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FREYSSINET PRODUCTS CO.

PRODUCT DESCRIPTION

# Expansion joints

# Wd/Wd+

Réf. : EJ-013
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FREYSSINET
SUSTAINABLE TECHNOLOGY

## COPYRIGHT



## REVISION INDICES FOLLOW-UP TABLE

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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 pavement 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. Scope of use for Wd/Wd+ Joint

The Wd/Wd+ joint is mainly used as an expansion joint for roads. With its exceptional robustness thanks to its aluminium metal elements, it is specially designed for heavy and intense traffic.

## 1.4. Design

The Wd/Wd+ expansion joint is designed in accordance with the guidelines of the European Technical Approval (ETA) for expansion joints according to European Assessment Document. The calculation note checks the sufficient mechanical strength of the Wd joint under static load and also to fatigue. The expansion joint is also sized according to AASHTO for part of the range (AASHTO LRFD).


FREYSSINET

Wd EXPANSION JOINTS

ETAG 032

MECHANICAL RESISTANCE
Calculation note

JWD000-NCA 001 B

## 1.5. Manufacturing

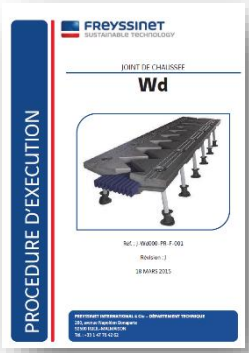
Freyssinet designs and manufactures his own expansion joints. By this way, we are able to guarantee to all of our customers the same level of excellence and quality in our products and services.

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.

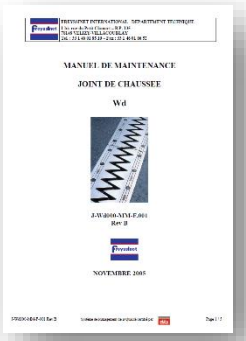
## 1.6. Installation

The installation of Wd/Wd+ is a delicate operation during which any error or lack of precision can, during the lifetime of the structure, induce harmful effects on the expansion joint, and in extreme cases, endanger the integrity of the structure. The service life and proper operation of expansion joints are closely linked to the quality of their installation. That is why Freyssinet has written a procedure that describes the principles to be followed in order to guarantee the correct installation of the joint. The installation manual is available on request.




## 1.7. Survey

Expansion joints are the essential elements of a bridge. Their durability depends on traffic, environmental conditions and quality of their installation. It is essential to apply a control and maintenance policy to deal with any problems: painting, protection, wear and tear... Freyssinet has decided to draft a monitoring and maintenance procedure in accordance with European directives that will extend the life of expansion joints. Maintenance manual is available and must be followed carefully by the bridge owner to establish an appropriate maintenance program.



# 2. APPLICABLE DOCUMENTS

## 2.1. Specific documentation

The use of Wd/Wd+ is inseparable from the following documentation (latest version):

- Installation procedure J-Wd000-PR-F-001
- Maintenance Manual J-Wd000-MM-F-001
- Calculation note ETAG 032 J-Wd000-NC-A-001*
- Calculation note (Wd60 to Wd230) AASHTO (Edition 2010) J-Wd000-NC-A-006*
- Technical specifications J-Wd000-SP-F-001 *

*Documents not supplied and certain documents only available in English or French version

## 2.2. Standards for components

FPC has analysed 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

| Designation | Applicable standard | Material |
|---|---|---|
| **Main elements** | | |
| Metal element | NF EN 1706 | Aluminium alloy |
| Elastomer profile | Freyssinet specifications | Mixture EPDM |
| **Joint fixations** | | |
| Socket | NF EN 1563 / ASTM A536 | EN-GJS-400-15 / 65-45-12 |
| Threaded rod / Screw | ISO 4014 / DIN 931<br>NF EN E25-136 / DIN 976 | Screw M12 Class 10.9 (Wd60, Wd80)<br>Screw M16 Class 10.9 (Wd110)<br>Rod M22 Class 10.9 (Wd160, Wd230, Wd320) |
| Washer | ISO 7089 / DIN 125<br>NF EN 10083 | Class 10.9 (Wd60, Wd80 and Wd110)<br>C40 (Wd160, Wd230 and Wd320) |
| Nut | ISO 4032 / DIN 934 | HR Class 10 |
| PVC Spacer | NF EN 50086 | P.V.C. |
| Product for filling anchorages | Freyssinet specifications | Pure bitumen |
| **Accessories** | | |
| Drain | NF EN 10088 | Freyssinet specifications |
| Sidewalk joint (PL et TO) | Joint TO for Wd60 and Wd80<br>Joint PL for other models | |
| Upstand | NF EN 10025 | S235 JO |

*Table 1 : Standards for components*

## 2.3. Standards for manufacturing

| Designation | Applicable standard |
|---|---|
| Manufacture of metal structures | NF EN 1706 |
| Elastomer manufacturing | Freyssinet specifications |
| Geometric characteristics | ISO 8062 |

*Table 2 : Manufacturing standards*

## 2.4. Standards for quality control

| Designation | Applicable standard |
|---|---|
| Mechanical characteristics | NF EN 1706 / EN 1563 / ASTM A536 |
| Corrosion protection control | NF EN ISO 2808 |

*Table 3 : Control standards*

# 3. DESCRIPTION OF Wd/Wd+

## 3.1. Overview

Belonging to the family of console tooth joints, the Wd and Wd+ joints consist of pairs of independent triangular tooth elements cast in aluminum alloy, delivered in length of one meter and arranged facing each other. A succession of pairs of elements installed end to end forms the joint line. Fasteners ensure that the metal elements are anchored to the structures. The underside of the joint, in contact with the concrete, can be coated with an epoxy paint (model Wd+) for structures subjected to high humidity and/ or de-icing salts.

Les Wd/Wd+ joints are designed to ensure a certain comfort for the user:

- The triangular teeth of the metal elements allow uninterrupted operation and ensure perfect rolling continuity and a significant reduction of noise.
- The accessibility of the anchor screws and the short length of the elements allow easy maintenance and removal without interrupting traffic other than the track concerned. The effective capacity of the Wd and Wd+ joints is determined according to the angle of the structure and varies from 60 to 320 mm depending on the model.

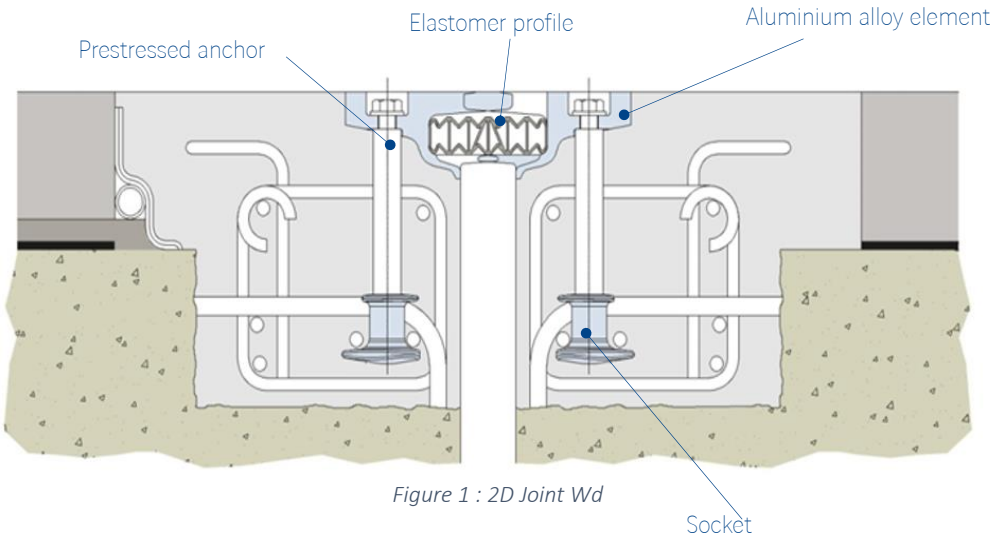



*Figure 1 : 2D Joint Wd*

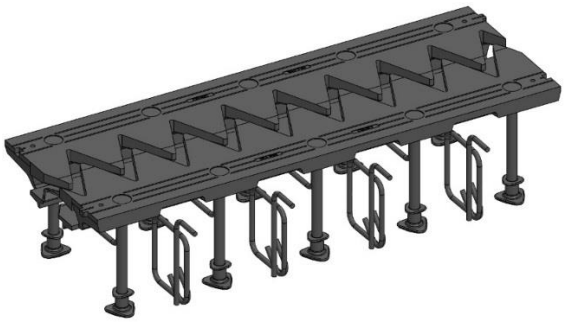


*Figure 2 : 3D joint Wd80*

## 3.2. Movement capacity

| Type | Longitudinal movement (mm) |
|---|---|
| Wd/Wd+ 60 | 60 |
| Wd/Wd+ 80 | 80 |
| Wd/Wd+ 110 | 110 |
| Wd/Wd+ 160 | 160 |
| Wd/Wd+ 230 | 230 |
| Wd/Wd+ 320 | 320 |

*Table 4 : movement capacity*

The table below shows the blast capacity of the Wd/Wd+ joints as a function of the angle(a) of the structure.

| Type | Droit (100gr) | 80 gr | 60 gr | 40 gr | 30 gr |
|---|---|---|---|---|---|
| Wd/Wd+ 60 | 60 | 61 | 71 | 66 | 67 |
| Wd/Wd+ 80 | 80 | 84 | 92 | 85 | 86 |
| Wd/Wd+ 110 | 110 | 116 | 104 | 92 | 90 |
| Wd/Wd+ 160 | 160 | 169 | 158 | 141 | 139 |
| Wd/Wd+ 230 | 230 | 185 | 127 | 102 | 97 |
| Wd/Wd+ 320 | 320 | 231 | 150 | 120 | 112 |

*Table 5 : Movement capacity according to the angle of the structure*

*(Dimension en mm)*

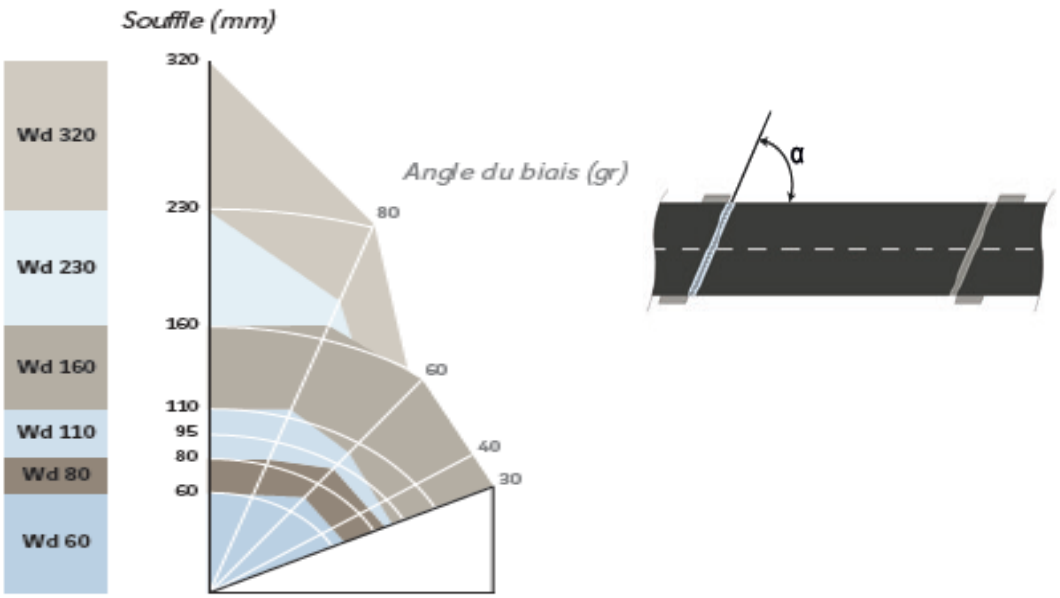



*Figure 3 : Wd joint range of stroke*

Example: If the angle of the structure is 80 gr (72°), and you need a movement of about 116 mm, the most appropriate joint is Wd/Wd+110.

Wd/Wd+ joints only accept very little vertical movement (maximum 3 mm). The transversal movement of the Wd/Wd+ joint depends on the opening of the joint.

Below is a graph representing the possible transversal movements according to the models and the stroke.

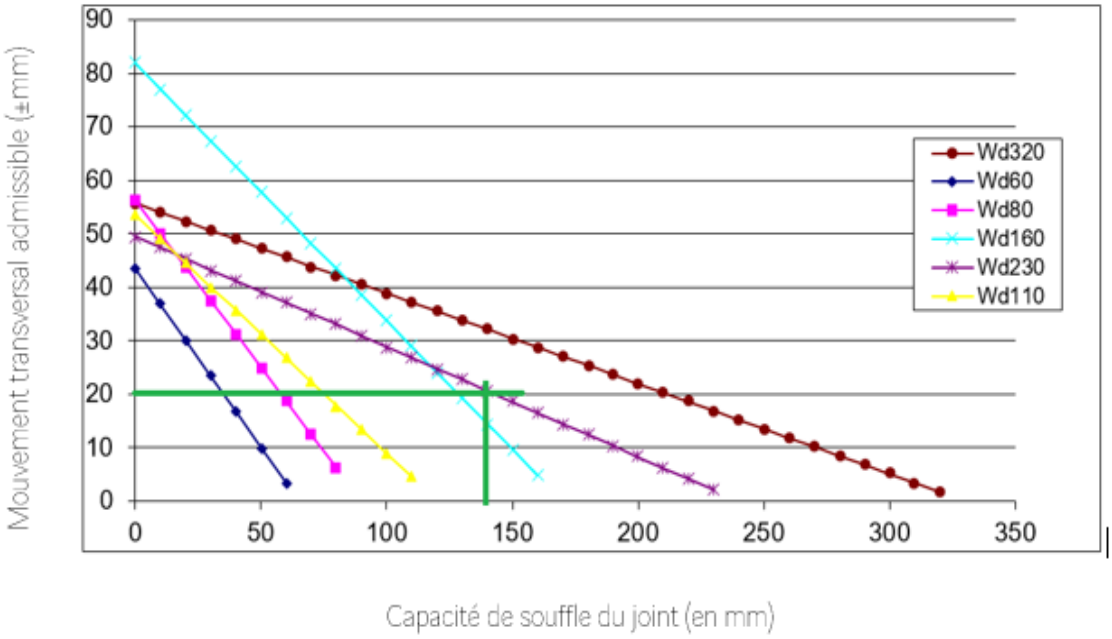
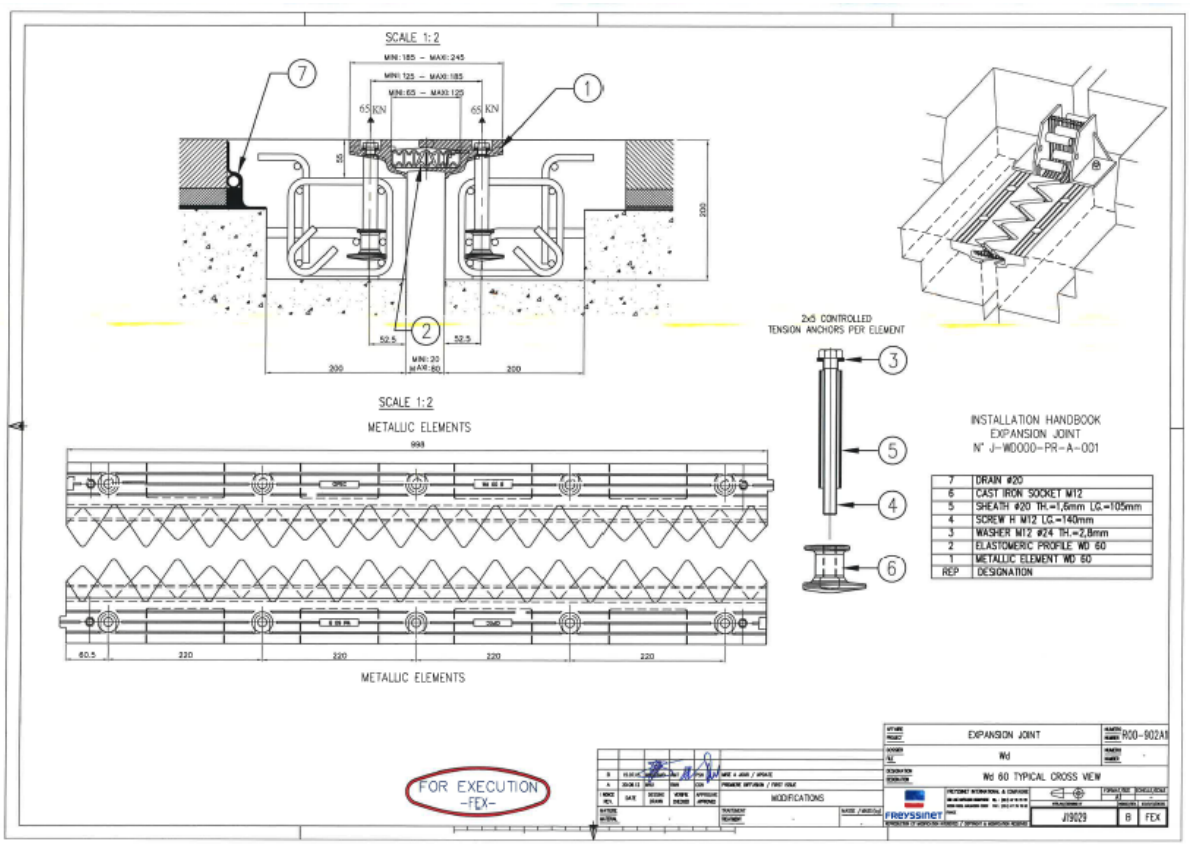



*Figure 4 Graph of permissible transverse movements as a function of joint breaths*

Example : If a maximum stroke of 140 mm and a maximum transverse displacement of +/-20 mm are required, the most suitable joint is Wd230 (see green lines).

## 3.3. Drawings

General drawings (joint elements and fixing) can be given in the formats .pdf and .dwg upon request. 3D views are also available.




## 3.4. Components

### 3.4.1. Metal element

These elements ensure the protection of the deck and abutment ends and continuity of the bearing.

**Material:** Aluminium alloy

### 3.4.2. Elastomeric profile

It ensures the tightness of the joint.

**Material** : EPDM

Elastomer profiles are available in lengths of 25 m.

However, depending on the quantities and deadlines, different lengths may be offered.

*Figure 5 : Elastomeric profile*

### 3.4.3. Joint fixings

#### 3.4.3.1. Socket

To ensure the anchoring of the screw (WD60, 80 and WD 110) or the threaded rod (WD160, 230 and 320) and the diffusion of tension forces in the concrete, we use a cast iron socket.

**Matériau** : EN-GJS-400-15

#### 3.4.3.2. Threaded rod or screws

Ensures the holding of the element on its support.

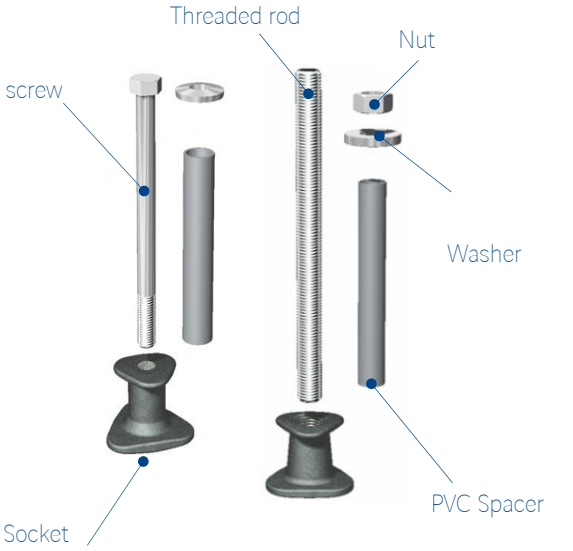



*Figure 6 : Exploded 3D view of the fixings elements*

#### 3.4.3.3. Washer

The washer distributes the force over the metal element.

#### 3.4.3.4. Nut

This element ensures tightening of screws, threaded rods  and their maintain

#### 3.4.3.5. Spacer tube

The spacer tube makes it possible to keep a free length of the fastening on the concrete. The free length allos the elongation of the fastening during the tensioning and ensure loss of prestressing at very long time run, perfectly controlled and reduced.

#### 3.4.3.6. Filling product for anchors

It's used for the protection and the waterproofness of the anchorages, in particular when installation is finished so as to fill the reservations of the anchorage heads and the handling holes of the levelling beams.

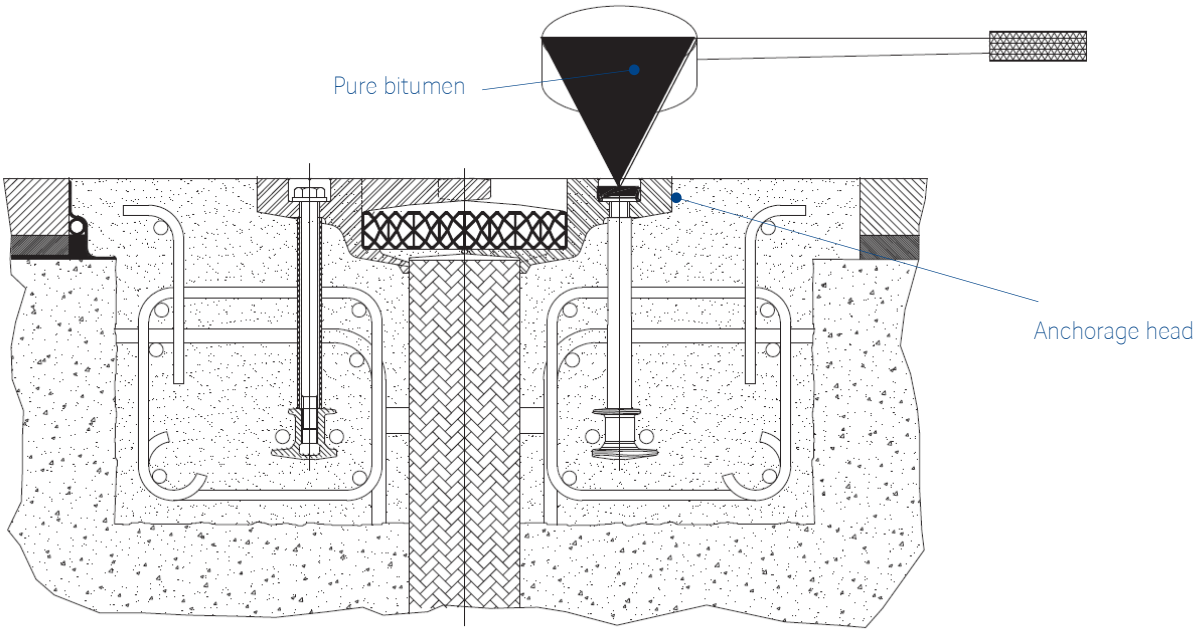



*Figure 7 : Diagram of the filling of the pure bitumen anchors*

### 3.5. Corrosion protection - Wd+ only

The underside of the joint, in contact with the concrete, can be coated with epoxy paint for structures subjected to high humidity and de-icing salts.

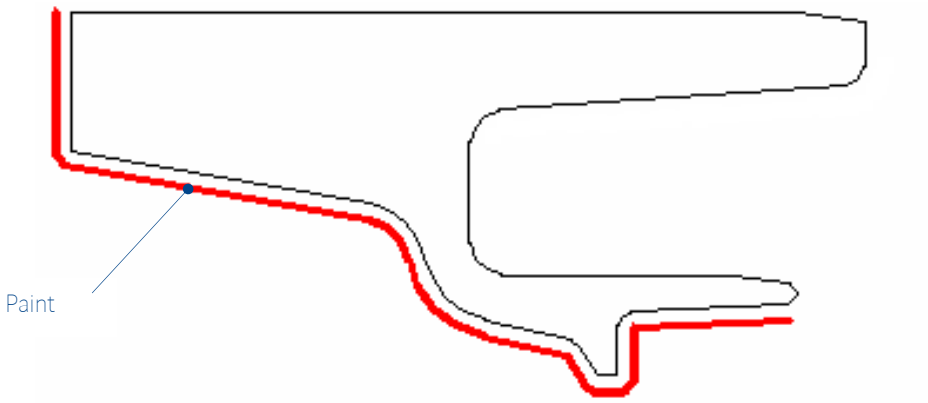



*Figure 8 : Paint areas (in contact with concrete)*

## 3.6. Accessories

The following options are not included in the Wd/Wd+. They must be clearly requested by the client if necessary.

### 3.6.1. Sidewalk joint

To complete the general waterproofing at the pavement joint and the continuity of joint treatment on sidewalks (or non-circulated areas), the accessories below are available.

| Type | Sidewalk joint model |
|---|---|
| Wd/Wd+ 60 | TO 80 |
| Wd/Wd+ 80 | TO 80 |
| Wd/Wd+ 110 | PL 110 |
| Wd/Wd+ 160 | PL 160 |
| Wd/Wd+ 230 | PL 230 |
| Wd/Wd+ 320 | PL 350 |

*Table 6 : Models of sidewalk joint Wd/Wd+*

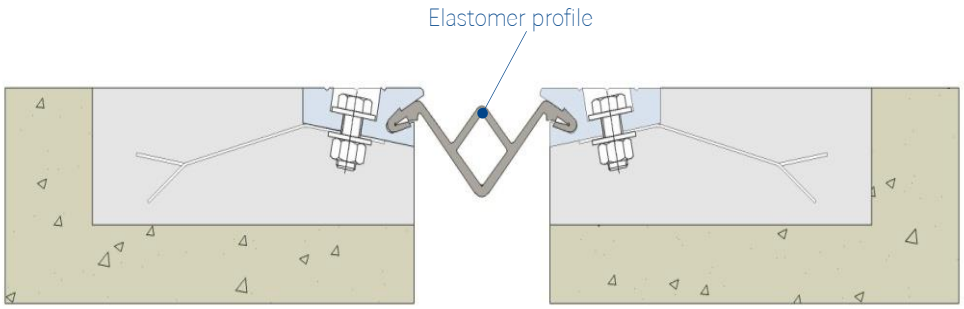



*Figure 9 : Sidewalk joint model TO*

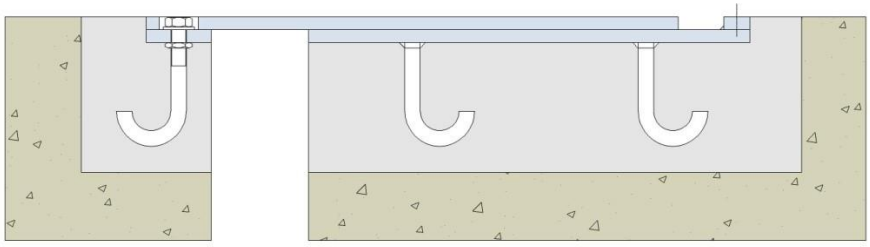


*Figure 10 : Sidewalk joint model PL*

Several types of sidewalk joints can be offered (with or without waterproofing membrane, with or without kerb, with or without skew).

### 3.6.2. Upstand

Its function is to ensure the "elastomer profile lifting" and it is generally used at low point of the joint line. However, there is no contraindication to using it at the high point as well.

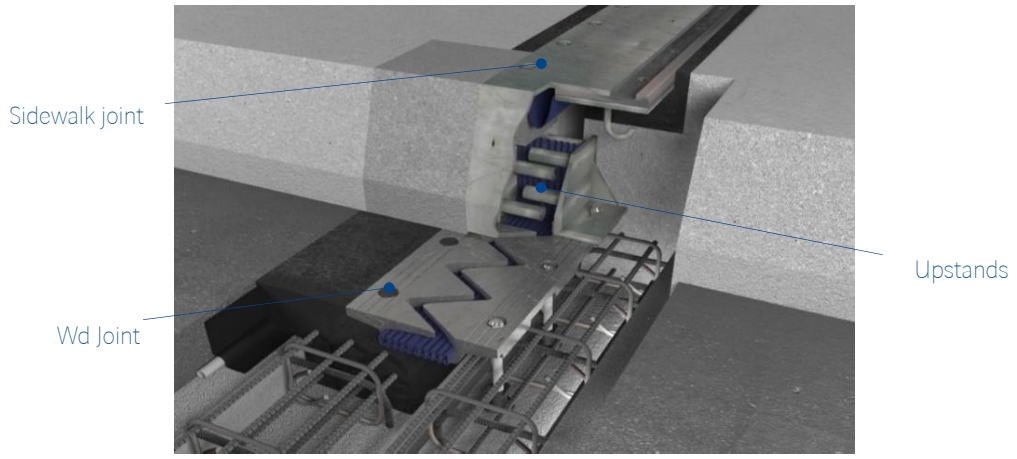



*Figure 11 : 3D image of the sidewalk joint*

*Figure 12 : Upstand installation*

Note : If upstands are to be used, additional joint lengths must be provided.
For example, if the length of the pavement between sidewalks is 10m, an additional 140mm must be provided for each upstand used in order to be able to fix it on the non-traffic area.

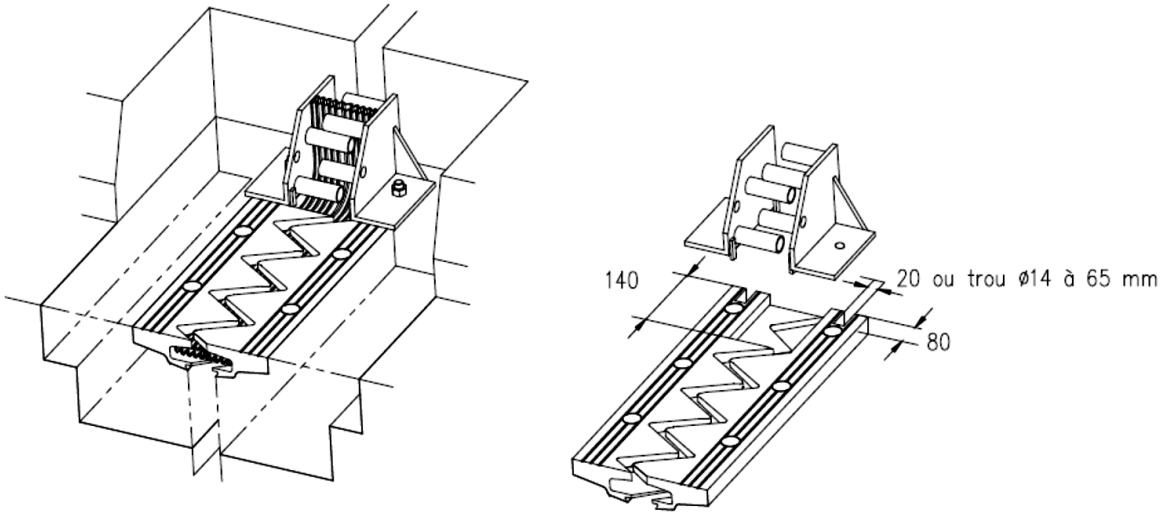



*Figure 13 : Diagram of the cutting and assembly of the upstands*

### 3.6.3. Cover plate

Covers plate can be offered in addition to complete the set "joint - upstand- sidewalk joint" assembly. These galvanized border covers are adaptable to type T2 or T3 borders.

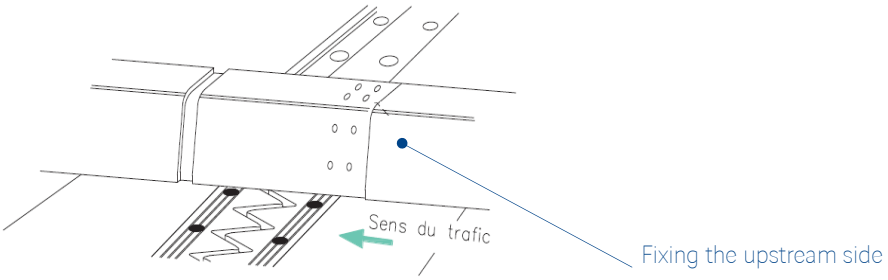



*Figure 14 : 3D diagram of the sidewalk joint with border cover*

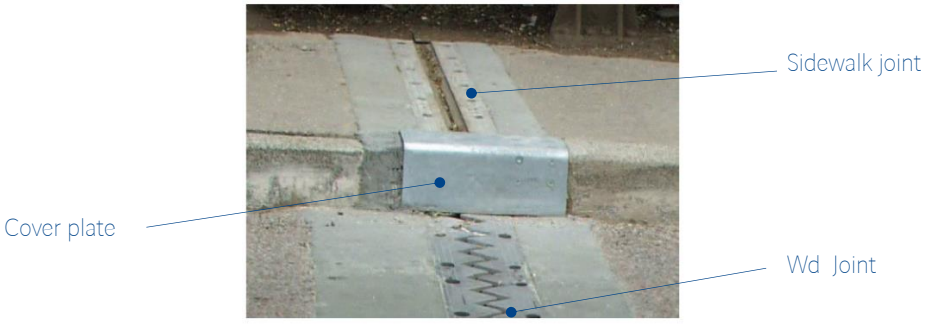



*Figure 15 : Sidewalk joint with border cover*

### 3.6.4. Levelling beams

The levelling beam are used for the installation. This equipment is necessary to install on level the joint between the bridge and the abutment.

Levelling beam

*Figure 16 : Installation of the Wd joint*

### 3.6.5. Drain

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

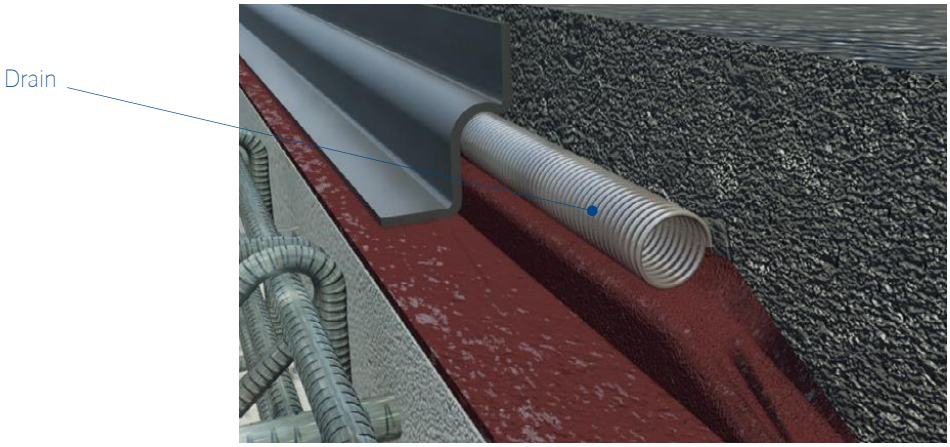



*Figure 17 : Detail of the drain assembly*

Some components of the stainless steel drain are subject to special regulations concernaning 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).

A drain installation procedure is available on request.

# 4. DESIGN

## 4.1. Calculation

The Wd/Wd+ joint is designed according to ETAG 032 for all models.
It is also designed according to AASHTO (Edition 2010) for models Wd60 to Wd230.

## 4.2. Testing

The Wd/Wd+ joint has been tested according to ETAG 032 :

- Fatigue test
- Corrosion test
- Watertightness test

*Figure 18 : Test assembly*

## 4.3. Warranty

The beneficiary provisions of the present deed of warranty ("Warranty") are applicable for the sole purpose of the sales of Wd / Wd+ 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 warrants that the Goods supplied to the beneficiary of this Warranty are manufactured in compliance with the applicable technical specifications.
- In the event the Warrantee notifies the Supplier of any Defect within:
  - Two (2) years for elastomeric components and corrosion protection;
  - Five (5) years for other components;

  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;
  - For all components supplied as part of the Goods, Supplier's Warranty shall apply to any repaired or replaced Goods, for an extended period of one (1) year following completion of repair or delivery of replacement Goods, not to exceed an overall Warranty period of three (3) years for elastomeric components and corrosion protection, and six (6) years for other components.

### 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 manuals listed below;
- The Defect arises as a result of any error or omission of any drawing, design or specification supplied by the Warrantee to the Supplier;
- 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), wilful damage, negligence or abnormal storage or working conditions or any misuse of the Goods, including in particular damage resulting from rough handling;
- The Defect arises from the occurrence of any Force Majeure event, Act of God, fire, and other circumstances beyond the Supplier's reasonable control;
- The Defect arises from an exposure at an outside temperature above 50°C;
- The Defect arises from overloads, stresses, impacts, sliding movements and any other parameter exceeding data provided in the applicable technical specifications.

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; and
- 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 and water needed for any correction work.

#### 4.3.3. Duties of the Beneficiary

The Warrantee shall follow the instructions provided in the installations and maintenance manuals (in their latest versions)

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.

## 4.4. Quality

### 4.4.1. Quality - ISO 9001

FPC is certified since September 1997 (according to successive standards as ISO 9002 v94 and ISO 9001 v2000). Since the renewal audit of June 2018, the company is certified ISO 9001 v2015.
Manufacturing, sale and trade of structure equipment (road expansion joints, bearings and seismic protection devices) and components for cable stays and concrete prestressing.
Trade of products for structure reinforcement.
Exclusion from the field of application: Design and development carried out by the Technical Department of Freyssinet International & Cie.

### 4.4.2. Security - OHSAS 45001

FPC is certified OHSAS 45001 since 2018

### 4.4.3. Environment – ISO 14001

FPC is certified ISO 14001 v 2015 since June 2018


Certificat
Certificate
N° 1997/8276.11
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FREYSSINET PRODUCTS COMPANY
ISO 9001 : 2015
2021-07-15
2024-04-04
Julien NIZRI
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification


Certificat
Certificate
N° 2011/39985.7
Page 1 / 1
FREYSSINET PRODUCTS COMPANY
ISO 45001 : 2018
2021-07-15
2024-07-14
Julien NIZRI
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification


Certificat
Certificate
N° 2010/38401.5
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FREYSSINET PRODUCTS COMPANY
ISO 14001 : 2015
2021-07-15
2024-07-04
Julien NIZRI
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification

## 4.5. Quality documentation

Different levels of quality documentation can be provided (Level 0 to Level 2). The definition of each level is available in the price list of the quality files sent with the offer. The level of quality documentation must be determined at the beginning of the project.

| JOINT Wd | | | | |
|---|---|---|---|---|
| Item | Documentation | Level 0 | Level 1 | Level 2 |
| General Documentation | Delevery note | X | X | X |
| | ITP | - | - | X |
| Expansion joint element | Material certificate * | - | - | - |
| | ITP | - | - | X |
| Socket | Certificat matière 3.1 | - | X | X |
| | ITP | | - | X |
| Elastomer profile | Material certificate 3.1 | - | X | X |
| | ITP | - | - | X |
| Final check | Corrosion control reports | - | - | - |

*Table 7 : Quality documentation of Joint Wd*

| JOINT Wd+ | | | | |
|---|---|---|---|---|
| Item | Documentation | Level 0 | Level 1 | Level 2 |
| General Documentation | Delevery note | X | X | X |
| | ITP | - | - | X |
| Expansion joint element | Material certificate * | - | - | - |
| | ITP | - | - | X |
| Socket | Material certificate 3.1 | - | X | X |
| | ITP | | - | X |
| Elastomer profile | Material certificate 3.1 | - | X | X |
| | ITP | - | - | X |
| Final check | Corrosion control reports | - | - | X |

*Table 8 : Quality documentation of joint Wd+*

All documents can be consulted during an audit.

*The certificate(s) of the component's material(s) is (are) not communicated.

# 5. REFERENCES

The list of references for FPC projects is available on request but can also be consulted on the FPC website.