



PVL Connecting Loop

Single wire wall connecting loop

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Single wire wall connecting loop

Benefits of PVL

- Easy to install, individual boxes are installed to formwork.
- Flexible wire loop stays in opened position due to patented structure.
- Anchoring tail is easy to place into reinforcement.
- Stepped box shape secures the box in to the concrete.



Wire Loop boxes are installed to the formwork according to spacing needed to bear the shear loads, before the panel is casted. After removing the formwork, protective tape is removed and the loop is opened with for example a hammer or a pin. Pair of boxes and the vertical rebar installed into loops form a joint which resists vertical shear forces, together with the concrete grout in the joint.

Peikko PVL Connecting Loops are available in loop lengths 60, 80, 100, 120 and 140 mm.



Contents

About PVL Connecting Loop	4
1. Product properties	4
1.1 Structural behavior	4
1.2 Limitations of application	4
1.2.1. Loading and environmental conditions	4
1.2.2. Interaction in the joint	5
1.2.3 Positioning of PVL to the joint	5
1.3 Other properties	6
2. Resistances	6
Selecting PVL Connecting Loop	7
Annex A – Additional reinforcement	8
Installation of PVL	last page

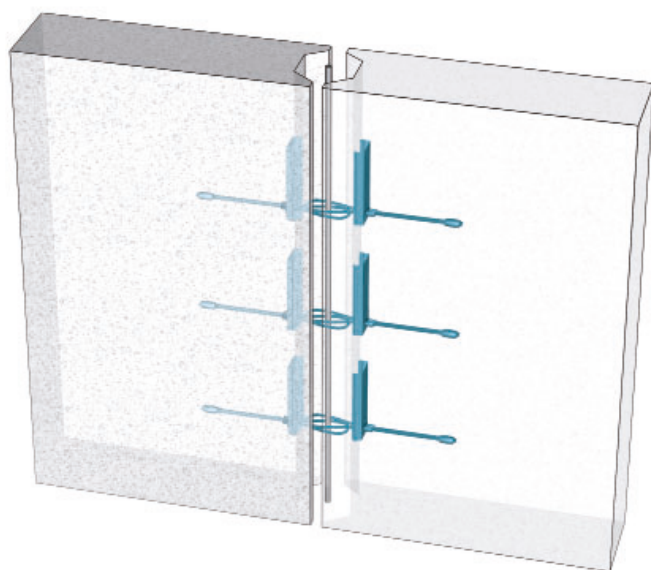
1. Product properties

PVL Connecting Loop consists of recess box which anchors itself to concrete well thanks to its stepped side form, and a wire, which together with the box forms are a load bearing structure.

Spacing of PVL Connecting Loops in the joint depends on the shear loads to be transferred. Boxes are installed to the formwork of wall panels before concreting.

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Picture 1. PVL Connecting Loops in the joint of wall panels



1.1 Structural behavior

PVL Connecting Loop resists shear forces with "a tension bar", which consists of loops and the vertical rebar in the joint, and "a compression bar", which forms between the edges of the recess boxes from concrete.

1.2 Limitations of application

PVL Connecting Loops are designed to be used in conditions which are explained later in this technical manual. If these conditions are not fulfilled, Peikko Technical Support can recommend other Peikko solutions.

1.2.1. Loading and environmental conditions

Resistances of PVL Connecting Loop connections are defined according to loop spacing and compression strength of the concrete grout in the joint. Resistances are calculated according to Eurocode 2 parts 1-1 and 1-2.

It is assumed that no forces, compression or tension, parallel to wall panels and loops effect to the joint. Only shear force effecting in the vertical joint is taken into account. Concrete grout shall have minimum the same compression strength than the concrete of the wall panels, minimum C25/30.

PVL Connecting Loops must not be used

- In joints, which are exposed to such a seismic or dynamic strains which exceed the deformation capacity of concrete grout in the joint.
- For lifting or as a lifting loop.

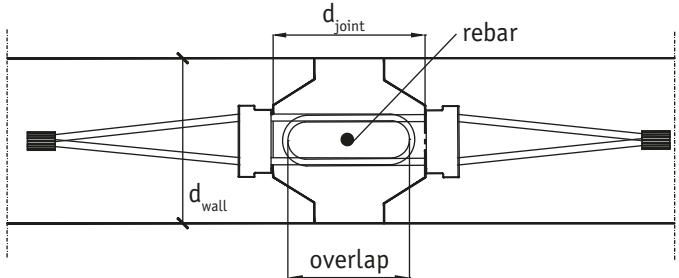
If PVL connecting loops are used in fire resistant load bearing walls, the concrete cover thickness must be effective enough so that the wire loop will not reach its critical temperature $T_{crit.} = 350^{\circ}\text{C}$.

1.2.2. Interaction in the joint

Minimum value for thickness of the wall panels and ideal joint width is given in Table 1.

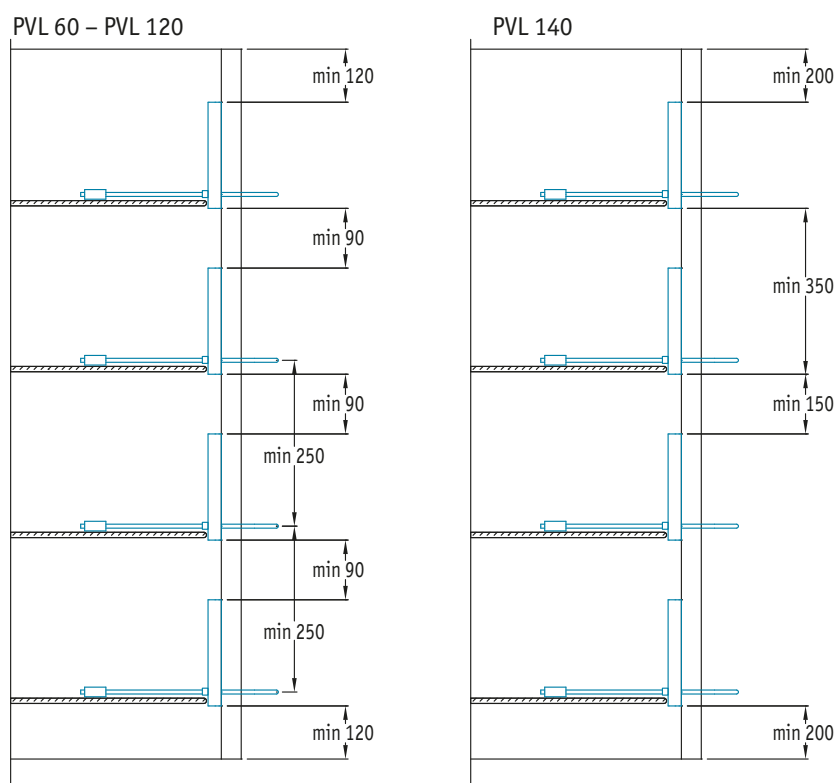
Table 1. Minimum value for thickness of the wall panels and ideal joint width.

PVL	d_{wall}	d_{joint} [mm]	overlap L
PVL 140	150	160	120
PVL120	80	140	100
PVL 100	80	120	80
PVL 80	80	100	60
PVL 60	80	80	40

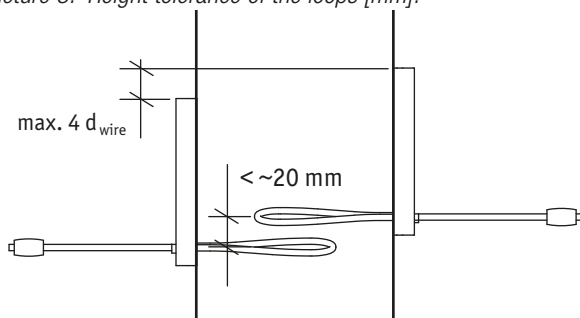


1.2.3 Positioning of PVL to the joint

Picture 2. Minimum distances for PVL Connecting Loop.



Picture 3. Height tolerance of the loops [mm].



1.3 Other properties

Peikko PVL Connecting Loops are manufactured from following materials in Peikko China factory:

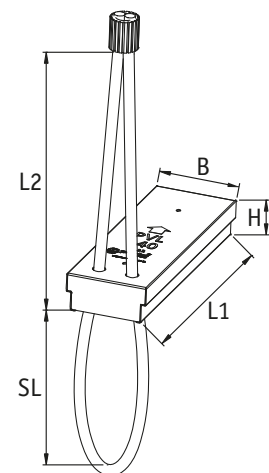
Box	Q195, thickness 0,7 mm	GB/T 700-1988
	Steel sheet, zinc plated and passivated	
Ferrule	16 Mn	GB/T 8162-1999
Cover	Tape	
Wire Loop	6x19+IWS 1770 N/mm ²	GB/T 20118-2006
	Patented structure solid core wire based on standard EN12385-2.	

Dimensions of PVL Connecting Loops are shown in Table 2.

Peikko Group's production units are externally controlled and periodically audited on the basis of production certifications and product approvals by various organizations, including Inspecta Certification, VTT Expert Services, Nordcert, SLV, TSUS and SPSC among others.

Table 2. Main dimensions of PVL Connecting Loops

PVL	L1	L2	B	H	SL	wire Ø
	[mm]					
PVL 140	200	232	70	32	140	9
PVL 120	160	182	50	22	120	6
PVL 100					100	
PVL 80					80	
PVL 60					60	



2. Resistances

Resistances of PVL Connecting Loop connections are defined according to loop spacing and compression strength of the concrete grout in the joint. Resistances are calculated according to Eurocode 2 parts 1-1 and 1-2.

Table 3. Design Shear resistance V_{Rd} [kN/m] of PVL 60, PVL 80, PVL 100 and PVL 120 Wire Loop for the joint described in Picture 2, Annex A, Additional reinforcement.

Concrete strength (EC 2)	Spacing of loops [mm]										
	250	300	350	400	450	500	550	600	650	700	750
C25/30	153	132	116	105	96	89	83	78	74	70	67
C30/37	156	134	119	107	99	91	86	81	77	73	70
C35/45	158	137	122	110	101	94	88	83	79	76	73
C40/50	162	141	126	114	105	98	92	88	83	80	77
C45/55	165	144	128	117	108	101	95	90	86	83	80
C50/60	168	146	131	120	111	104	98	93	89	85	82

Table 4. Design Shear resistance V_{Rd} [kN/m] of PVL 140 Wire Loop for the joint described in Picture 2, Annex A, Additional reinforcement.

Concrete strength (EC 2)	Spacing of loops [mm]							
	350	400	450	500	550	600	650	700
C25/30	170	153	137	123	112	103	96	90
C30/37	185	165	148	134	121	111	103	97
C35/45	197	177	158	143	130	119	110	103
C40/50	209	188	167	151	138	128	117	109

Selecting PVL Wire Connecting Loop

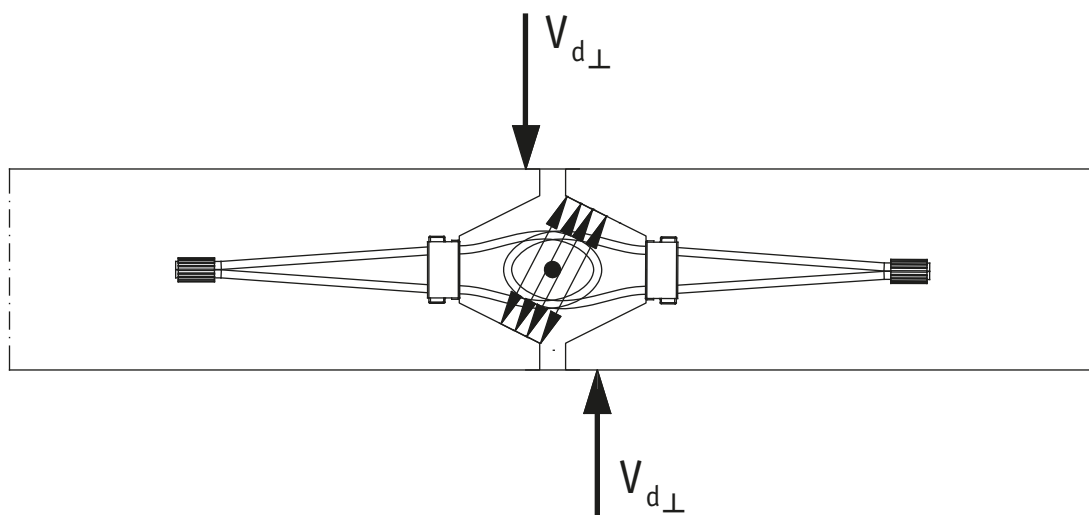
PVL Wire Loop is selected according to wall thickness and joint width. Generally PVL 80 is used for non-load bearing walls and PVL 120 for load bearing / stiffening walls. PVL 140 is used for higher loads in load bearing and stiffening structures.

Spacing of PVL Wire Loops is selected according to shear force effecting to the joint in ultimate limit state.

Shear resistance in direction perpendicular to the Wall panels surface depends on the shape of the cross-section of the joint and reinforcement of the panels around the joint.

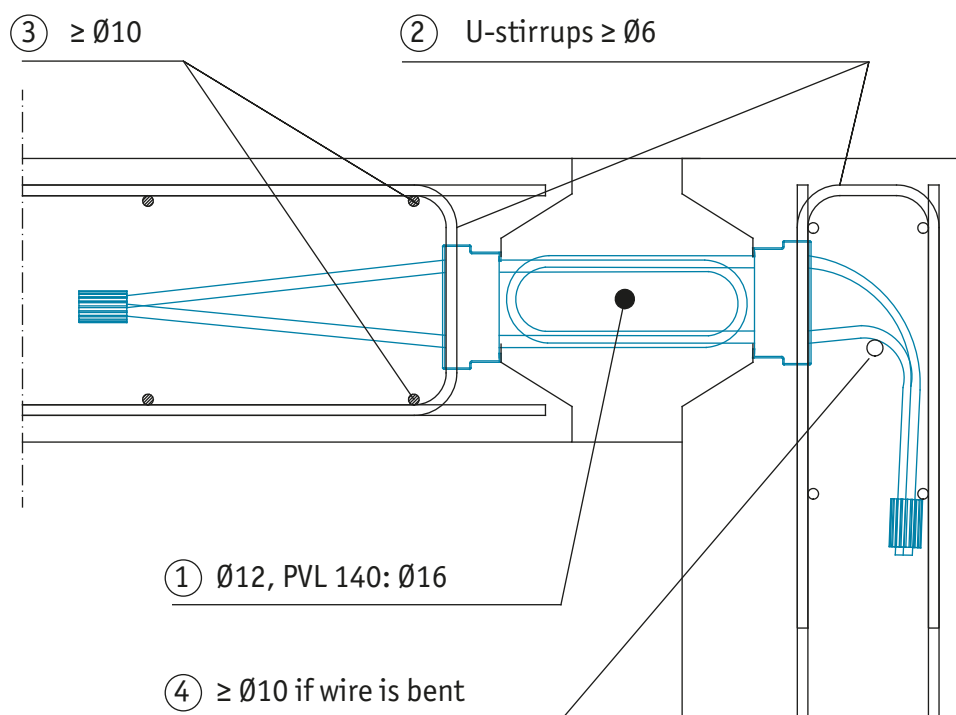
Concrete dowel defines the shear resistance perpendicular to the wall.

Picture 4. Shear force perpendicular to the joint.



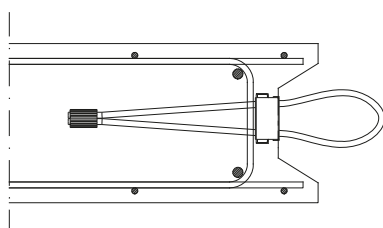
Additional reinforcement

Picture 5. Anchoring the PVL Connecting Loops in the joint of precast elements.



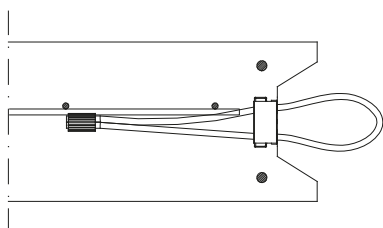
Additional reinforcement PVL 60, 80, 100, 120

Mesh on both surfaces



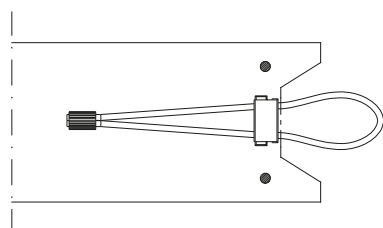
- mesh on both surfaces min. $\text{Ø}6$ k 150
- U-stirrups $\text{Ø}8$ or $2 \times \text{Ø}6$
- edge reinforcement min. $2 \text{ Ø}10$

Central mesh



- mesh min. $\text{Ø}6$ k 150
- edge reinforcement min. $2 \text{ Ø}10$

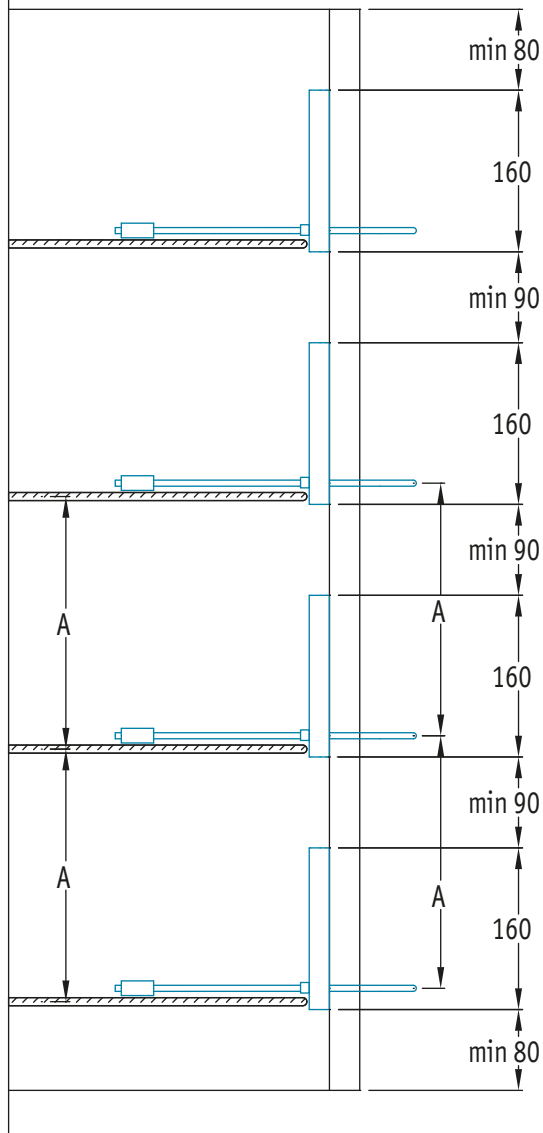
No meshes



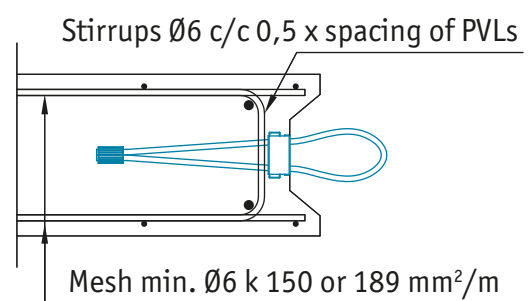
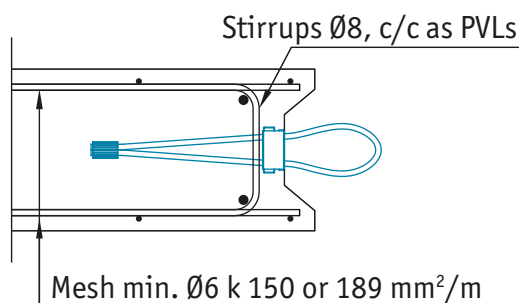
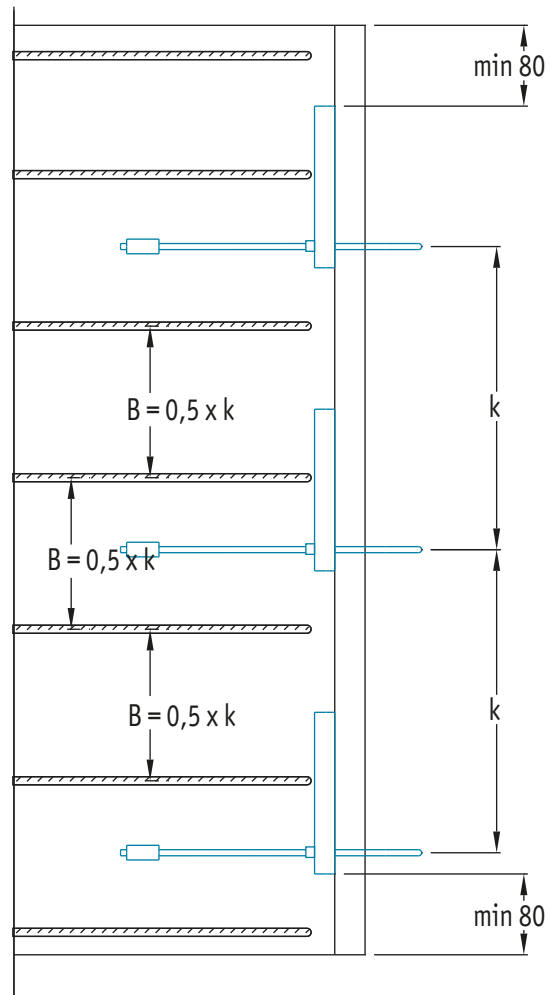
- edge reinforcement min. $2 \text{ Ø}10$
- wire loop min. c/c 600 mm
- min. distance from element top and bottom edge 450 mm

U-stirrups, alternatives:

Stirrup Ø8 for every PVL wire, spacing the same as PVLs



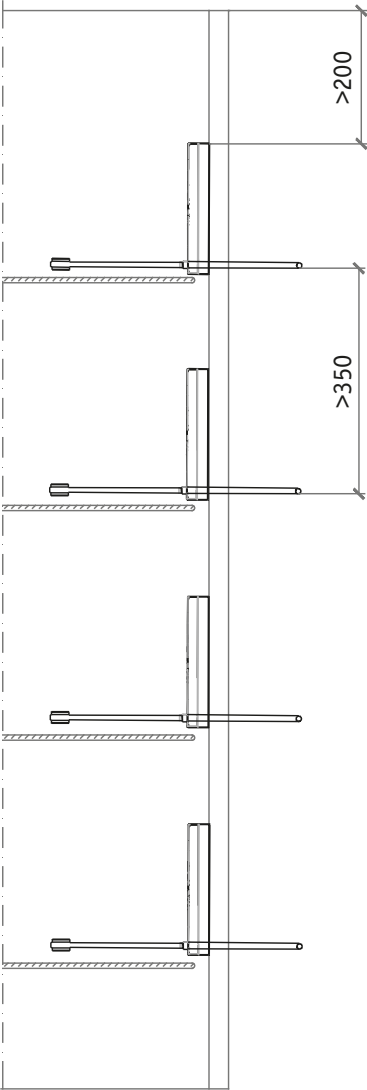
Stirrup Ø6, spacing 1/2 of PVLs' spacing



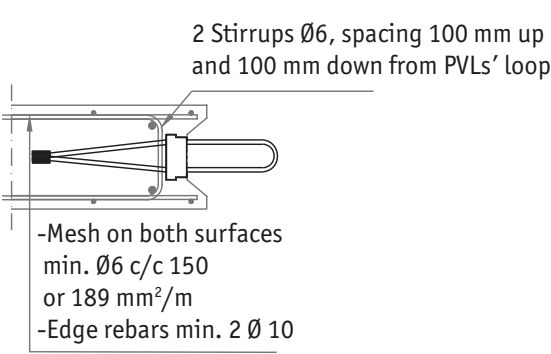
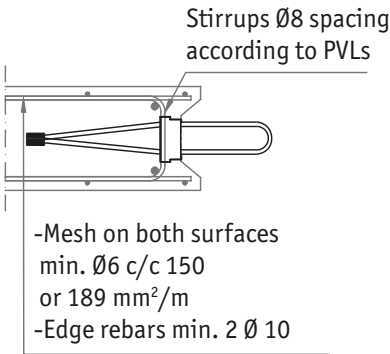
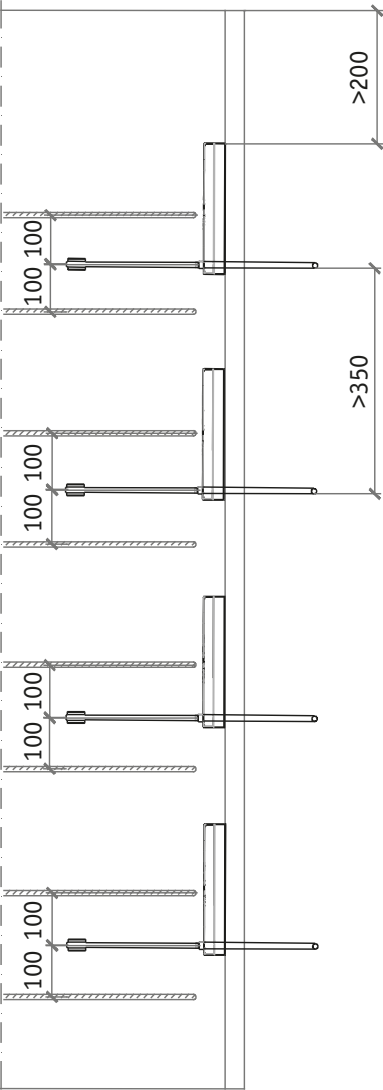
Additional reinforcement options PVL 140

Reinforcement: B500B.

Stirrup Ø8 to every PVL wire,
spacing the same than PVLs



2 Stirrups Ø6, spacing 100 mm up
and 100 mm down from PVL's loop



Installation of PVL Connecting Loop

In precast factory

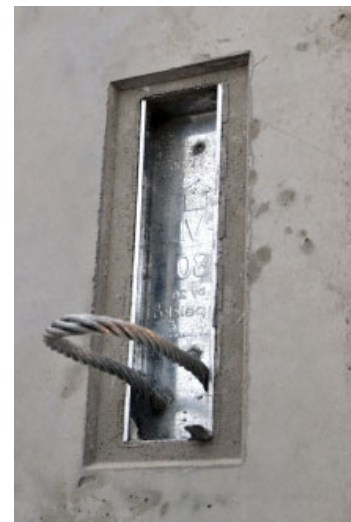
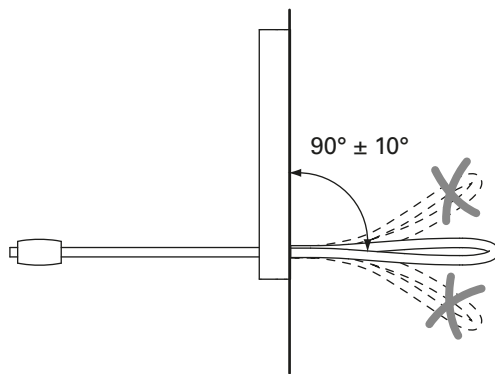
PVL Connecting Loops are fixed to the formwork with nails. Common way is to make a plywood strip, which forms the recess shape to wall panel end. Then PVLs are nailed with correct spacing to this reusable plywood strip.

When concrete has hardened and formwork is removed, protective tapes can be removed and loops opened for example with hammer. Due to patented structure of the wire, loops will remain in opened horizontal position.



On construction site

Wall panels are installed according to plans and supported. Vertical rebar is installed into a joint, and horizontal position of the loops is checked. After formwork has been done, concrete grout is poured or pumped into the joint.



NOTE: Wire maintains its full strength in normal use, where maximum 3 open-close bendings takes place.



PEIKKO GROUP CORPORATION

Peikko Group, founded in 1965, is a family owned company specializing in composite beams and fastening products for concrete connections. Peikko provides innovative solutions to help customers make their building process faster, easier and more reliable. Precasters, builders, constructors, developers, flooring specialists, machine manufactures, power plant designers, architects and structural designers can all enjoy and take advantage of the Peikko solutions.

Peikko Group has offices in 30 and factories in 9 countries in Europe, North America and Middle East. Peikko Group, with headquarters in Lahti, Finland, employs more than 800 persons.