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FREYSSINET PRODUCTS CO.

PRODUCT DESCRIPTION

Expansion joints

WP

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FREYSSINET

SUSTAINABLE TECHNOLOGY

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REVISION INDICES FOLLOW-UP TABLE

Rev	Date	Modification	Prepared by	Checked by	Approved by
0	31/10/2018	First issue	E.THIBOEUF	R. MARTIN	F. ROBERT
A	07/03/2022	General modification	D. GUILOUCHI	E. THIBOEUF	P.SALMON

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1. INTRODUCTION

1.1. Scope of the document

This document is intended to describe the product in term of design, manufacturing and inspection, as well as the interaction between the different parts involved in a project.

1.2. Freyssinet expansion joints

Freyssinet Group is the world leader in specialized civil engineering, working in two fields: structures and soil. The structural activities include pre-stressing, cable-stayed structures and strengthening of structures. As part as these activities, Freyssinet supplies structural fittings like bearings (elastomeric, mechanical and pot bearings), seismic devices, dampers and expansion joints for bridges and buildings.
Freyssinet Group is organized in geographical zones around the world with strong local roots, with 70 subsidiaries in more than 50 countries. It is a subsidiary of Vinci Construction, world leader in construction and associated services, which combines almost 2,500 companies in more than 100 countries all around the world.
The expansion joints developed by Freyssinet are designed to answer the European and world normative requirements but also the environmental requirements specific to this type of devices. FPC is the industrial branch of the Freyssinet Group and its headquarters are situated in St. Eusèbe (France), from where the manufacturing of Freyssinet products (pre-stressing, stay cables, bridge fittings, etc.) is organized and controlled.
To cope with the increasing demand of all the Freyssinet subsidiaries in the world, FPC has developed an important network of production facilities all over the world, implementing the same Quality Control System worldwide, in accordance with International Quality Standards.
As a result of this group strategy of procurement network, Freyssinet' subsidiaries have improved their services worldwide, and offer flexible and reactive solutions to their clients' needs.

1.3. WP's scope of use

The WP expansion joint is renowned for its durability and ability to heavy traffic. On the strength of this acquisition and in the interest of continuous improvement, Freyssinet has completed this wider range and different systems for recovering runoff water.
The capacity of WP expansion joints can vary from 60 to 1400 mm depending on the model.

1.4. Conception

WP expansion joint is designed in accordance with European Assessment Document for cantilever expansion. The calculation note checks WP mechanical's characteristics under static and fatigue loads. Tests under static and fatigue load have been performed so successfully.

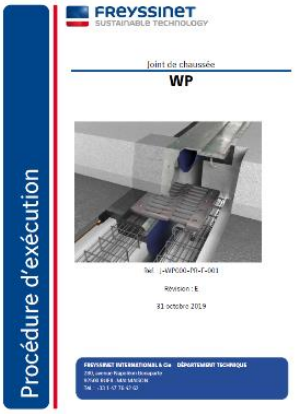
1.5. Manufacturing

Freyssinet designs and manufactures his own expansion joints. By this way, we are able to guarantee to all of our customers the same level of excellence and quality in our products and services.

Joints are designed and manufactured according to specifications which commit a long time holding under high traffic load. They are protected by an anti-corrosion protection, most often metal spray and sealer.

This complete control over our products and systems means that we can adapt our solutions to a wide range of applications and extreme operating conditions.

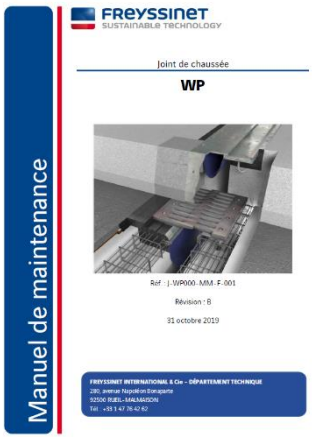
1.6. Installation



WP expansion joint is installed on site by specialized teams. It's set up by successive element of 1 meter long. The steel elements of the joint are strongly anchored to the structures by prestressed anchors.

The installation of WP is done preferably after coating of the carriage way so as to ensure a precise altimetric adjustment of the joint.

1.7. Survey



Expansion joints are the essential elements of a bridge. Their durability depends on traffic and environmental conditions. The WP does not require heavy maintenance. However, in order to optimize its service life, it is recommended to carry out maintenance operations essentially related to the operation of the structure, the environment of the joint, its general condition, its fastenings and the integrity of the membrane or elastomeric profile if any.

Maintenance and monitoring operations must be carried out by qualified personnel and may be entrusted to Freyssinet's specialized teams as part of a maintenance contract. Freyssinet has decided to draft a follow-up and maintenance procedure.

2. APPLICABLE DOCUMENTATION

2.1. Specific documentation

The use of the WP expansion joint is inseparable from the following documents (Last version):

- Installation procedure → J-WP000-PR-001
- Maintenance manual → J-WP000-MM-001
- Calculation note → J-WP000-NC-006* regarding EAD
- Calculation note → J-WP000- NCA- 002* regarding AASHTO
- Calculation note → J-WP000- NCA- 005* regarding BD 33/94
- Technical spécifications → J-WP000-SP-001*

*Non-communicable documents and some of them are only in French or English

2.2. Standards for components

Designation	Applicable STANDARD	Material
Principal elements		
Steel element	NF EN 10025	S335 J0
Fixing		
Thread rod or screw	ISO 4014 / DIN 931 NF E25-136 / DIN 976	Class 10.9
Washer	ISO 7089 / DIN 125 / NF EN 10083	C40 QT
Nut	ISO 4032 / DIN 934	HR Class 10
PVC Spacer	NF EN 50086	P.V.C.
Socket	NF EN 1563 / ASTM A536	EN GJS-400-15 / 65-45-12
Protection of fixing	Specification Freyssinet	Pur bitumen
Options regarding type of WP		
LSM membrane (For each type of WP)	NF T 47-402	Polychloroprene
Elastomeric profile (Type 3)	Specification Freyssinet	EPDM
Support of elastomeric profile (Type 3)	NF EN 10025	S355 J0
Accessories		
Drain	NF EN 10088	Freyssinet specification
Sidewalk PL	Sidewalk « PL »	

Table 1 : Standards for components

FPC analyzed all standards to meet their specific requirements. FPC uses equivalences for the choice of its materials in order to optimize the costs while respecting the specifications dictated by the standards.

2.3. Standards for manufacturing

Designation	Applicable standard
Steel structure manufacturing	EN 10025
Rubber profile manufacturing	Freyssinet Specifications
Geometrical characteristics	ISO 2768 mK
Welders qualification	ISO 9606-1

Table 2 : Standards for manufacturing

2.4. Standards of control

Désignation	Norme applicable
Mechanical characteristics	NF EN 1706 / EN 1563 / ASTM A536
Visual examination of rubber profile	Freyssinet Specifications
Visual examination of welds	NF EN ISO 5817
Control of the corrosion protection	NF EN ISO 2063

Table 3 : Standards for control

3. WP'S DESCRIPTION

3.1. Overview

Belonging to the family of saw teeth expansion joint, it consists of pairs of independent elements with parallel teeth, one meter long and arranged face to face.
These teeth are oxycut in a rolled steel plate. A succession of pairs of elements installed end to end forms the line of joint. Controlled fasteners provide anchoring of the metal elements to the structures.

- WP Type 1: Expansion joint without any seal
- WP Type 2: Type 1 with elastomeric membrane
- WP Type 3: Expansion joint with an elastomer profile. The design of WP Type3 is different from that of Type 1
- WP Type 4: Type 1 with an elastomer membrane and sheet metal with water recovery in a gutter

Below are the drawings of the different types:

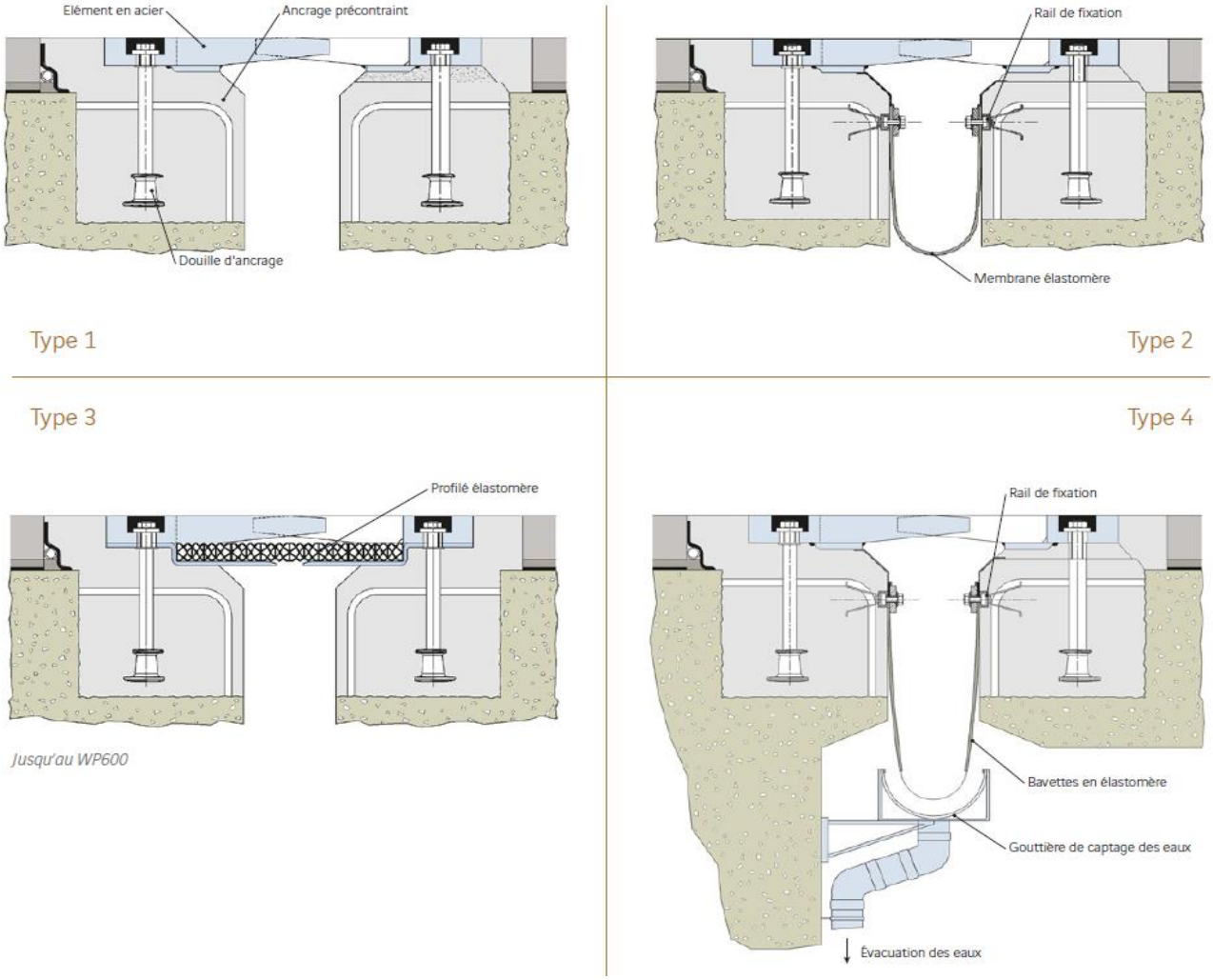


Figure 1 : Drawing of different types of WP

3.2. Specific features

The WP joint has the following characteristics:

- Robust (including under intense and dynamic stress)
- Quiet and comfortable (Teeth expansion joint)
- Durable (Metal expansion joint strongly anchored to the structures)
- Possibility of collecting runoff water

Because of its simple design, it has the advantage of being able to adapt quite easily to special specifications and requirements of different projects.

3.3. Dimensions

3.3.1. WP Type 1 Expansion joint & type 2

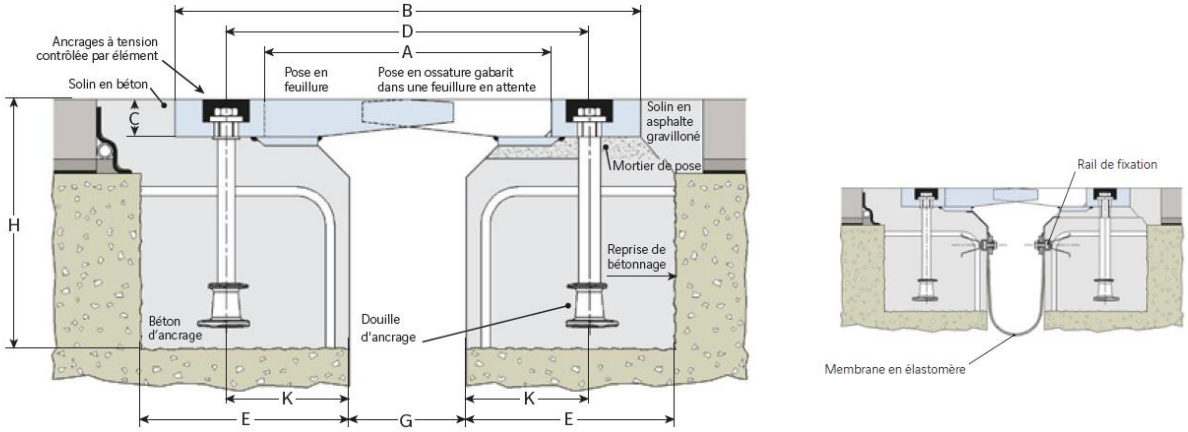


Figure 2 : Cross section of a WP Type 1 & 2 WP 60 to WP 700

Type Acier	A		B		D		G		Réservation			Élément métallique			
	min.	max.	min.	max.	min.	max.	min.	max.	E min.	H min.	K	C	L	M	N
WP60	80	140	240	300	190	250	20	80	210	200	85	30	70	150	30
WP80	100	180	280	360	190	270	40	120	220	250	75	35	90	180	35
WP100	120	220	340	440	230	330	60	160	240	250	85	35	110	220	35
WP120	140	260	460	580	350	470	80	200	290	350	135	50	130	290	50
WP160	180	340	500	660	390	550	120	280	290	350	135	50	170	330	50
WP180	200	380	520	700	410	590	140	320	290	350	135	50	190	350	50
WP200	220	420	580	780	456	656	160	360	310	350	148	55	210	390	55
WP250	270	520	510	760	370	620	50	300	330	350	160	50	260	380	65
WP300	320	620	590	890	410	710	50	350	370	350	180	50	310	445	65
WP350	370	720	650	1000	470	820	50	400	400	350	210	60	360	500	75
WP400	420	820	740	1140	540	940	50	450	445	350	245	65	410	570	80
WP450	470	920	810	1260	550	1000	50	500	480	350	250	65	460	630	80
WP500	520	1020	890	1390	610	1110	50	550	520	350	280	70	510	695	85
WP550	570	1120	960	1510	670	1220	50	600	555	350	310	75	560	755	90
WP600	620	1220	1020	1620	720	1320	50	650	585	350	335	80	610	810	95
WP650	670	1320	1140	1790	770	1420	50	700	645	350	360	90	660	895	105
WP700	720	1420	1160	1860	820	1520	50	750	655	350	385	60	710	930	125

Table 4 : Dimensions of elements WP Type 1 & 2 WP 60 to WP 700

For WP joints type 1 & type 2 greater than or equal to 750 mm are provided with a second mounting of anchorages.

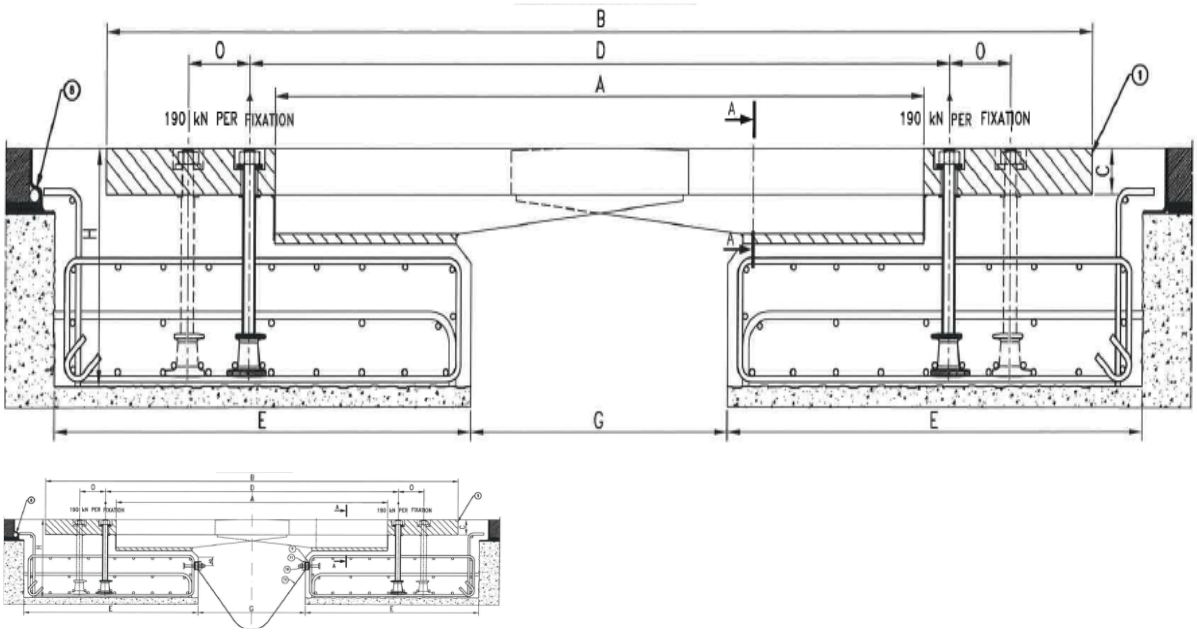


Figure 3 : Typical cross section of elements WP750 to WP 1400 type 1 & 2

Type Acier	A		B		D		G		Réservation			Élément métallique				
	min.	max.	min.	max.	min.	max.	min.	max.	E min.	H min.	K	C	L	M	N	O
WP750	770	1520	1410	2160	870	1620	50	800	780	350	410	70	760	1080	145	120
WP800	820	1620	1480	2280	920	1720	50	850	815	350	435	70	810	1140	145	120
WP850	870	1720	1470	2320	1010	1860	50	900	810	350	480	70	860	1160	145	120
WP900	920	1820	1610	2510	1020	1920	50	950	880	350	485	70	910	1255	145	150
WP950	970	1920	1760	2710	1070	2020	50	1000	955	350	510	70	960	1355	145	120
WP1000	1020	2020	1810	2810	1120	2120	50	1050	980	350	535	80	1010	1405	155	120
WP1100	1120	2220	1910	3010	1220	2320	50	1150	1030	350	585	80	1110	1505	155	120
WP1200	1220	2420	2090	3290	1320	2520	50	1250	1120	350	635	80	1210	1645	155	120
WP1300	1320	2620	2060	3360	1420	2720	50	1350	1105	350	685	80	1310	1680	175	120
WP1400	1420	2820	2360	3760	1520	2920	50	1450	1255	350	735	80	1410	1880	185	120

Table 5 : Dimensions of WP elements Type 1 WP750 to WP1400

3.3.2. WP Type 3 expansion joint

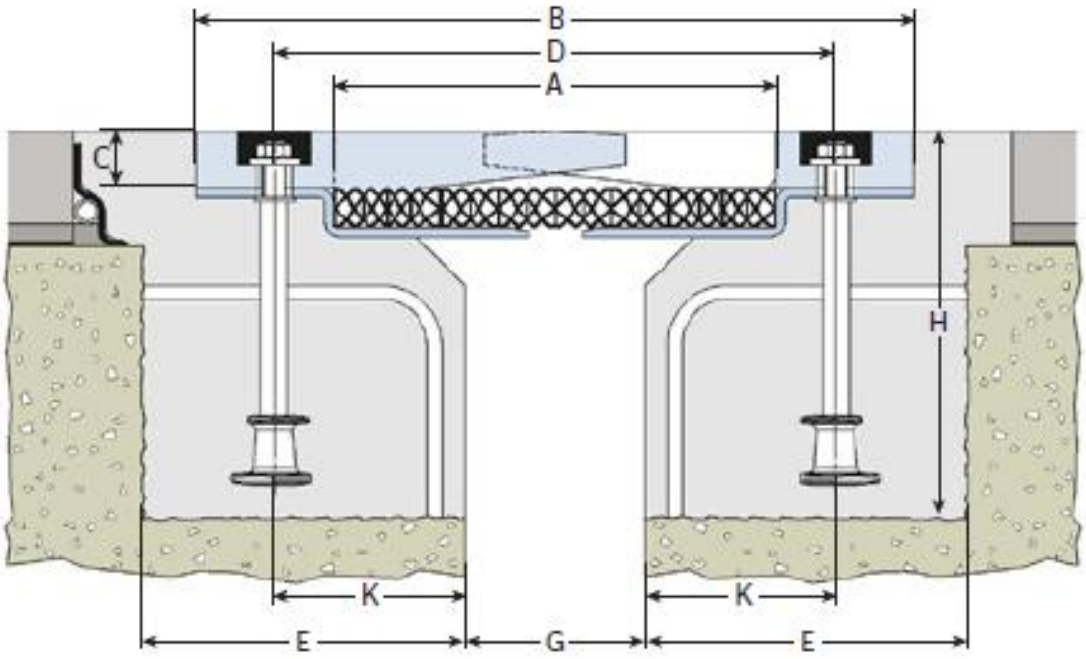


Figure 4 : Typical cross section of WP joints type 3 from WP3200 to WP3 600

Type	A		B		G		D		Réservation			Élément métallique			
									E	H	K	C	L	M	N
	min.	max.	min.	max.	min.	max.	min.	max.	min.	min.					
WP3 200	220	420	820	1020	120	320	600	800	450	350	240	70	210	510	115
WP3 250	270	520	900	1150	170	420	670	920	470	350	250	80	260	575	125
WP3 300	320	620	965	1265	220	520	730	1030	480	350	255	90	310	635	135
WP3 350	370	720	1045	1395	270	620	800	1150	490	350	265	100	360	700	145
WP3 400	420	820	1200	1600	320	720	920	1320	540	350	300	100	410	800	145
WP3 450	470	920	1265	1715	370	820	980	1430	550	350	305	110	460	860	155
WP3 500	520	1020	1450	1950	420	920	1120	1620	620	350	350	110	510	975	155
WP3 550	570	1120	1560	2110	470	1020	1210	1760	650	350	370	120	560	1055	165
WP3 600	620	1220	1635	2235	520	1120	1310	1910	660	350	395	130	610	1120	175

Dimensions en mm

Table 6 : Dimensions of WP Type 3 elements from WP 200 to WP 600

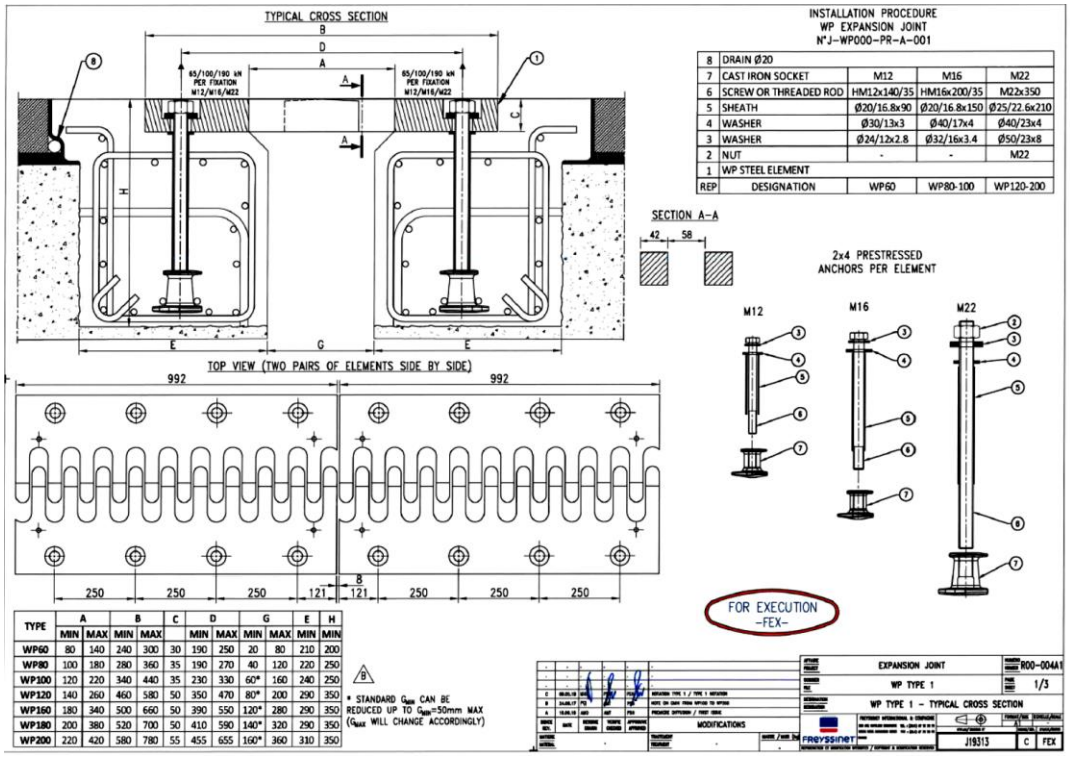
3.4. Movement capacity

The longitudinal movement of WP joints corresponds to +/- the model divided by 2. Example: The WP700 expansion joint accepts a longitudinal movement of +/- 350 mm. Due to the design and the shape of the joint, the standard WP is not suitable for installation on structures with angle. Indeed, the WP can accept only a very small transversal displacement.

Note: For structures with curves, the design of the WP joint can be adapted according to the skew of the bridge. A special study must be done by the Technical department. (see 3.10.2)

3.5. Drawings

Overall drawings (Element + anchorages) can be made available in .pdf and .dwg formats for WP Type 1, 2 and 3 on request. 3D views are also available.



8	DRAIN Ø20			
7	CAST IRON SOCKET	M12	M16	M22
6	SCREW OR THREADED ROD	HM12x140/35	HM16x200/35	M22x350
5	SHEATH	Ø20/16.8x90	Ø20/16.8x150	Ø25/22.6x210
4	WASHER	Ø30/13x3	Ø40/17x4	Ø40/23x4
3	WASHER	Ø24/12x2.8	Ø32/16x3.4	Ø50/23x8
2	NUT	-	-	M22
1	WP STEEL ELEMENT			
REP	DESIGNATION	WP60	WP80-100	WP120-200

TYPE	A		B		C	D		G		E	H
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX	MIN	MIN
WP60	80	140	240	300	30	190	250	20	80	210	200
WP80	100	180	280	360	35	190	270	40	120	220	250
WP100	120	220	340	440	35	230	330	60*	160	240	250
WP120	140	260	460	580	50	350	470	80*	200	290	350
WP160	180	340	500	660	50	390	550	120*	280	290	350
WP180	200	380	520	700	50	410	590	140*	320	290	350
WP200	220	420	580	780	55	455	655	160*	360	310	350

* STANDARD G_{min} CAN BE REDUCED UP TO G_{min}=50mm MAX (G_{max} WILL CHANGE ACCORDINGLY)

Figure 5 : General drawing of WP

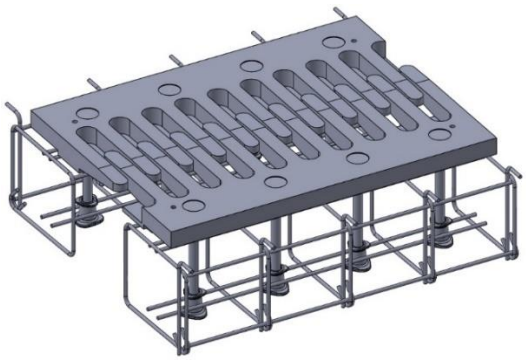


Figure 6 : 3D view of a WP

3.6. Layout drawing of elements

In option, FPC can proposed drawing with element on each line.

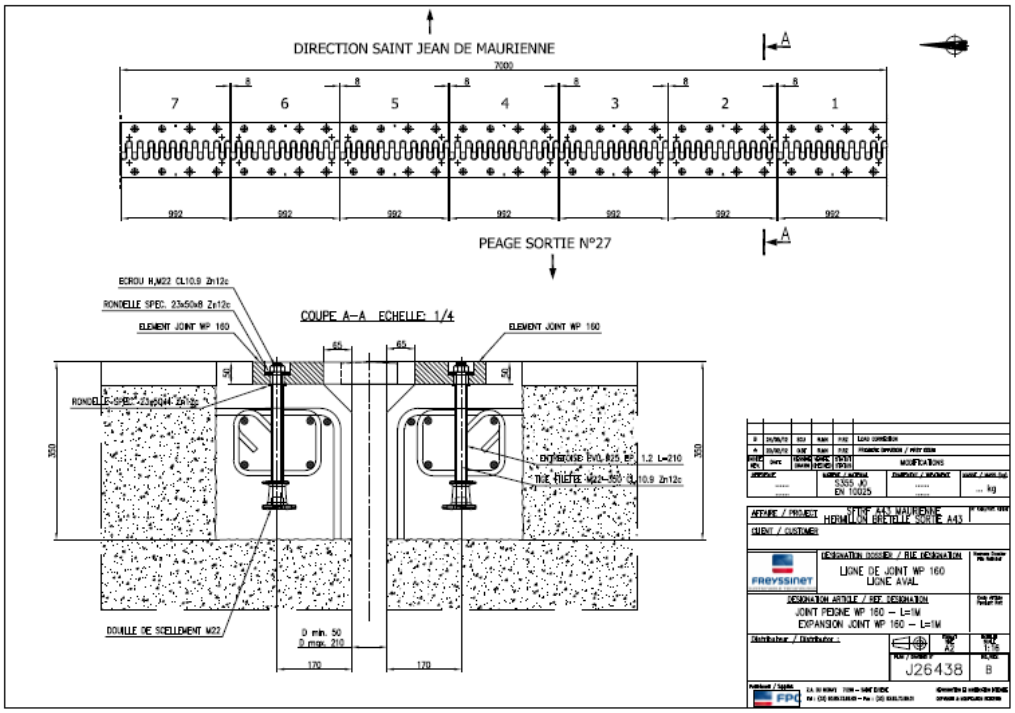


Figure 7 : Drawing with elements on each line

3.7. Technical Data Sheet

A technical data sheet is available on request (or downloadable on the Freyssinet techlibrary).

ROAD JOINTS

WP EXPANSION JOINT

FREYSSINET SUSTAINABLE TECHNOLOGY

Data sheet n°: CV1-9

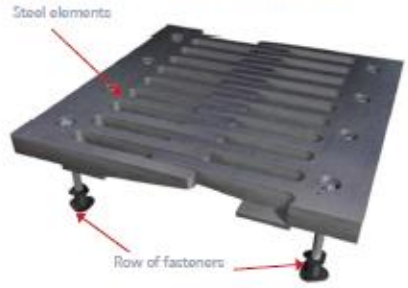
- Robust
- Large movement
- Easy maintenance
- Silent
- User comfort

Introduction

Expansion joints for road bridges are used to ensure the continuity of the running surface and its load bearing capacity (safety and comfort of the users) while guaranteeing the structure freedom of movement.

Description

The WP joint is a cantilever joint consisting of pairs of individual steel elements with parallel saw teeth. These 1-metre units are installed end-to-end to form the joint line. They are anchored to the main structure by high prestressed fasteners.



WP joint overview

Applications

WP joints can be used for all types of structures:

- Concrete, steel and composite structures
- Slab, cable-stayed, suspension, lifting or tilting bridges
- New build or repair works

Compiegne bridge (France) equipped with WP650 and WP850

Advantages

- **Robustness** owing to simple design using independent oxy cut saw teeth elements
- **High durability** using efficient tension control bolts
- **Perfect road surface continuity** due to the presence of the teeth enabled operation with no gap, to ensure user comfort and significantly reduced noise over the joint
- **Easy maintenance** and **reduced traffic disruption** due to the easily accessible anchor bolts and one-meter long sections for removal of the joint if necessary, without interrupting traffic except on the affected lane
- **Large movement** capacity up to 1,400 mm

Grand Canal bridge, Saint-Nazaire (France)

Installation

The WP joint is installed on site by expert Freyssinet teams. The metallic elements of the joint are securely anchored to the structure using prestressed fasteners.
Installation of the complete line can be done in one phase or lane by lane to avoid traffic.
To guaranty perfect levelling with the road surface, joints are installed after the asphalt has been applied.

A71 Highway equipped with WP250

WP EXPANSION JOINT

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SUSTAINABLE TECHNOLOGY

Movement range

The WP joint is manufactured on request and may be adapted to the movement direction of the main structure: straight or skew.

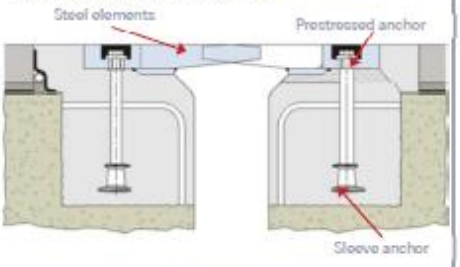
Straight WP and skew WP

Water collector

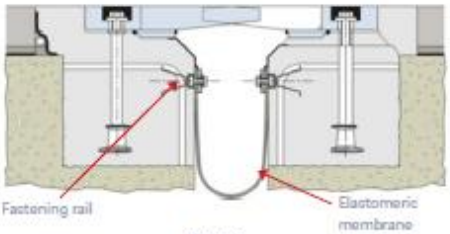
A system for recovering runoff water may be combined with basic WP joints (type 1).

The system comprises either:

- A continuous elastomeric looped membrane over the entire length of the joint (type 2)
- An elastomeric profile inserted between the metallic elements (type 3)
- Two elastomeric or stainless-steel sheets collector with a gutter located under the joint (type 4).



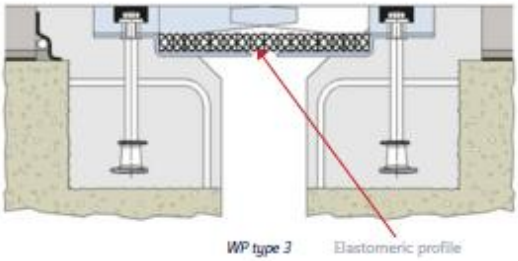
WP type 1



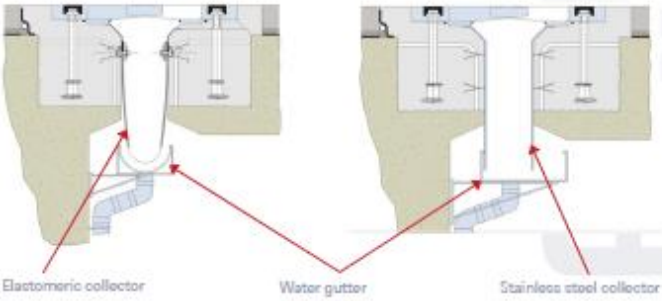
WP type 2

Close-up view of WP500 elastomeric membrane - Abidjan Riviera Marcory

Details of the elastomeric membrane



WP type 3



WP Type 4

WP EXPANSION JOINT

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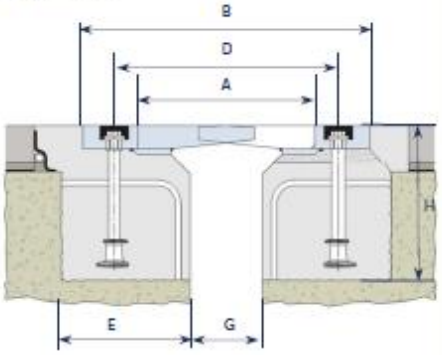
General dimensions

WP Type 1, 2, 4



Type	A		B		D		G		E	H
	mini	maxi	mini	maxi	mini	maxi	mini	maxi	mini	mini
WP60	80	140	240	300	190	250	20	80	210	200
WP80	100	180	280	360	190	270	40	120	220	250
WP100	120	220	340	440	230	330	60	160	240	250
WP120	140	260	460	580	350	470	80	200	290	350
WP160	180	340	500	660	390	550	120	280	290	350
WP180	200	380	520	700	410	590	140	320	290	350
WP200	220	420	580	780	455	655	160	360	310	350
WP250	270	520	510	760	370	620	50	300	330	350
WP300	320	620	590	890	410	710	50	350	370	350
WP350	370	720	650	1000	470	820	50	400	400	350
WP400	420	820	740	1140	540	940	50	450	445	350
WP450	470	920	810	1260	550	1000	50	500	480	350
WP500	520	1020	890	1390	610	1110	50	550	520	350
WP550	570	1120	960	1510	670	1220	50	600	555	350
WP600	620	1220	1020	1620	720	1320	50	650	585	350
WP650	670	1320	1140	1790	770	1420	50	700	645	350
WP700	720	1420	1160	1860	820	1520	50	750	655	350

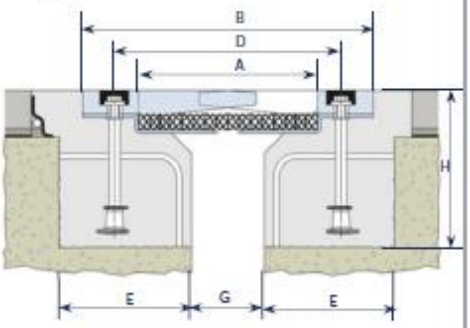
Dimensions in mm

Models up to WP1400 can be supplied. Contact us

WP 500 under installation ½ carriage way (Saint-Nazaire Bridge France)

Europe bridge, Orléans (France) equipped with WP 250

WP Type 3



Type	A		B		D		G		E	H
	mini	maxi	mini	maxi	mini	maxi	mini	maxi	mini	mini
WP3 200	220	420	820	1020	600	800	120	320	560	350
WP3 250	270	520	900	1150	670	920	170	420	600	350
WP3 300	320	620	965	1265	730	1030	220	520	630	350
WP3 350	370	720	1045	1395	800	1150	270	620	670	350
WP3 400	420	820	1200	1600	920	1320	320	720	750	350
WP3 450	470	920	1265	1715	980	1430	370	820	780	350
WP3 500	520	1020	1450	1950	1120	1620	420	920	875	350
WP3 550	570	1120	1560	2110	1210	1760	470	1020	930	350
WP3 600	620	1220	1685	2285	1310	1910	520	1120	990	350

Dimensions in mm

ROAD JOINTS

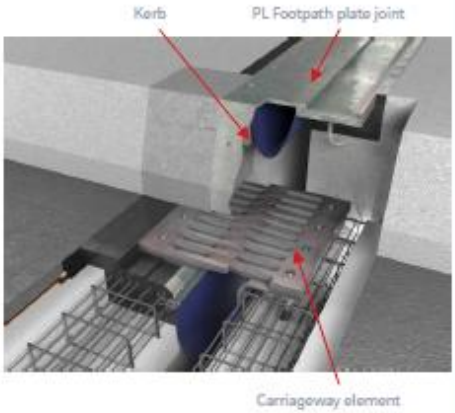
WP EXPANSION JOINT

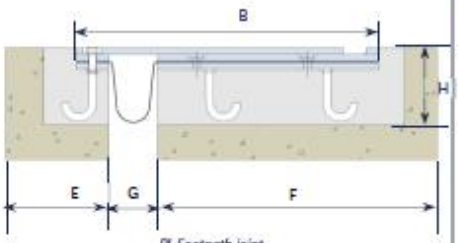
FREYSSINET
SUSTAINABLE TECHNOLOGY

Add-ons

To ensure overall waterproofing along the expansion joint and joint continuity on pavements (or non-traffic areas), the following add-ons are available:

- Footpath joint with or without water recovery membrane (PL footpath joint)
- Kerb cover plate





PL Footpath joint

Type	Model	B		G		E	F	H
		mini	maxi	mini	maxi			
WP60	PL60	160	220	12	72	150	250	150
WP80	PL80	180	260	12	92	150	270	150
WP100	PL110	210	310	20	130	150	290	150
WP120	PL120	230	350	30	190	150	310	150
WP160	PL160	280	440	40	270	150	350	150
WP180	PL180	300	480	50	400	150	370	150
WP200	PL200	330	530	12	72	150	390	150
WP250	PL250	380	630	12	92	150	440	150
WP300	PL300	440	740	20	130	150	490	150
WP350	PL350	490	840	30	190	150	540	150
WP400	PL400	540	940	40	270	150	590	150
WP500	PL500	640	1140	12	72	150	690	150
WP550	PL550	690	1240	12	92	150	740	150
WP600	PL600	740	1340	20	130	150	790	150
WP650	PL650	840	1440	30	190	150	840	150
WP700	PL700	940	1540	40	270	150	890	150

Dimensions in mm

References

WP800 Vila Pouca (Portugal)

WP550 connected to an orthotropic deck, Srebény (Hungary)

Ronde Bridge (Spain)

Global approach

- Specification and design services
- Manufacture by carefully selected partners
- Production supervision to ensure compliance with specifications defined
- Full installation / replacement or technical support
- Inspection and maintenance
- Certifications include ISO 9001, ISO 14001, ISO 45001

3.8. Components

3.8.1. Main element

3.8.1.1. Steel

Material : S355 J0 (EN 10025)

Characteristics :

- Elastic limit: min 295 MPa (Depends on the thickness)
- Breaking strength : min 450 MPa
- Elongation at break : min 18%

Figure 8 : WP Element

3.8.1.2. Elastomeric membrane (Type 2)

Material : Polychloroprene

Characteristics :

- Hardness DIDC : 60 +5/-4
- Breaking strength : min 10 MPa
- Elongation at break : >250%

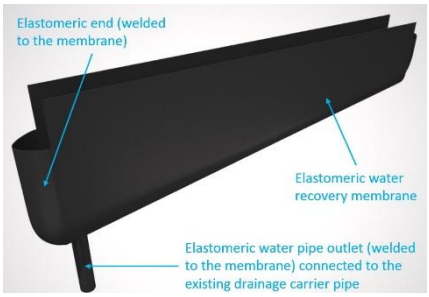


Figure 9 : Elastomeric membrane

3.8.1.3. Elastomeric profile (Type 3)

Material : EPDM

Characteristics :

- Hardness DIDC : 70 +/-5
- Breaking strength : min 7 MPa
- Elongation at break : > 250%

Figure 10 : Elastomeric profile

3.8.2. Expansion joint fixing

3.8.2.1. Socket

To ensure the anchoring of the screw or the threaded rod (Depending on the type of joint and type of fixing) and the diffusion of tension forces in the concrete, we use a cast iron socket.

Material : EN-GJS-400-15

Characteristics :

- R : 400 MPa
- $Re_{0.2\%}$: 250 MPa
- A% after breaking : 15%

3.8.2.2. Threaded rod or screw

It ensures the holding of the element on its support.

Class 10.9, corrosion protection GEOMET

3.8.2.3. Nut

This element ensures the tightening.

3.8.2.4. Washer

The washer distributes the force on the metal seal.

Figure 11 : 3D view of fixing elements

3.8.2.5. PVC spacer

The spacer tube makes it possible to keep a free length of the fastening relative to the concrete

3.8.2.6. Filling the reservations (Pur bitumen)

It's used for the protection and the waterproofness of the anchorages, in particular in finishing during the installation to fill the reservations of the anchorages heads and the handling holes of the levelling beams.

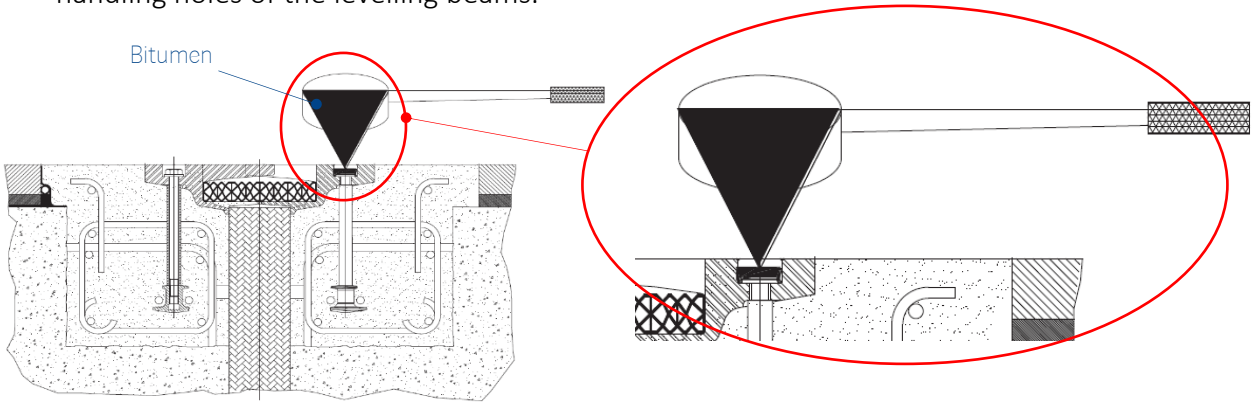


Figure 12 : Filing of anchors with pure bitumen

3.8.3. Protection

The protection of the metal elements of the WP joints is ensured by shot blasting + metallization Zn / Al 150 microns + mouth pores.

3.9. Accessoires

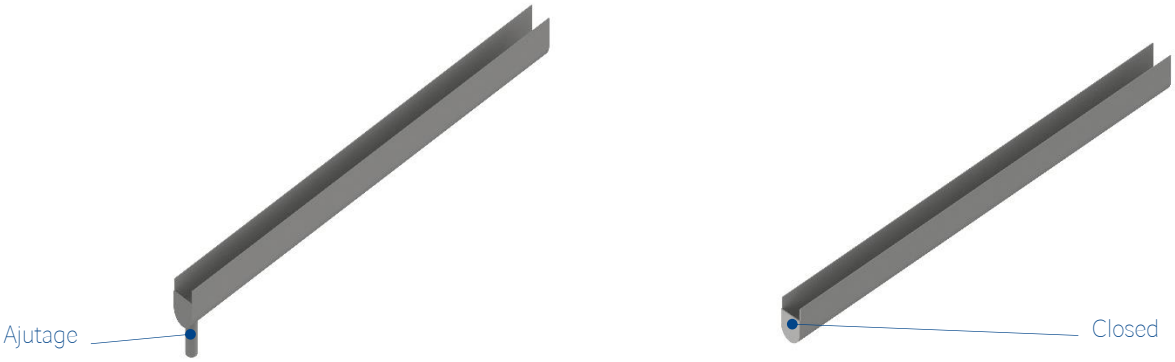
The following options are not included in the WP expansion joint. They must be clearly requested by the client if necessary.

3.9.1. Waterproofness

An additional elastomeric membrane can be made on request on WP Type 1 which will make type 1 to type 2.
This is the installation of a polychloroprene membrane attached to a rail.

Figure 13 : Standard elastomeric profile with rail Halfen

The elastomeric membrane can be adapted to the configuration of the structure with closed elastomeric membrane, ajutages of different diameter and length …



a) *Elatomeric membrane + ajutage + closed*

b) *Elastomeric membrane with closed*

c) *Elastomeric membrane+ 2 closed+ ajutage*

d) *Standard elastomeric membrane*

Figure 14 : Different types of elastomeric membrane

Other types of elastomeric membrane can also be proposed

Figure 15 : Removable elastomeric membrane

3.9.2. Stainless steel waterproofing membrane (type4)

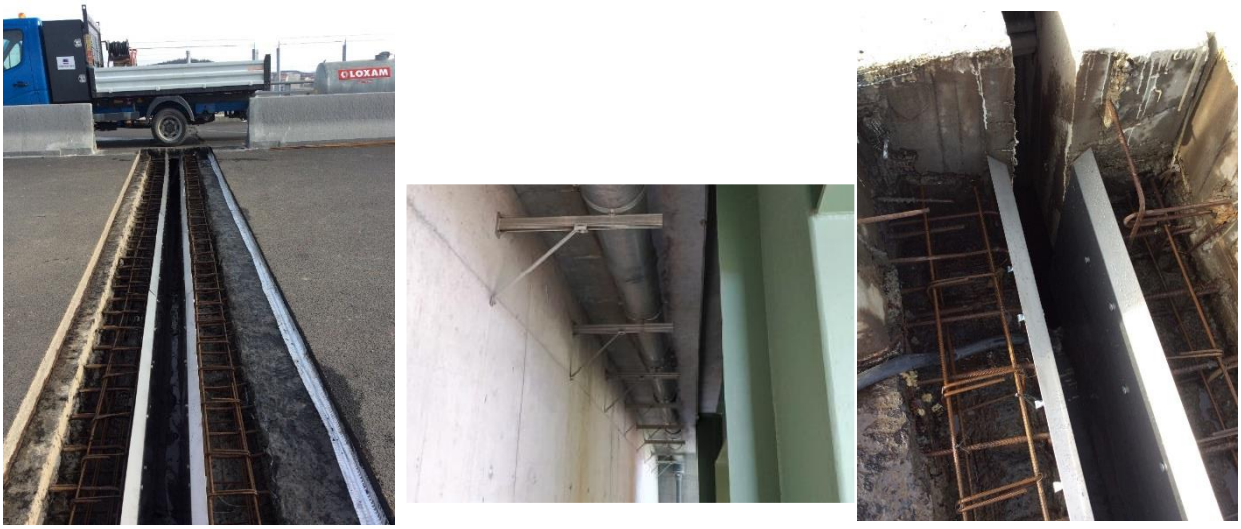


Figure 16 : Stainless steel membrane with rainwater recovery in a gutter

3.9.3. Steel sidewalk joint (Type 1, 2 et 3)

In order to complete the general waterproofness at the pavement joint and the continuity of the joint with the pavement (or non-circulated areas), it is possible to use steel pavement joints. Several types of PL joint are available (with or without membrane, with or without fallout, with or without skew).

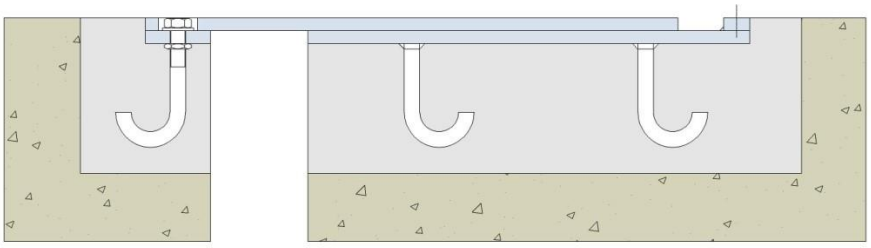


Figure 17 : Sidewalk PL without elastomeric membrane

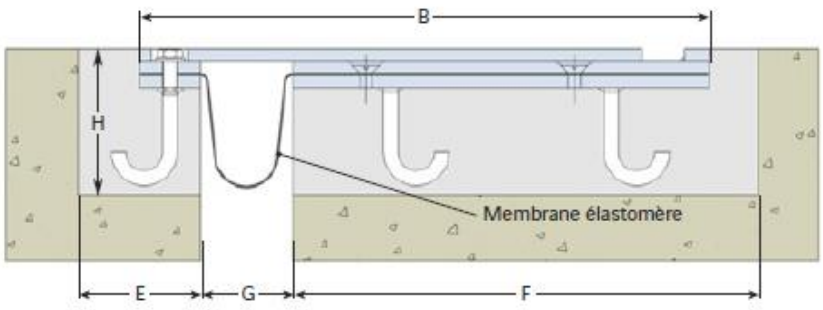


Figure 18 : Sidewalk PL with elastomeric membrane

3.9.4. Kerb cover plate

Kerb cover plate can be proposed in order to complete the set expansion joint – kerb and footpath. These galvanized kerb cover plate are adaptable to standard borders T2 or T3 These kerb cover plate can be used only for small movements (Under 300 mm). In the other cases, we advised to use PL joint with kerb

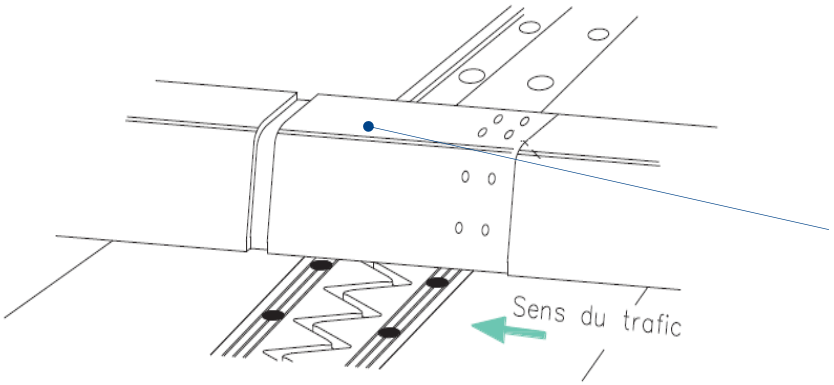


Figure 19 : Schema of a kerb cover plate T2/T3

Figure 20 : Photo of a kerb cover plate

3.9.5. Stainless drain

This stainless drain prevents a build up of water in this area that could damage the flashing

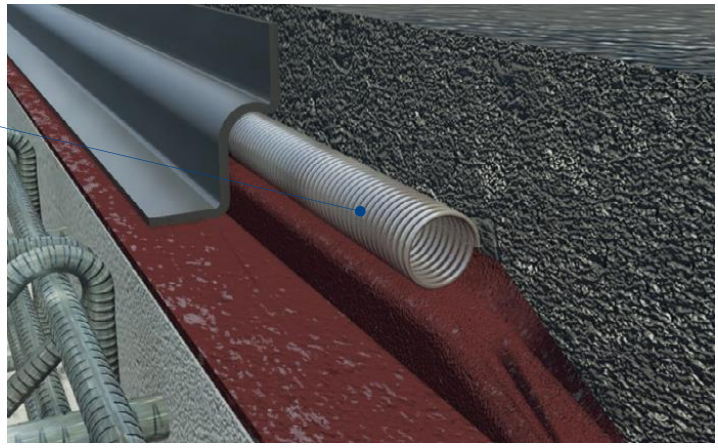


Figure 21 : Detail of drain assembly (3D view)

Some components of the stainless-steel drain are subject to special regulations concerning transport. This is the true impression. This product may be purchased locally.
Note: The commonly used drain is the stainless-steel drain but a PVC drain can also be used. (More information on simple request).

An installation procedure of drain can be proposed on request

3.9.6. Levelling beams (Installation arms)

The levelling beams are used for the installation. These equipment are necessary to install the joint with the correct level between the deck and the abutment.

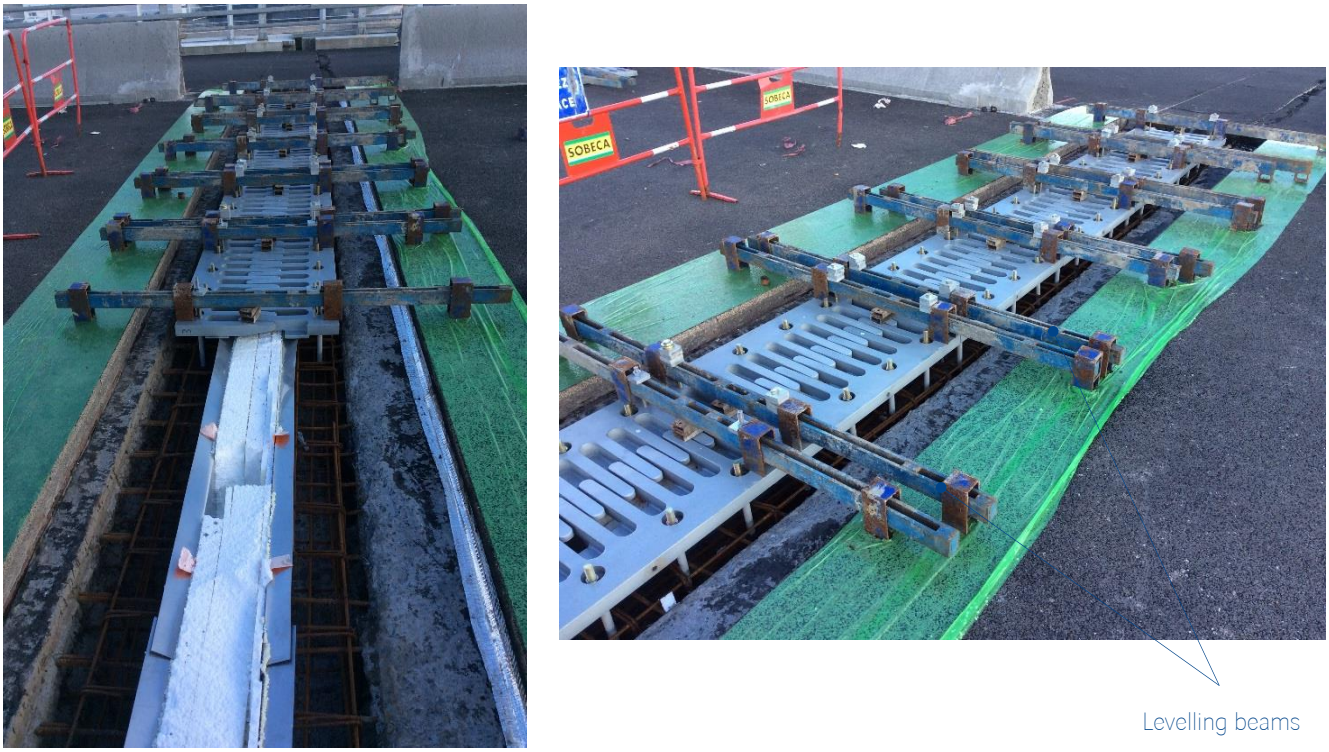


Figure 22 : Levelling beams of WP

3.10. Non standards options

3.10.1. Cut element (Type 1, 2 et 3)

Standard elements of WP are 1000 mm lenght (992mm exactly to have 8 mm between each elements). However, it's possible to manufacture shorter or longer elements to fit the length of the line.

In all cases, a minimum of 2 fixing has to be kept for each element. The manufacturing of these special element requires the realization of specific shop drawings by FPC ;

This can also be done on worksite but in this case, a corrosion protection of the cut part is to be expected.

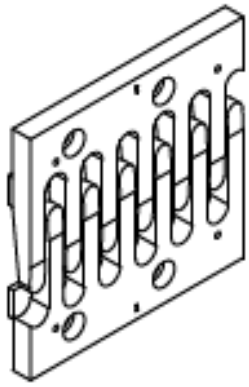


Figure 23 : Cut element

3.10.2. Element with angle

Figure 24 : Elément with angle

The special skewed elements are subject to particular design request.

3.10.3. Upstand

There is no reason to use upstand for WP Type 1 and Type 2 joints. However, for Type 3, upstands can be provided. Its function is to ensure the "elastomeric profile upstand" of type 3 and is generally used at a low point. However, there is no contraindication to using it at high point as well.
The completion of a statement (right or angle) requires a specific manufacturing drawing by FPC.

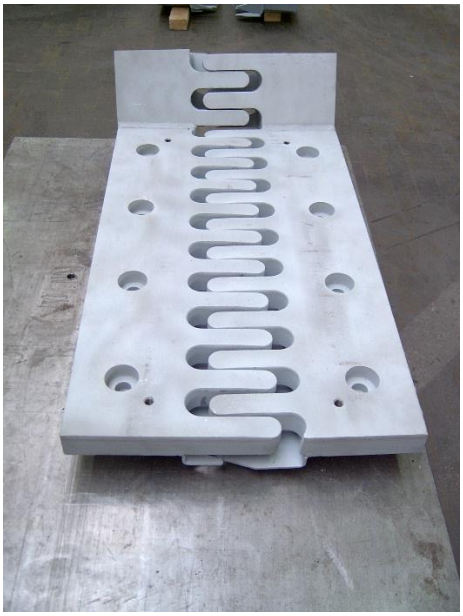


Figure 26 : WP Element with upstand

Figure 25 : WP Element with upstand and PL

3.10.4. Teeth thickness

The width of the teeth of a standard WP is 42mm + 8 mm of space between 2 teeth.

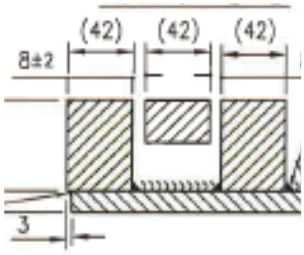


Figure 27 : Teeth 42+8

However, to adapt to certain local specification, it's possible to reduce the width of the teeth to 28mm + 8mm of space between the teeth.

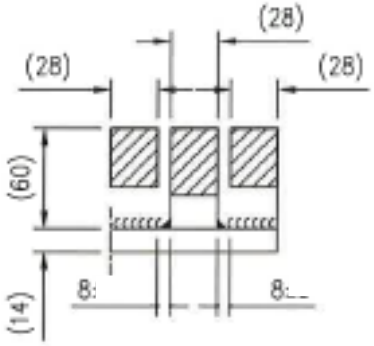


Figure 28 : Teeth 28+8

This adaptation can be done on all types of WP according to national specifications and upon request.

More precision on simple request to FPC.

3.10.5. Fixation to a composite bridge or a steel bridge without concrete

In order to adapt to a composite structure bridge (Thickness of the slab generally not suitable for the installation of WP joints) or steel bridge, it is possible according to the cases to carry out a fixing according to the drawing below
This solution does not require concreting phasing.

Figure 29 : Standard fixation on one side and special fixation on steel bridge on other side

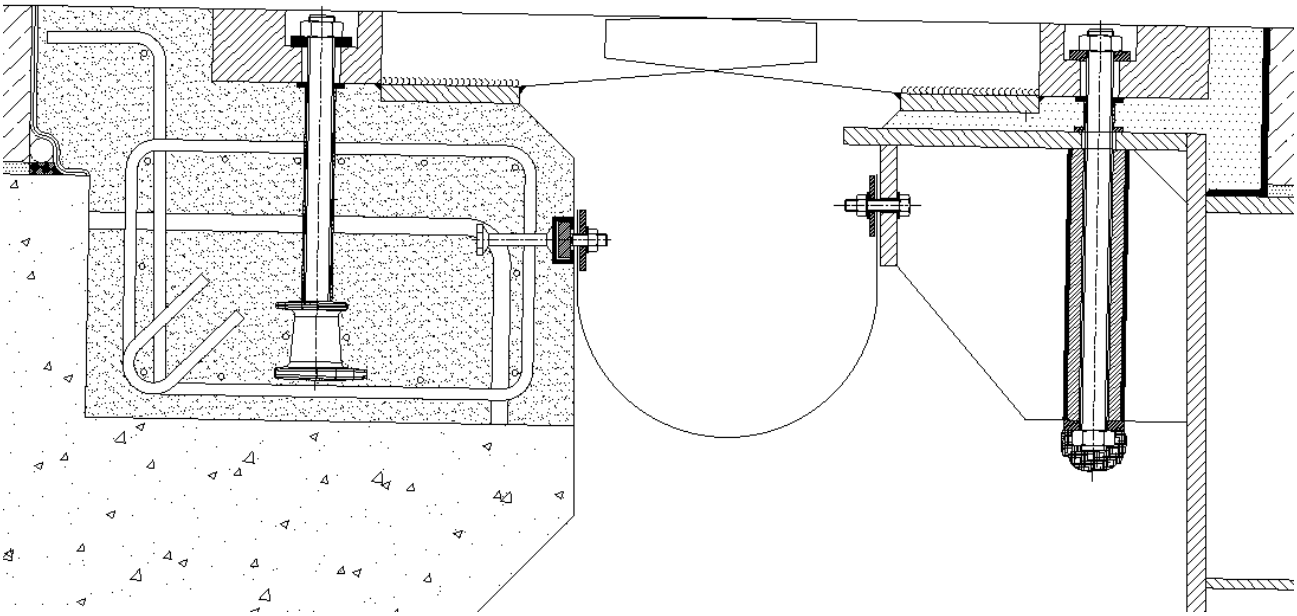


Figure 30 : Standard fixation on one side and special fixing on the other side

3.10.6. Fixation on a steel bridge with concrete

In order to adapt to a structure of steel structure, it is possible to carry out a fixing according the drawing below. This solution requires a concreting phase.

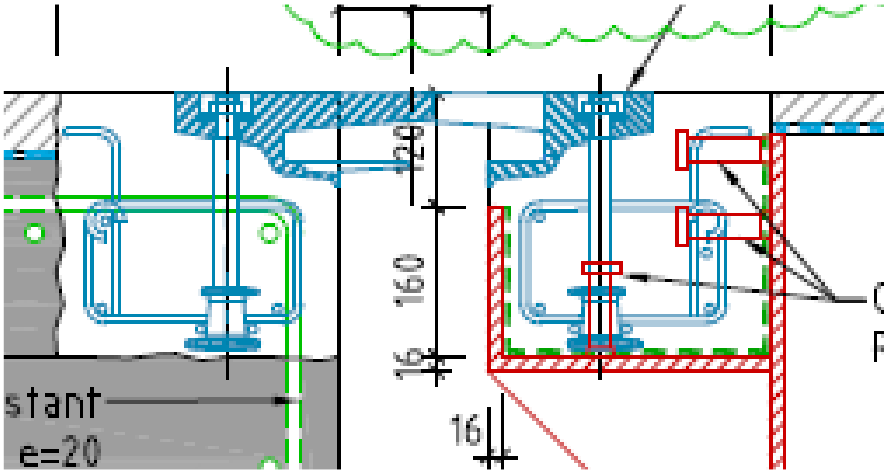


Figure 31 : Fixation on a steel bridge with concrete

3.10.7. Adaptation snow plough

The observation of some sites subjected to snow plowing operations shows that, like all joint models, the strength of these joints can be affected and this especially on sloping structures and / or variable devers. It's therefore possible to adapt on the WP joint elements "blade hunts" metal part slightly lower than the elements.

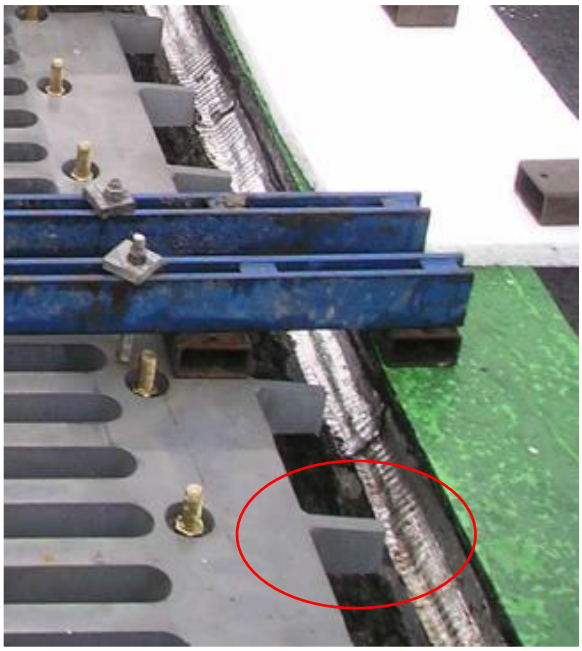
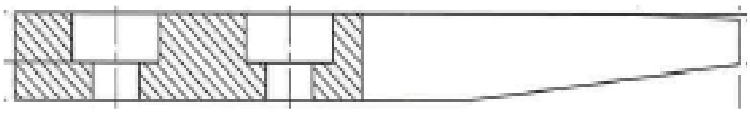


Figure 32 : Adaptation with blade hunts

3.10.8. Two rows of anchors

As mentioned in paragraph 3-2, WP Type 1 and 2 joints with a big movement than or equal to 700mm have 2 rows of anchors. However, in order to adapt to certain local standards, it's possible to have 2 rows of anchors on lower movement.



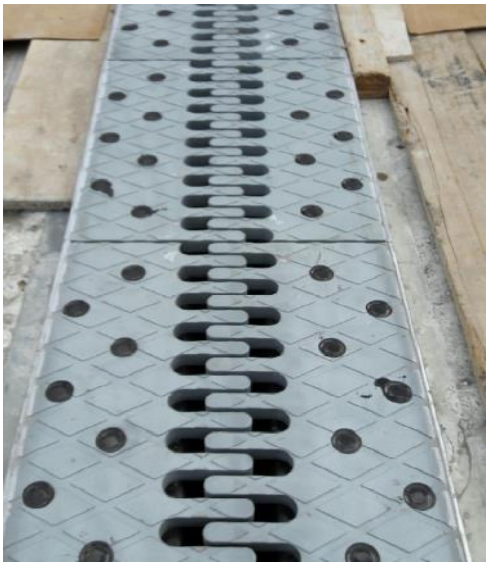
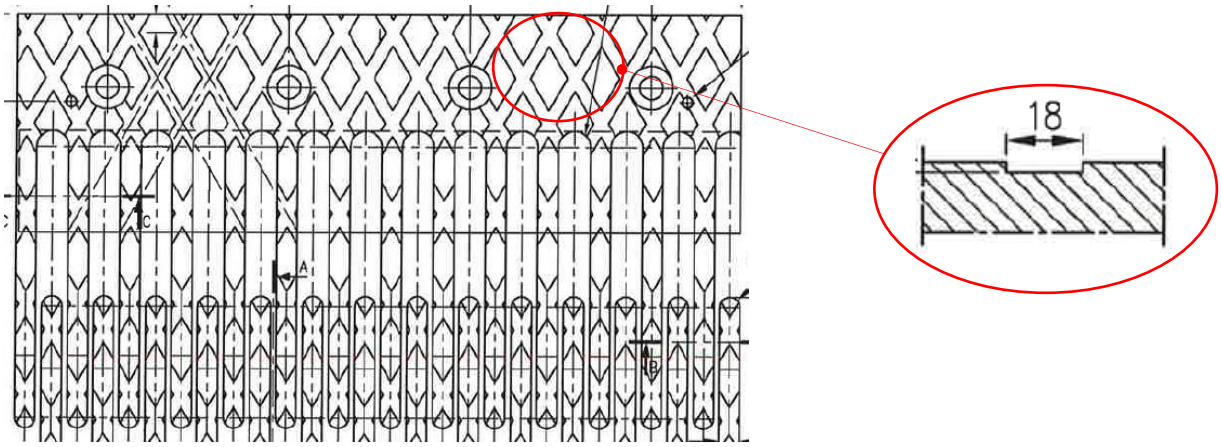


Figure 33 : Photos of a WP 180 and WP160 with 2 rows of fixings and groove

3.10.9. Grooves

Also, in order to adapt to certain local standards, it's possible to manufacture grooves on the rolling face. This option can be performed on all types of WP and all movements.

The grooves are 18mm wide with a thickness of 2,5mm inclined according to the drawing below.



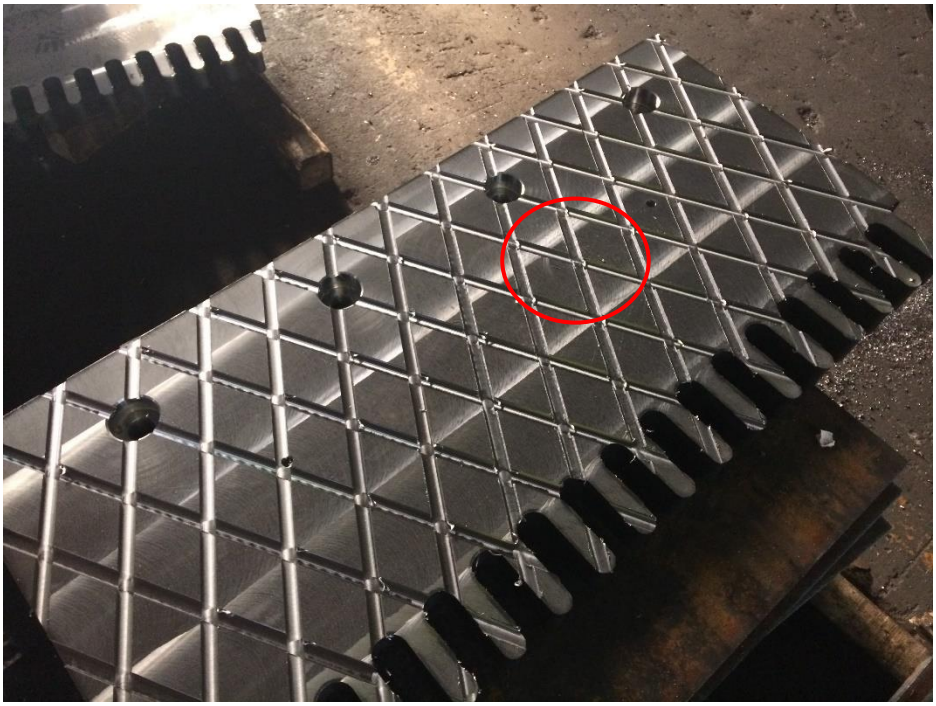


Figure 34 : WP element with groove

3.10.10. Welding

In order to adapt to certain local standards, it's possible to manufacture element with welds on the rolling face. This option can be performed on all types of WP and all movements.

Welds have a thickness of 3mm and re made according to the drawing below.

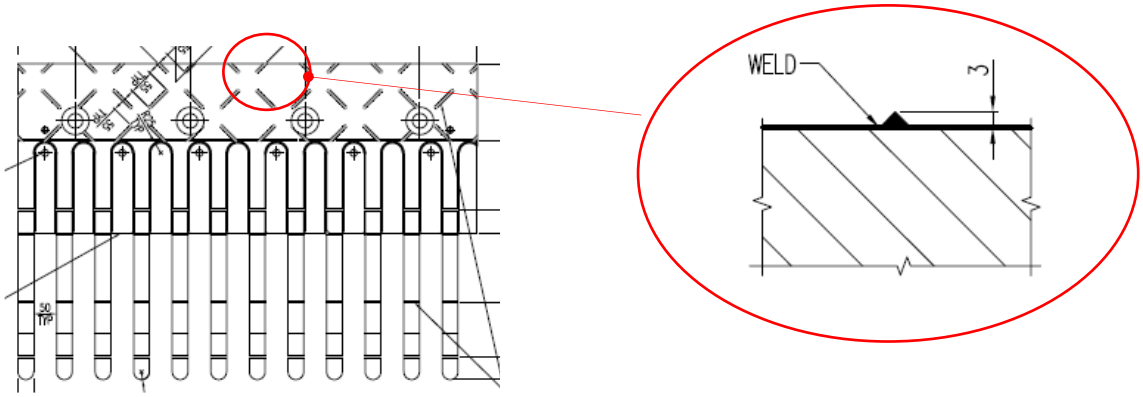


Figure 35 : Element with welds

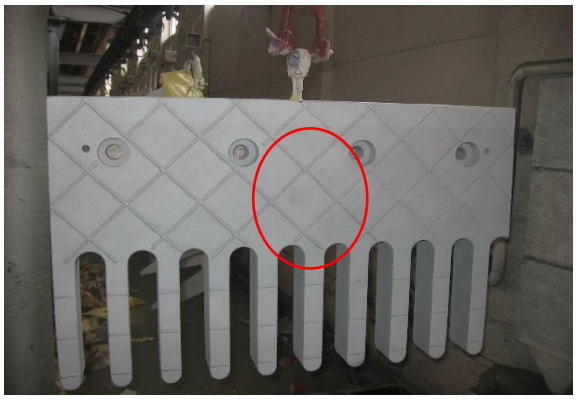


Figure 36 : Photo of an element with welds

3.10.11. Fixing with cones

Depending on the use and context on the site, it's possible to replace the cast iron socket with a cone anchorage system. This process is mainly used in the repair activity.

This kind of fixing help to not get recess on the structure. A special procedure is available on request.

Figure 37 : Photo of a coring and cone fixing

3.11.12 Cycle lanes

Mainly in urban areas, especially designed sheets for cycle paths can be added to the metal elements of WP joints in their traffic area.

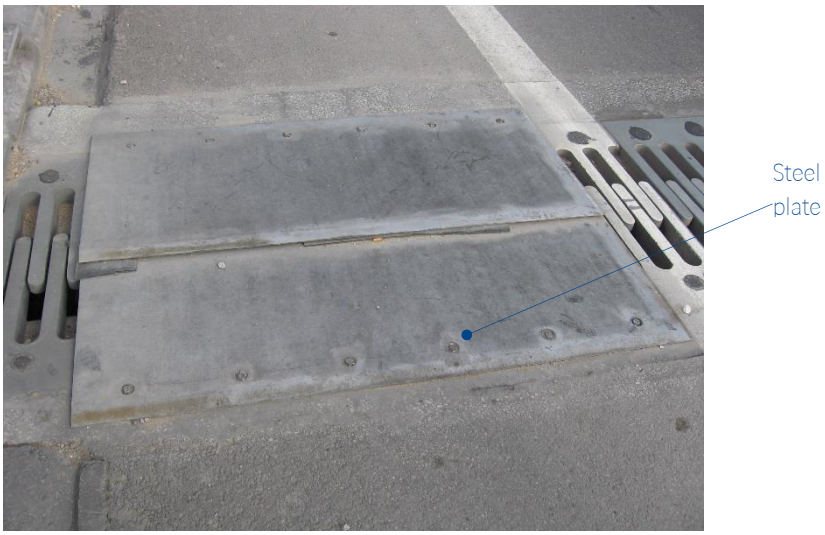


Figure 38 : Photo of adaptation for cycle lanes

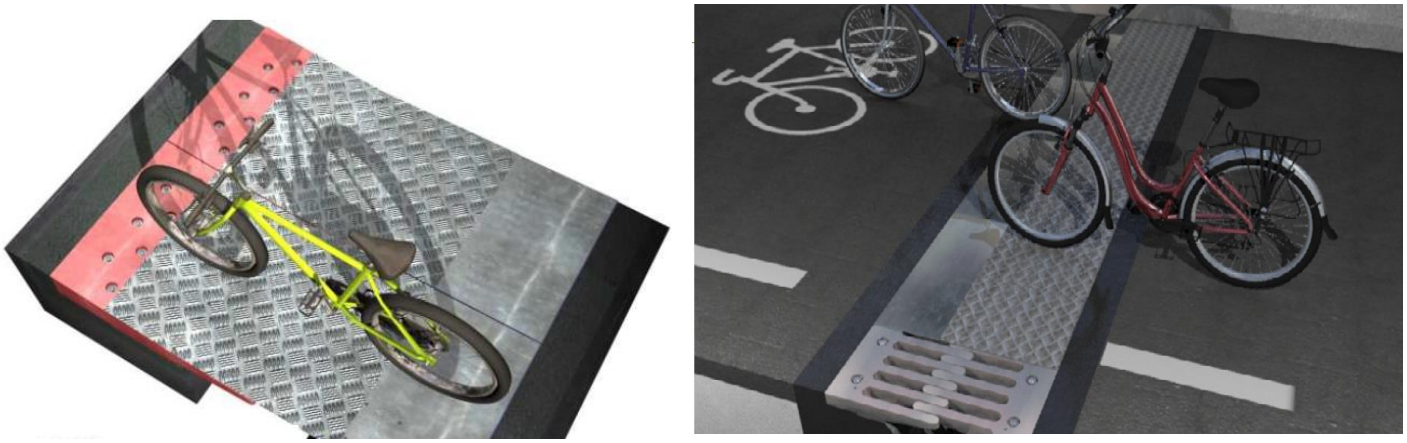


Figure 39 : 3D view of adaptation for cycle lanes

4. DESIGN

4.1. Calculation

WP expansion joint is designed according to European Assessment Documents (EADs) and this for all models of WP.

4.2. Testing

WP expansion joint was tested in laboratory:

- Fatigue test
- Static test (ULS Loads)

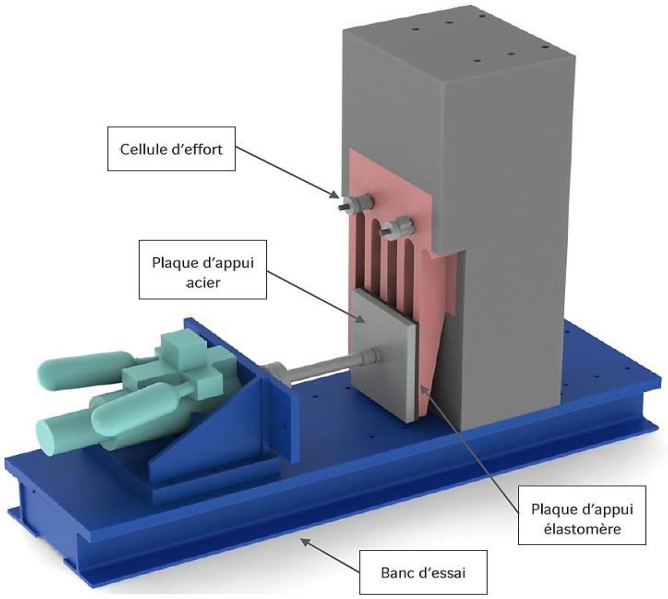


Figure 40 : Scope of the test

4.3. Warranty

The beneficiary provisions of the present deed of warranty ("Warranty") are applicable for the sole purpose of the sales of WP1, WP2, WP3 and WP4 Expansion Joints (the "Goods") by Freyssinet Products Company (the "Supplier") to the Soletanche Freyssinet subsidiaries or any of their licensees (the "Warrantee").

4.3.1. Scope of the warranty

- Supplier Supplier warrants that the Goods supplied to the beneficiary of this Warranty are manufactured in compliance with the applicable technical specifications.
- Supplier agrees to indemnify the Warrantee from any direct damages, costs, losses or expenses arising from any fault or deficiency in materials or manufacturing provided as part of the Goods ("Defect").
- In the event the Warrantee notifies the Supplier of any Defect within two (2) years following delivery of the Goods to the Warrantee according to applicable Incoterms, the Supplier shall carry out correction work in respect of such Defects in accordance with the provisions below:
  - Liability of the Supplier under this Warranty is limited to repair or delivery of replacement Goods at the applicable delivery point, at the Supplier's option;
  - All Goods or part thereof that has/have been replaced or repaired shall bear the balance of the original warranty period as shall remain from the date of the repair or replacement of such Good or part.

4.3.2. Exclusions

Notwithstanding the foregoing, the Supplier shall not be liable for Goods' failure to comply with the Warranty in any of the following events:

- The Defect arises because the Warrantee failed to follow the Supplier's oral or written instructions as to the storage, commissioning, installation, use and maintenance of the Goods as provided in the applicable manuals (in their latest version);
- The Defect arises as a result of any error or omission of any drawing, design or specification supplied by the Warrantee to the Supplier, including as a result of the Seller following any drawing, design or Goods specifications supplied by the Client
- The Warrantee materially alters or repairs the Goods without the Supplier's prior written consent;
- The Defect arises as a result of normal wear and tear (including corrosion of steel parts and ageing of rubber components);
- The Defect arises as a result of any wilful damage caused to the Goods (or part thereof) by the Warrantee or any third party, or negligence or abnormal storage or working conditions or any misuse of the Goods, including damage resulting from rough handling;
- The Defect arises from the occurrence of any unforeseen environmental conditions or by Force Majeure events (including but not limited to fires, floods, earthquakes, etc.), Act of God, and other circumstances beyond the Supplier's reasonable control;

- The Defect arises from an exposure at a temperature below -20°C or above 50°C;
- The Defect arises from overloads, stresses, impacts, sliding movements and any other parameter exceeding data provided in the applicable technical specifications;
- The Defect arises due to failure of any civil/ structural/ ancillary works associated with structure, outside the perimeter of defined scope of the System Supplier.

It is further understood that Supplier shall bear no liability for:

- Any consequential damages incurred by the Warrantee and/or its clients (Including but not limited to costs for third party inspection, liquidated damages, penalties for delay, loss of use, stand-by costs, etc.) or aesthetic damages;
- Any dismantling or reinstatement costs;
- Warrantee's or third party's labour costs;
- Specialist equipment, scaffolding, heavy tools and lifting equipment as well as power, gas and water needed for any correction work.

4.3.3. Warrantee's duties

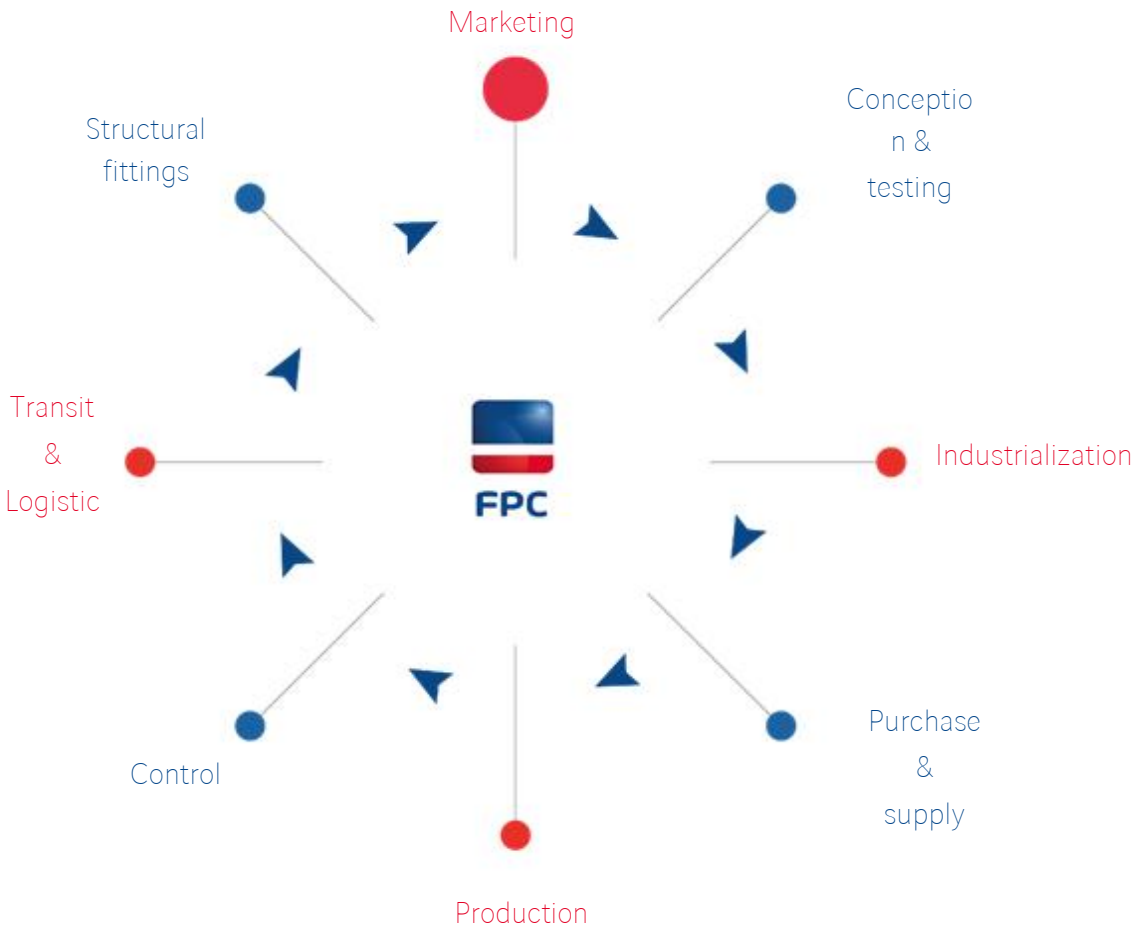
The Warrantee shall respect the rules of the art and follow the instructions provided in the installation and maintenance manuals (in their latest version)

THIS WARRANTY SHALL BE APPLICABLE AS THE STANDARD WARRANTY RELATING TO ANY OF THE GOODS SOLD BY THE SUPPLIER TO THE WARRANTEE.

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY EMBODIES THE ENTIRE UNDERSTANDING OF THE SUPPLIER AND THE WARRANTEE, AND SUPERSEDES ANY PRIOR WRITTEN OR OTHER AGREEMENT BETWEEN THE SUPPLIER AND THE WARANTEE, IN RELATION TO ANY WARRANTY RELATING TO THE GOODS.

5. PROJECT MANAGEMENT & MANUFACTURING

FPC coordinates all the steps of the projects. Support departments are also involved in the process:

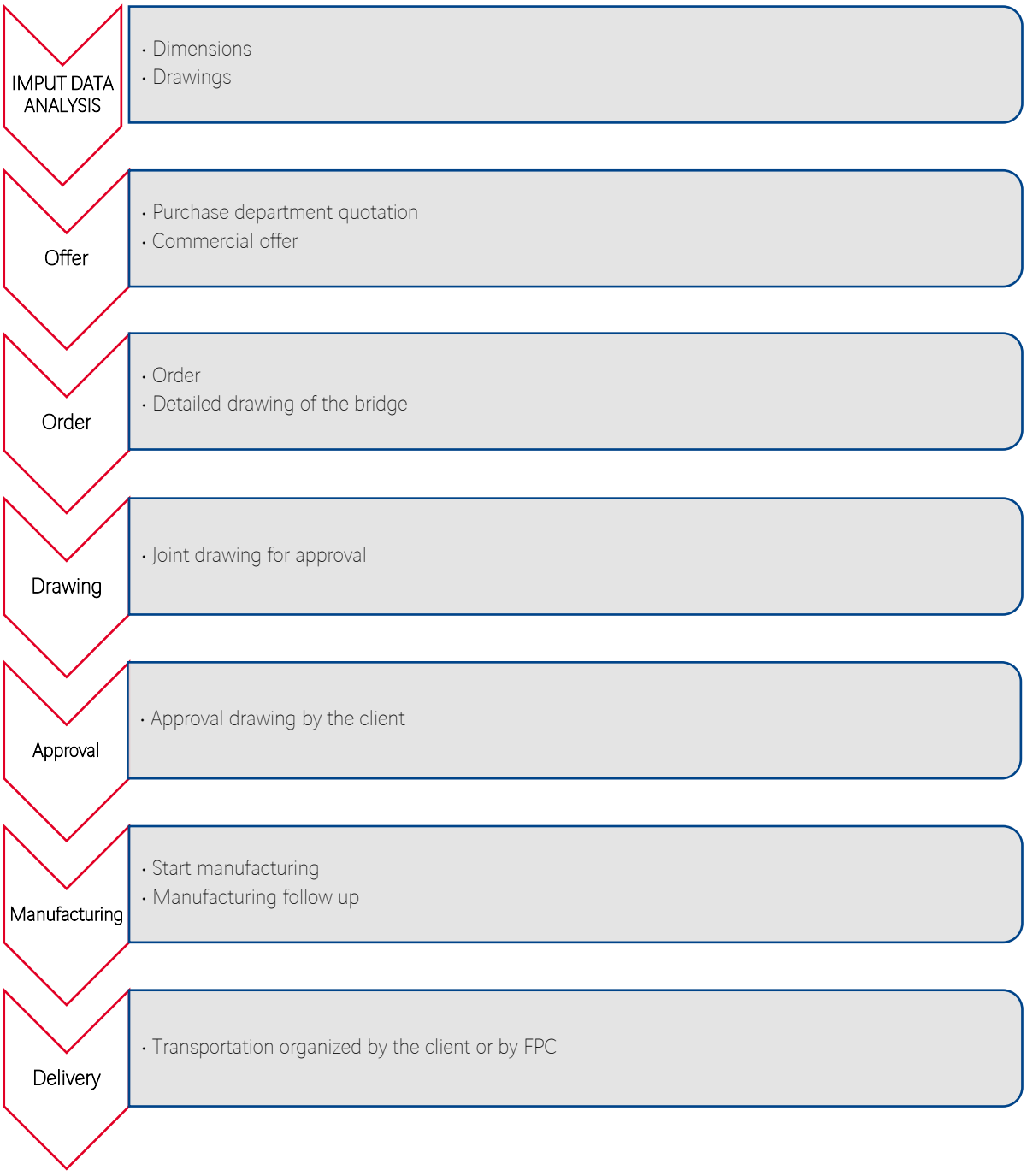


5.1. Project process

Two processes are possible. In fact, either the project concerns standard WP joints or the project concerns special elements (element cut, element with angle, non-standard options etc.) in which case the process is not the same.
It should be noted that the metal elements of WP are not kept in stock, even for standard expansion joint.
For projects with standard elements, there is no manufacturing plan to achieve so the time is the manufacturing time (material supply, manufacturing, control, packaging etc.). This time depends on the joint model, the quantities and the workload of the partners.

For each project where there are cuts, elements with angle, upstand, etc ... the following process must be taken into account. The delay of each step must be anticipated.

After receiving all the information that FPC needs, the process below is applied:



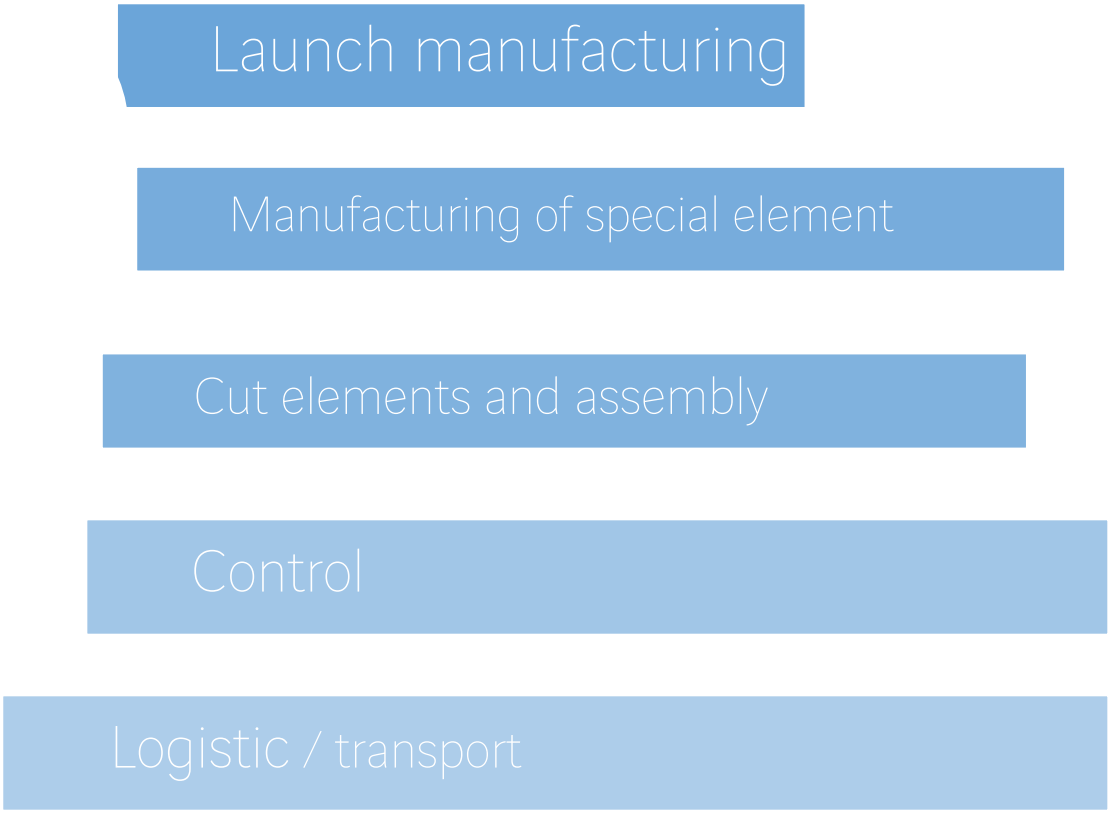
Before starting any manufacturing process, the approval drawing signed from customer is required. This step is absolutely mandatory for the good continuity of the project.

5.2. Manufacturing

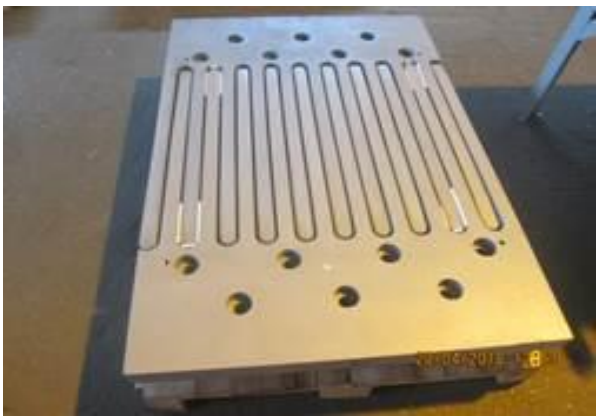
5.2.1. Sites of production

Steel elements of WP are manufactured in Romania. A detailed presentation of production sites is available on request.

5.2.2. Manufacturing process (Without non standards options)



5.2.3. Manufacturing stage



5.3. Quality

5.3.1. Quality - ISO 9001

FPC is certified ISO 9001:2015

5.3.2. Safety- OHSAS 18001

FPC is certified OHSAS 45001:2018

5.3.3. Environment – ISO 14001

FPC is certified ISO 14001:2015

Certificat
Certificate

N° 1997/8276.11 Page 1 / 1

AFNOR Certification certifie que le système de management mis en place par :
AFNOR Certification certifies that the management system implemented by:

FREYSSINET PRODUCTS COMPANY

pour les activités suivantes :
for the following activities:

FABRICATION, VENTE ET NEGOCE DE COMPOSANTS POUR LE GENIE CIVIL SPECIALISE : JOINTS DE CHAUSSEE, COMPOSANTS POUR L'ANCRAGE DE HAUBANS ET LA MISE EN PRECONTRAINTE DES BETONS, BARRES ET ACCESSOIRES POUR LA GEOTECHNIQUE, PRODUITS DE RENFORCEMENT ET PROTECTION DE STRUCTURES, ET CONSOMMABLES D'EQUIPEMENTS DE CHANTIER.

MANUFACTURING, SALE AND TRADE OF COMPONENTS FOR SPECIALISED CIVIL ENGINEERING: ROAD EXPANSION JOINTS, COMPONENTS FOR STAY CABLE ANCHORAGES AND CONCRETE PRESTRESSING, BARS AND ACCESSORIES FOR GEOTECHNICS, PRODUCTS FOR STRUCTURE REINFORCEMENT AND PROTECTION, AND CONSUMABLES FOR CONSTRUCTION EQUIPMENT.

a été évalué et jugé conforme aux exigences requises par :
has been assessed and found to meet the requirements of:

ISO 9001 : 2015

et est déployé sur les sites suivants :
and is developed on the following locations:

SIEGE : ZA DU MONAY BP 10 FR-71210 ST EUSEBE
FREYSSIBAR : RUE DU BRULARD ZI LA FIOLLE FR-71450 BLANZY

Ce certificat est valable à compter du (année/mois/jour) 2021-07-15 Jusqu'au 2024-07-04
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Julien NIZRI
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification

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MANUFACTURING, SALE AND TRADE OF COMPONENTS FOR SPECIALISED CIVIL ENGINEERING: ROAD EXPANSION JOINTS, COMPONENTS FOR STAY CABLE ANCHORAGES AND CONCRETE PRESTRESSING, BARS AND ACCESSORIES FOR GEOTECHNICS, PRODUCTS FOR STRUCTURE REINFORCEMENT AND PROTECTION, AND CONSUMABLES FOR CONSTRUCTION EQUIPMENT.

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has been assessed and found to meet the requirements of:

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et est déployé sur les sites suivants :
and is developed on the following locations:

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for the following activities:

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MANUFACTURING, SALE AND TRADE OF COMPONENTS FOR SPECIALISED CIVIL ENGINEERING: ROAD EXPANSION JOINTS, COMPONENTS FOR STAY CABLE ANCHORAGES AND CONCRETE PRESTRESSING, BARS AND ACCESSORIES FOR GEOTECHNICS, PRODUCTS FOR STRUCTURE REINFORCEMENT AND PROTECTION, AND CONSUMABLES FOR CONSTRUCTION EQUIPMENT.

a été évalué et jugé conforme aux exigences requises par :
has been assessed and found to meet the requirements of:

ISO 14001 : 2015

et est déployé sur les sites suivants :
and is developed on the following locations:

SIEGE : ZA DU MONAY BP 10 FR-71210 ST EUSEBE
FREYSSIBAR : RUE DU BRULARD ZI LA FIOLLE FR-71450 BLANZY

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Julien NIZRI
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification

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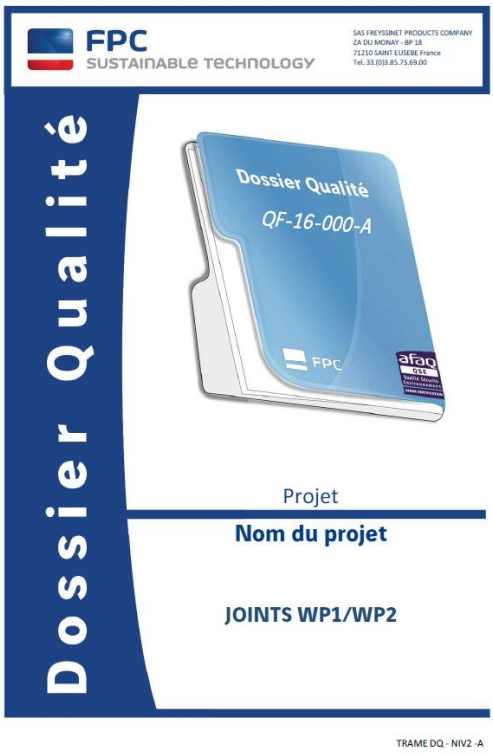
5.4. Quality documentation

Different levels of quality documentation can be proposed (from level 0 to level 2). The definition of each level is available on the quality file price list sent with the offer. The level of the quality documentation has to be determined at the beginning of the project.

Item	Documentation	Level 0	Level 1	Level 2
General documents	Delivery Bill	X	X	X
	ITP	-	-	X
Expansion joint element	Steel material certificate 3.1	-	X	X
	ITP	-	-	X
Socket	Steel material certificate 3.1	-	X	X
	ITP	-	-	X
Elastomeric profile	Mix control of rubber	-	X	X
	ITP	-	-	X
Final control	Geometrical control report	-	-	-

Table 7 : Quality documentation

*All documents can be shown during an audit.



6. REFERENCES

The references list is available on request for all FPC projects and on FPC intranet.