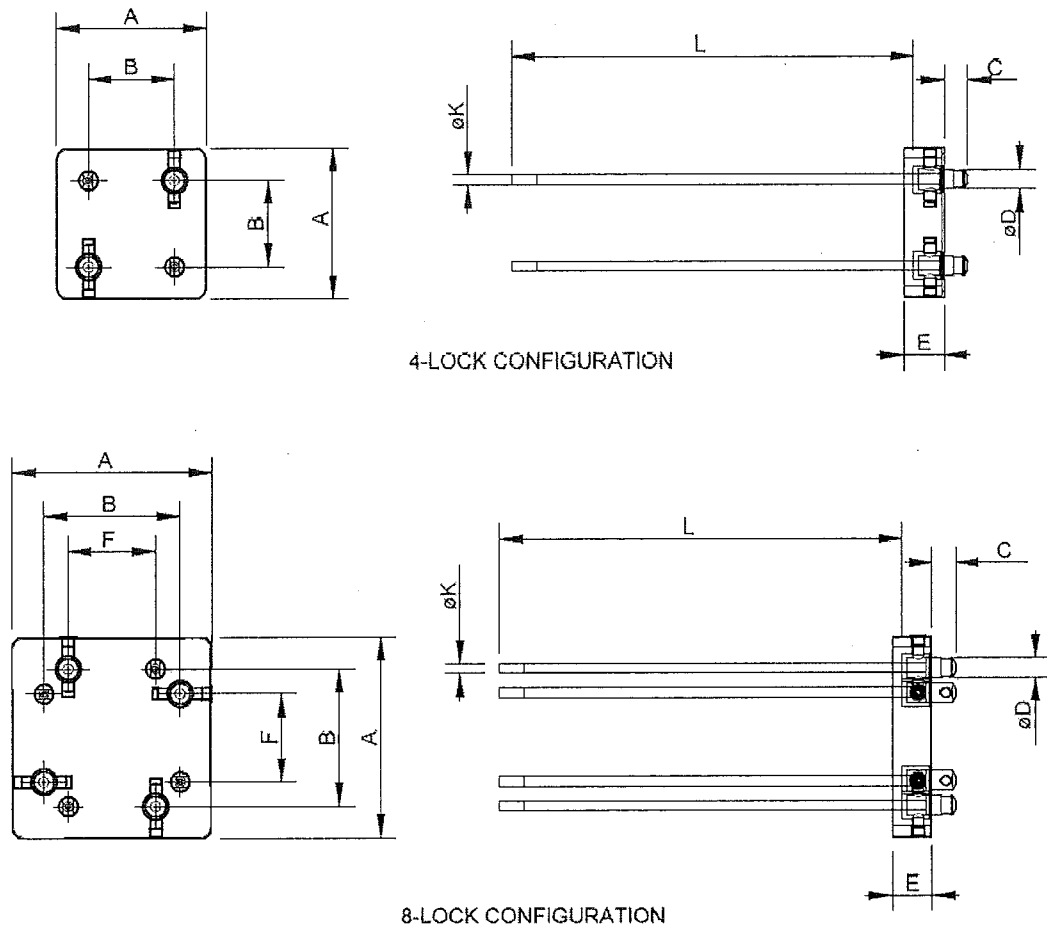


Table 1: ABB Plus main dimensions (mm) and weights (kg)

	A	B	C	D	E	F	K	L	Weight
200 single	197	-	49	38,3	80	-	16	660	4,2
235 single	232	-	49	38,3	80	-	20	770	5,9
235	232	105	49	38,3	80	-	16	660	9,9
235 NA	232	105	49	38,3	80	-	20	770	13,3
250 single	247	-	49	38,3	80	-	20	770	6,2
250	247	120	49	38,3	80	-	20	770	13,6
270	267	140	49	38,3	80	-	20	770	14,1
270 TB45	267	100	49	38,3	80	-	20	770	14,3
270 MA	267	100	49	38,3	80	-	25	960	21,9
300	297	170	49	38,3	80	-	20	800	15,3
300 NA	297	170	49	38,3	80	-	25	1045	23,8
350	347	220	49	38,3	80	-	20	770	16,5
350 NA	347	220	49	38,3	80	-	25	1045	25,4
350 MA	347	170	49	38,3	80	-	25	960	24,2
400	397	270	49	38,3	80	-	20	770	18,3
400-4M20	397	270	49	38,3	80	-	20	800	19,3
400 MA	397	220	49	38,3	80	-	25	960	26,0
400-8	397	270	49	38,3	80	173	20	800	28,7
400-8M20	397	270	49	38,3	80	173	20	800	30,4
450 MA	447	270	49	38,3	80	-	25	960	27,8
450-8	447	270	49	38,3	80	173	20	800	31,2
450-8 MA	447	270	49	38,3	80	173	25	960	45,4
500 MA	497	320	49	38,3	80	-	25	960	30,0
500-8	497	320	49	38,3	80	223	20	800	33,3
500-8 MA	497	320	49	38,3	80	223	25	960	47,5
550 MA	547	370	49	38,3	80	-	25	960	32,3
550-8	547	370	49	38,3	80	273	20	800	35,6

2.2 Materials

Table 2: ABB Plus materials

Locking block	200 1-pin, 235 1-pin, 235, 235NA, 250 1-pin, 250, 270, 270TB45, 300, 350, 400, 400-4M20, 400-8, 400-8M20, 450-8, 500-8, 550-8	S355J2+N	EN 10025-2
	270MA, 300NA, 350NA, 350MA, 400MA, 450MA, 450-8MA, 500MA, 500-8MA, 550MA, 550-8MA	19MnVS6M	Ovako
Locking dowel	200 1-pin, 235 1-pin, 235, 235NA, 250 1-pin, 250, 270, 270TB45, 300, 350, 400, 400-4M20, 400-8, 400-8M20, 450-8, 500-8, 550-8	S355J2+N	EN 10025-2
	270MA, 300NA, 350NA, 350MA, 400MA, 450MA, 450-8MA, 500MA, 500-8MA, 550MA, 550-8MA	19MnVS6M	Ovako
Reinforcement bar	All types	B500B	EC2:Annex C
Frame	All types	S235JR+AR	EN 10025-2
Guidance pipe	All types	S235JR+AR	EN 10025-2
Lock ring	All types	KS8	Seeger
Steel plug	All types	Steel	
Protection plug	All types	PELD	
Locking pin	200 1-pin, 235 1-pin, 235, 235NA, 250 1-pin, 250, 270, 270TB45, 300, 350, 400, 400-4M20, 400-8, 400-8M20, 450-8, 500-8, 550-8	19MnVS6M	Ovako
	270MA, 300NA, 350NA, 350MA, 400MA, 450MA, 450-8MA, 500MA, 500-8MA, 550MA, 550-8MA	42CrMo4	EN 10083-3

2.3 Method of manufacturing

The metal parts used in the pile joint are manufactured as follows:

- The sheets are cut mechanically. Bending.
- The reinforcement bars are sawed.
- The locking parts are machined.
- The pipes are machined.
- Welding is done by MIG robot or manually, welding class C EN ISO 5817

2.4 Quality control

The Finnish Concrete Industry Association has approved the product declaration No 314 for the Leimet ABB Plus pile joints. Leimet Oy has a quality control agreement with VTT Technical Research Centre of Finland.

3 APPROVALS

Leimet ABB Plus pile joint has following type approvals:

- Concrete association of Finland, Approval BY 5 B-EC2 314
- SITAC (Sweden).

4 MANUFACTURING INSCRIPTIONS

The pile joints carry the following manufacturing inscriptions:

- Leimet Oy logo
- Pile joint trademark
- Inspection body (VTT) logo
- Calendar week or date of manufacturing

5 CAPACITIES

5.1 Tensile and compressive capacity during pile driving

ABB Plus pile joints have been tested in compliance with EN 12794:2005+A1:2007/AC:2008 and categorised in Class A (28 Mpa).

According to point 7.7.2 of standard EN 12699, the pile driver must be selected so that the ramming energy does not cause concentrated power that exceeds the values given in *Table 3*. If the ramming tensions are monitored during pile driving, 10% can be added to these table values. The impact of driving conditions and driver machinery on eccentricity (edge stress) must be considered as an additional factor.

Table 3: Maximum forces when installing piles with ABB Plus joints (kN).

Pile joint	Compressive force (kN) Concrete C40/50	Compressive force (kN) Concrete C50/60	Tension force (kN)
200 single pin	1241	1552	90
235 single pin	1722	2153	141
235	1722	2153	362
235NA	1722	2153	565
250 single pin	1952	2440	141
250	1952	2440	565
270	2281	2852	565
270TB45	2281	2852	565
270MA	2281	2852	884
300	2822	3528	565
300NA	2822	3528	884
350	3853	4816	565
350NA	3853	4816	884
350MA	3853	4816	884
400	5043	6304	565
400-4M20	5043	6304	440
400MA	5043	6304	884
400-8	5043	6304	1130
400-8M20	5043	6304	880
450 MA	6393	7992	884
450-8	6393	7992	1130
450-8 MA	6393	7992	1767

500 MA	7904	9880	884
500-8	7904	9880	1130
500-8 MA	7904	9880	1767
550 MA	9575	11968	884
550-8	9575	11968	1130
550-8 MA	9575	11968	1767

The main reinforcement of the pile may also limit the maximum tensile force.

5.2 Capacities of installed piles

5.2.1 Dimensioning principles

The dimensions of ABB Plus pile joints comply with the following building regulations:

- EN 1992-1-1 Eurocode 2: Design of concrete structures. General rules and rules for buildings
- EN 1993-1-1 Eurocode 3: Design of steel structures Part 1-1: General rules and rules for buildings.
- EN 1993-1-8 Eurocode 3. Design of steel structures. Design of joints.

Lap length between joint reinforcement and pile main reinforcement has been calculated obtaining good bond conditions (EN 12794 B.8.4.2).

5.2.2 Ultimate limit state

N-M diagrams for pile joint capacities are given in Annex A. Capacities are only applicable to static loading structures.

6 USE AND RESTRCITIONS OF USE

6.1 General

When determining the structural dimensions of the pile, the strength of the pile element is reviewed and compared with the values provided in this manual. The smallest value is indicating the actual strength.

6.2 Corrosion

According to TK Bro, BVS 1583.10 C.2.1.3 by the Swedish Traffic Administration (Trafikverket), the corrosion of locking parts is 0.2 mm/120 years and the corrosion of parts between the bottom plates is 1mm/120 years. Corrosion has been taken in account when dimensioning locking parts.

6.3 Transverse tensile forces

The transverse tensile forces of pile heads during pile driving can be transferred by means of helical reinforcement and steel casing structures. The casings of the pile joints serve as structural parts during installation.

6.4 Prestressed concrete piles

Sufficient transmission length between pile reinforcement and tendons must be ensured when ABB Plus pile joints are used with prestressed concrete piles.

7

INSTALLATION

Leimet piling equipment does not require special preparations before installation in the casting mould.

The joint and rock point must be attached to a casting guide for the duration of casting (*Figure 3*). The joint installation can also be done with a casting guide beam (*Figure 6*). The reinforcement remains on the inside of the steel ends of the pile.

Before ABB Plus pile joint is placed in the mould it must be visually inspected. Faulty product shall not be used!

When placing or moving the pile joint it should not be lifted from rebars! Wrong handling can damage the pile joint!

7.1 Joint installation using casting guide

The casting guide is placed in the mould and locked in place, for example, by wedging it against mould sides so that the guide is aligned with the mould and secured in place. The air holes at the joint collar must face upwards. The joint is attached to the casting guide so that the locking dowels fit securely in the holes in the casting guide (*Figure 4*). The joint is secured in place by tightening the locking pins (*Figure 5*).

Figure 3: Casting guide

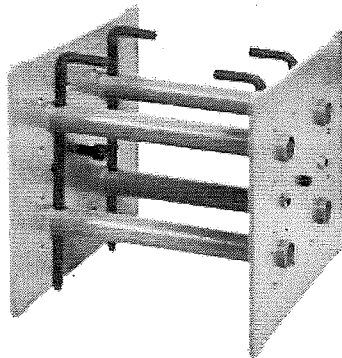


Figure 4: Fitting of the joint to the casting guide

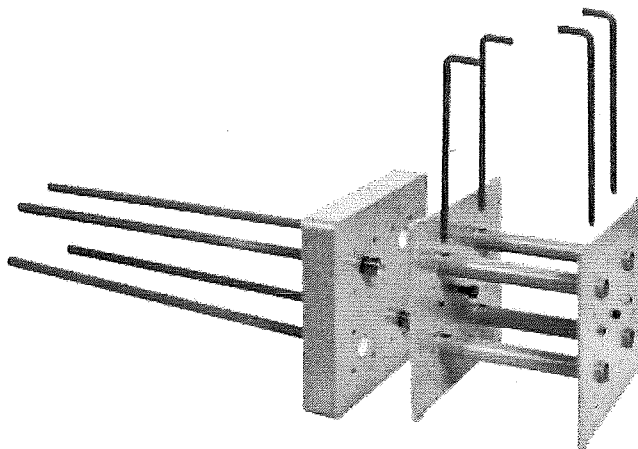
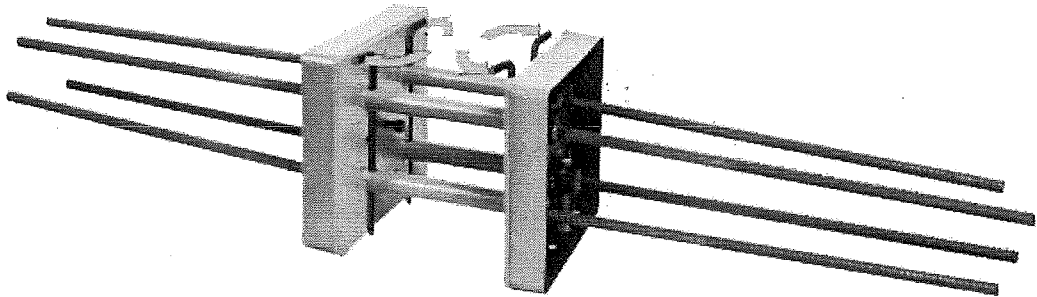
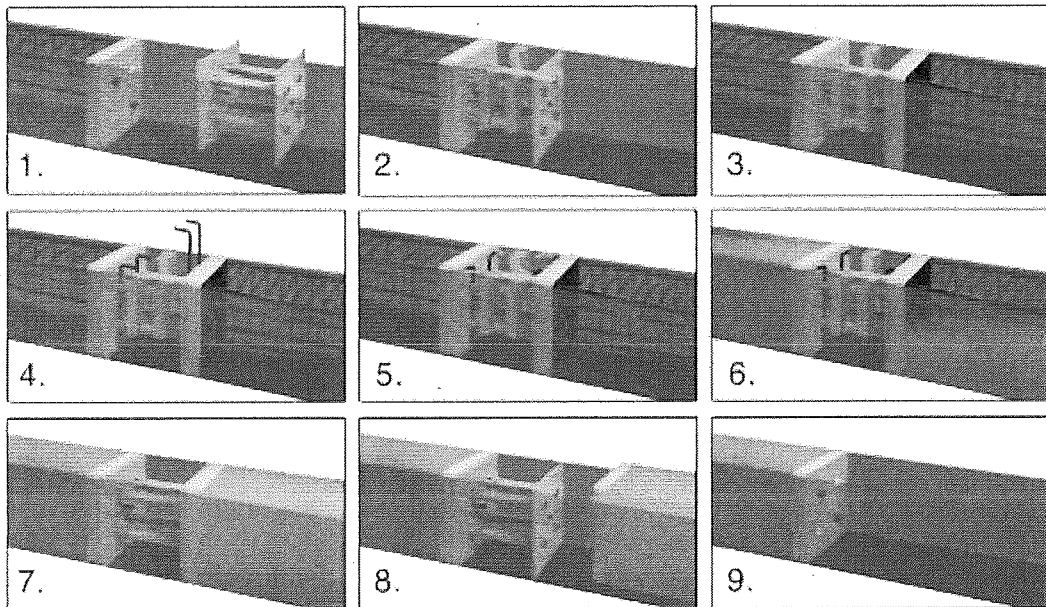


Figure 5: Securing the joint to the casting guide



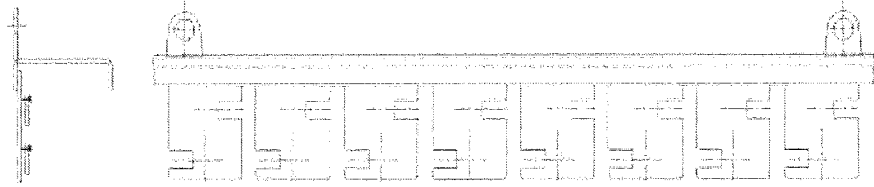
Using the Leimet casting guide



7.2 Joint installation using casting guide beam

The joint can be fitted to a casting guide beam while the beam is properly placed in the mould unit, or the joints can be fitted to the beam in a separate fitting room, allowing for optimal ergonomic position. After the fitting, the casting guide beam and fitted joints are lifted into place in the mould unit for instance using a bridge crane. The casting guide beam is placed at the end of the mould unit so that the machined surface of the beam is on top of the top edge of the mould unit, to ensure that the attached joint meets the straightness requirements.

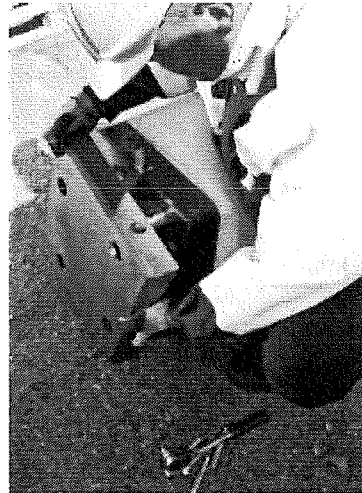
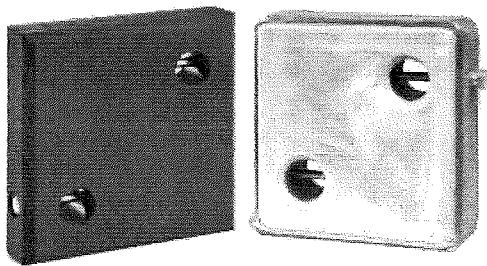
Figure 6: Casting guide beam

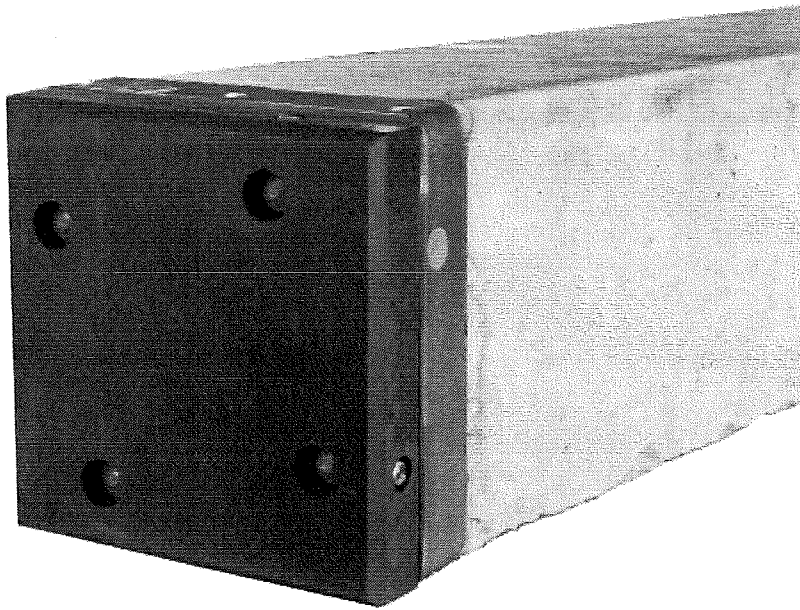


7.3 Joining of pile segments on site

When driving in a pile extension, the top joint on the bottom pile is always protected by a drive plate (*Figure 7*). The drive plate is locked to the joint by a locking screw.

Figure 7: Drive plate





Before extending the pile, remove the plastic caps from the locking block of the joint and clean the surfaces and holes of the joint. ABB Plus pile joint's locking pins are delivered bags different colours. Always before using the locking pin ensure that the color of the bag and the color of the protection plug in the joint is the same. If wrong locking pin is used it can reduce the capacity of ABB Plus pile joint!

The joints are placed against one another so that the locking dowels in one joint penetrate the holes in the locking block of the other (

Figure 8). The joint is locked in place using the lock pins enclosed in the delivery (*Figure 9*). To ensure that the seam meets the capacity requirements, the locking pins must be hammered until flush with the joint collar. If the locking pin is not hammered to the level of the collar it is not allowed to proceed the piling of the pile. The locking block contains a lock ring which ensures that the pins stay in the cylinder during and after installation.

Figure 8: Joining pile sections



Figure 9: Installation of the locking pins



8 SUPERVISION OF INSTALLATION

8.1 Measures before casting

- Ensure that the joint, rock point or box shoe is correctly selected (type, code and dimensions).
- Ensure that the dust caps of the joint's lock parts are in place.
- Ensure that the pile shoe and helical reinforcement are in place.
- Check the correct position of pile equipment in the mould. Check that the air holes of the joint and box plate face upwards.
- Ensure that the casting guides are secured to the mould.
- Ensure that the pile joint has not been damaged during delivery.

8.2 Measures after casting

- Ensure that all the piling components are precisely aligned to the pile. See EN 12794 4.3.1.1 for production tolerances.
- Ensure that lock parts (locking dowels and locking block holes) are clean.

8.3 Supervision of pile installation

- Visually inspect that the piling products have not been damaged in transport and handling
- Ensure that the joint surfaces of the locking dowels and cylinders are clean.
- Ensure that each lock part has a pin inserted and that the pins are hammered flush (level with the collar).