Austrian Institute of Construction Engineering
Schenkenstrasse 4 | T +43 1 533 65 50
1010 Vienna | Austria | F +43 1 533 64 23
www.oib.or.at | mail@oib.or.at

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
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European Technical Assessment

ETA-20/0028
of 30.06.2020

General part

Technical Assessment Body issuing the European Technical Assessment	Austrian Institute of Construction Engineering (OIB)
Trade name of the construction product	MAURER XC1 Expansion Joint
Product family to which the construction product belongs	Nosing expansion joints for road bridges
Manufacturer	Maurer SE Frankfurter Ring 193 80807 München Germany
Manufacturing plant(s)	Comprehensive list of manufacturing plants laid down in the technical documentation
This European Technical Assessment contains	24 pages including 11 Annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval (ETAG) No 032 “Expansion joints for road bridges Part 4: Nosing expansion joints”, edition May 2013, used as European Assessment Document (EAD)

Specific parts

1 Technical description of the product

The nosing expansion joint **MAURER XC1 Expansion Joint** is a kit consisting of the following components:

- Flexible elastomeric sealing element made of EPDM:
  "MAURER Sealing Element 100" (Pos. 1 in Figure 1, Figure 2 and Figure 3 in this ETA), material characteristics given in Annex 1.9 in this ETA.
- Edge profiles:
- "MAURER Edge Profile XC1/70" (Pos. 3a in Figure 1 in this ETA) or "MAURER Edge Profile XC1/120" (Pos. 3b in Figure 2 in this ETA) of at least steel grade S355J2+N according to EN 10025-2. Details are given in Annex 1 in this ETA.
- "MAURER Edge Profile D1/40" (Pos. 3d in Figure 3 in this ETA) of at least steel grade S235JR+N according to EN 10025-2 for the intended use in footpath.
- Noise reducing plates "MAURER M-Plate XC1/70°", "MAURER M-Plate XC1/90°" or "MAURER M-Plate XC1/110°" of at least steel grade S355J2+N according to EN 10025-2 (Position 4a-c in Figure 1 and Figure 2, details are given in Annex 1.1, Annex 1.3 and Annex 1.6 in this ETA) to be used with edge profiles XC1/70 resp. XC1/120.
- Bolt M12 and washer, material quality at least 10.9, 300HV according to EN 14399-4 and EN 14399-6 respectively, for fixing of the noise reducing plates to the edge profiles XC1/70 or XC1/120 (Position 5a in Figure 1 and Figure 2 in this ETA).
- Anchor plate (Pos. 6 in Figure 1 and Figure 2 in this ETA) and anchor loop for the carriageway (Pos. 7 in Figure 1 and Figure 2 in this ETA) or anchor loop for the footpath (Pos. 8 in Figure 3 in this ETA) of at least steel grade S235JR+AR according to EN 10025-2. The mechanical fixation of the nosing expansion joint **MAURER XC1 Expansion Joint** with edge profiles XC1/70, XC1/120 or D1/40 to the substructure is done by means of the anchor plate and/or anchor loop. Details of the anchorage system are given in Annexes 1.1, 1.3 and 1.8 in this ETA.
- Optional Cover plate (stud plate acc. to EN 10363 with surface texture of more than 1.2 mm) for the intended use in footpath, at least steel grade S235JR+AR according to EN 10025-2 or 1.4571 according to EN 10088-1, fixation according to Annex 1 in this ETA.
- Optional Components for kerbs and cornices are detailed in Annex 1.5 in this ETA.

The technical details of the components of the nosing expansion joint kit are deposited with the Technical Assessment Body Österreichisches Institut für Bautechnik.

The subject of this European Technical Assessment (ETA) is the complete nosing expansion joint kit **MAURER XC1 Expansion Joint**.

A schematic representation of the nosing expansion joint **MAURER XC1 Expansion Joint** is shown in Figure 1 to Figure 3 in this ETA and detailed drawings are depicted in Annex 1 in this ETA.

The minimum concrete quality for recess filling is C30/37 low shrinkage concrete according to EN 206. The reinforcement for connecting the expansion joint to the sub structure is detailed in Annex 1.8 in this ETA.

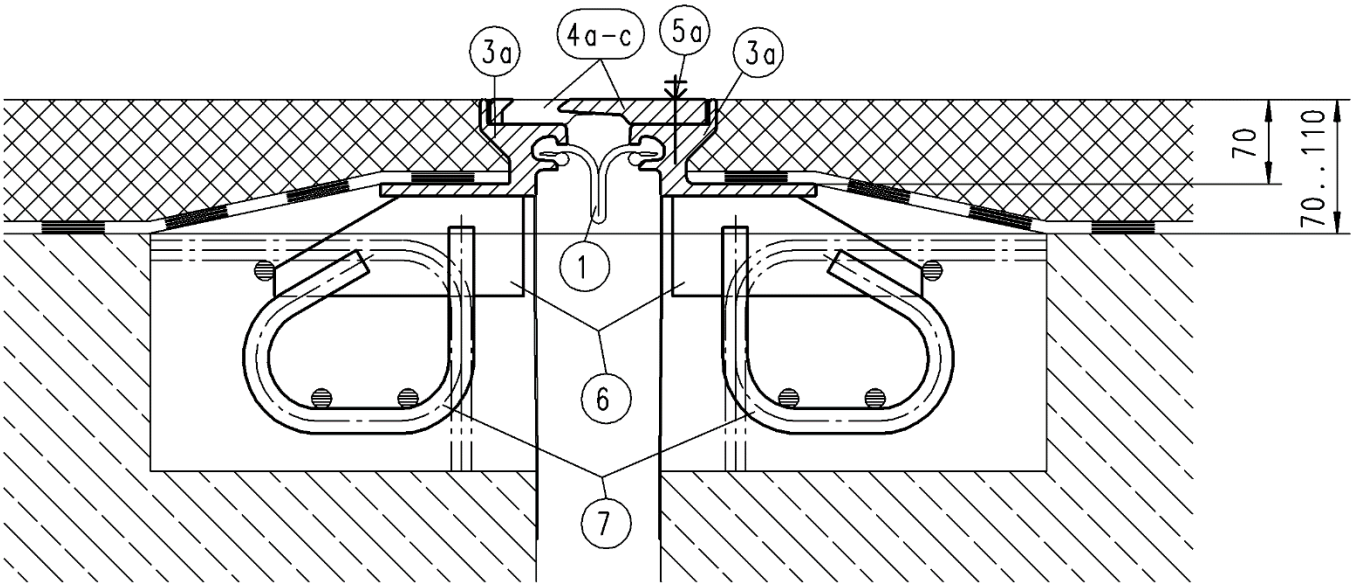


Figure 1: Exemplary cross section of the nosing expansion joint **MAURER XC1 Expansion Joint** with edge profile XC1/70 including anchorage, pavement thickness 70 mm

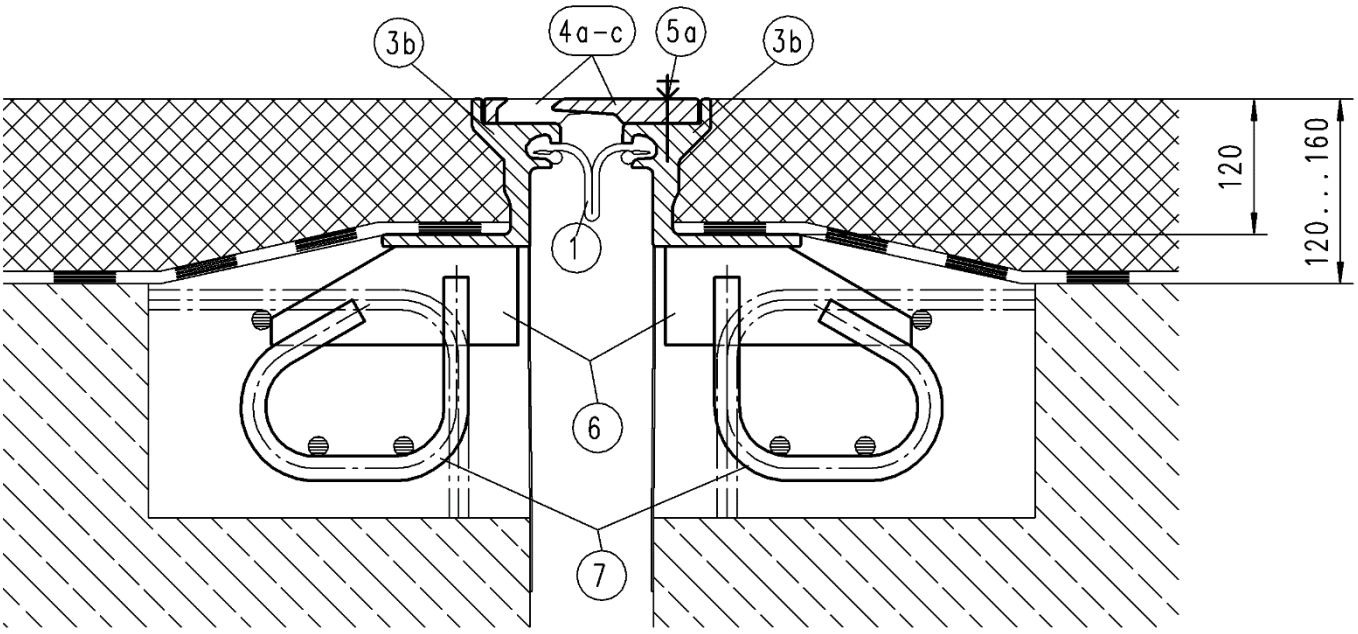


Figure 2: Exemplary cross section of the nosing expansion joint **MAURER XC1 Expansion Joint** with edge profile XC1/120 including anchorage, pavement thickness 120 mm

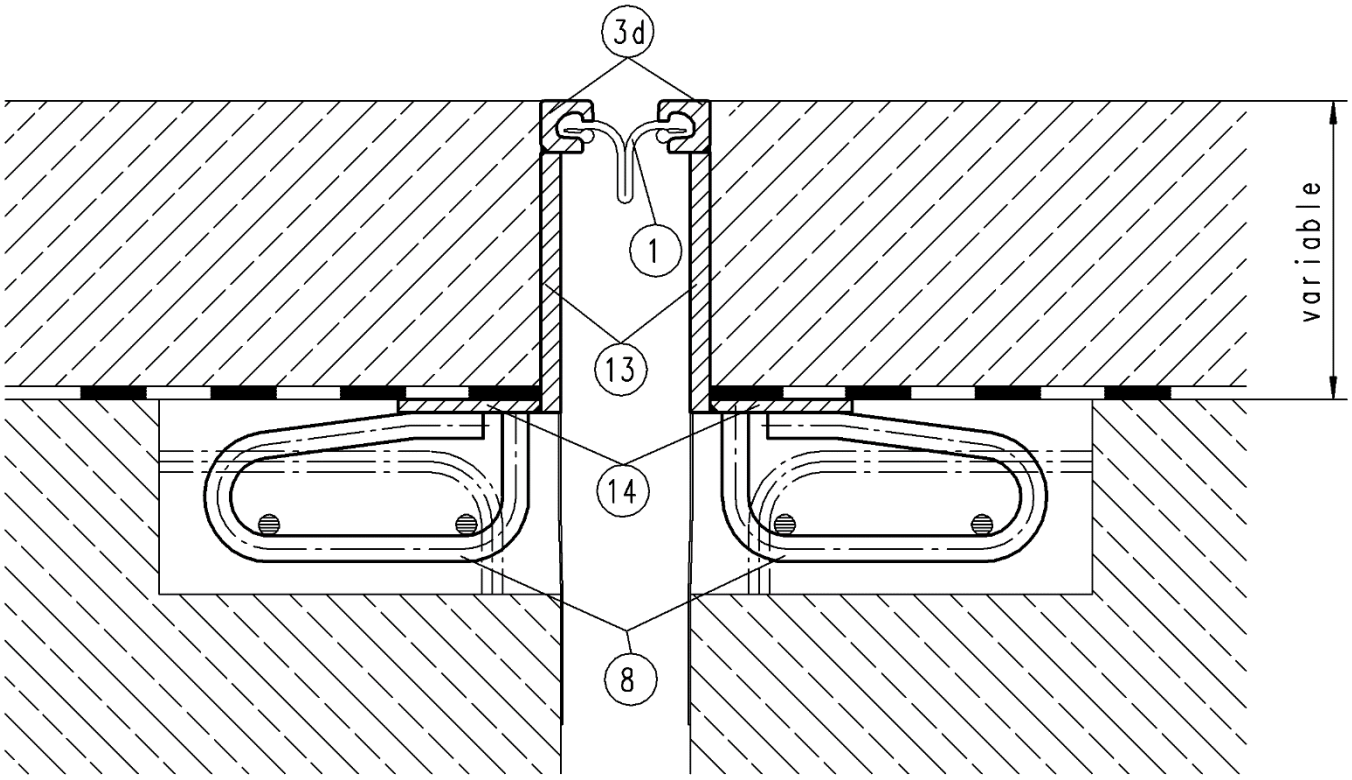


Figure 3: Exemplary cross section of the nosing expansion joint **MAURER XC1 Expansion Joint** with edge profile D1/40, including anchorage, variable pavement thickness for footpath

The substructure, bridge deck waterproofing and adjacent pavement in Figures 1 - 3 are not part of the kit covered by this ETA.

Key for Figures 1, 2 and 3:

Pos. 1	Elastomeric sealing element “MAURER Sealing Element 100”
Pos. 3a	Edge profile “MAURER Edge Profile XC1/70”
Pos. 3b	Edge profile “MAURER Edge Profile XC1/120”
Pos. 3d	Edge profile “MAURER Edge Profile D1/40”
Pos. 4a-c	Noise reducing plates “MAURER M-Plate XC1/70°”, “MAURER M-Plate XC1/90°” resp. “MAURER M-Plate XC1/110°”
Pos. 5a	Bolt and washer for fixing of the noise reducing plates to the edge profile
Pos. 6	Carriageway anchor plate
Pos. 7	Carriageway anchor loop
Pos. 8	Footpath anchor loop
Pos. 13	Vertical plate
Pos. 14	Horizontal plate

The assessed nominal movement capacities are given in Table 1, based on the definition of movement directions according to Figure 4 in this ETA.

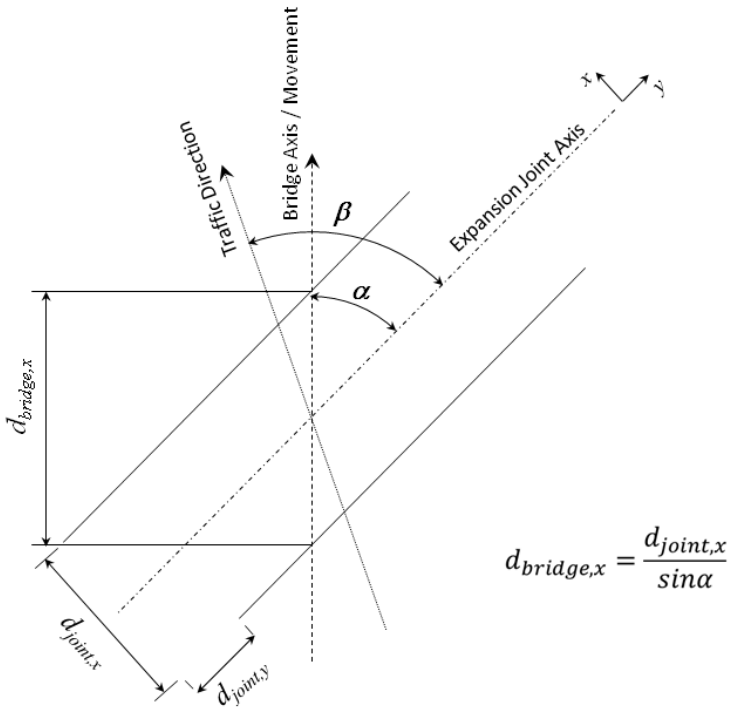


Figure 4: Definition of movement directions in relation to joint axis and bridge axis

Table 1: Movement capacity of **MAURER XC1 Expansion Joint** in different directions for a skew angle α of 90° (angle between bridge axis and joint axis)

Movement range		
Maximum movement perpendicular to joint axis	max $u_{joint,x}$ =	±50 mm (Σ 100 mm)[1)]
Maximum vertical movement [2)]	max u_z =	±6 mm for $d_{joint,x}$ = 0 mm ±7 mm for $d_{joint,x}$ = 10 mm ±8 mm for $d_{joint,x}$ = 20 mm ±9 mm for $d_{joint,x}$ = 30 mm ±10 mm for $d_{joint,x}$ = 40 mm ±11 mm for $d_{joint,x}$ = 50 mm ±27 mm for $d_{joint,x}$ > 55 mm
Maximum movement parallel to joint axis	max $u_{joint,y}$ =	±28,2 mm[3)] for $d_{joint,x}$ = 100 mm
Maximum rotations	Limitation as given for transversal, longitudinal and vertical movement	

[1)] Movement range with respect to the different skew angles and noise reduction plates is given in Table 2 and Table 3 in this ETA.
[2)] The maximum vertical movement is due to geometrical reasons depending on the opening of the joint. A maximum vertical movement of ±27 mm can be achieved for all opening positions by demounting of the M-Plates.
[3)] The maximum transversal movement is due to geometrical reasons depending on the opening of the joint, the type of M-Plate and the skew angle. This is detailed in Annex 1.10 in this ETA.

Reaction forces related to the movements of the expansion joint are given in Table 4 in this ETA.

The minimum opening of the nosing expansion joint **MAURER XC1 Expansion Joint** is 0 mm.

The values for the allowable skew angles and the values of the nominal movement capacity depending on the skew angle β with respect to gaps and voids are given in Table 2 and Table 3.

Table 2: Standard geometry of nosing expansion joint **MAURER XC1 Expansion Joint** with noise reducing plate "MAURER M-Plate XC1/90°" (see Annex 1.6) in respect to its movement capacity

User category	**Angle between traffic direction and joint axis (see Fig. 4)**	**Minimal gap in bridge axis** $d_{bridge,x}$	**Maximal gap in bridge axis** $d_{bridge,x}$	**Total bridge movement**
		[mm]	**[mm]**	**[mm]**
Vehicles	80° ≤ **β** ≤ 100°	0	101,5 for β = 80°	101,5 for β = 80°
Cyclists and small motorcycles			100 for β = 90°	100,0 for β = 90°
Pedestrians[1)]			101,5 for β =100°	101,5 for β = 100°
Pedestrians[2)]			80	80

1) Including M-Plates XC1/90° or edge profiles with cover plates for footpath
2) Edge profile D1/40 without cover plates for footpath

Table 3: Standard geometry of nosing expansion joint **MAURER XC1 Expansion Joint** with noise reducing plate "MAURER M-Plate XC1/70°" and "MAURER M-Plate XC1/110°" respectively (see Annex 1.6) in respect to its movement capacity

User category	**Angle between traffic direction and joint axis (see Fig. 4)**	**Minimal gap in bridge axis** $d_{bridge,x}$	**Maximal gap in bridge axis** $d_{bridge,x}$	**Total bridge movement**
		[mm]	**[mm]**	**[mm]**
Vehicles	60° ≤ **β** ≤ 80° or 100° ≤ **β** ≤ 120°	0	115,5 for β = 60° 106,4 for β = 70° 101,5 for β = 80° 101,5 for β = 100° 106,4 for β = 110° 115,5 for β = 120°	115,5 for β = 60° 106,4 for β = 70° 101,5 for β = 80° 101,5 for β = 100° 106,4 for β = 110° 115,5 for β = 120°
Pedestrians[1), 3)]				
Cyclists and small Motorcycles[1)]			85	85
Pedestrians[2)]			80	80

1) Including M-Plates XC1/70° resp. XC1/110°
2) Edge profile D1/40 without cover plates for footpath
3) Edge profiles with cover plates for footpath

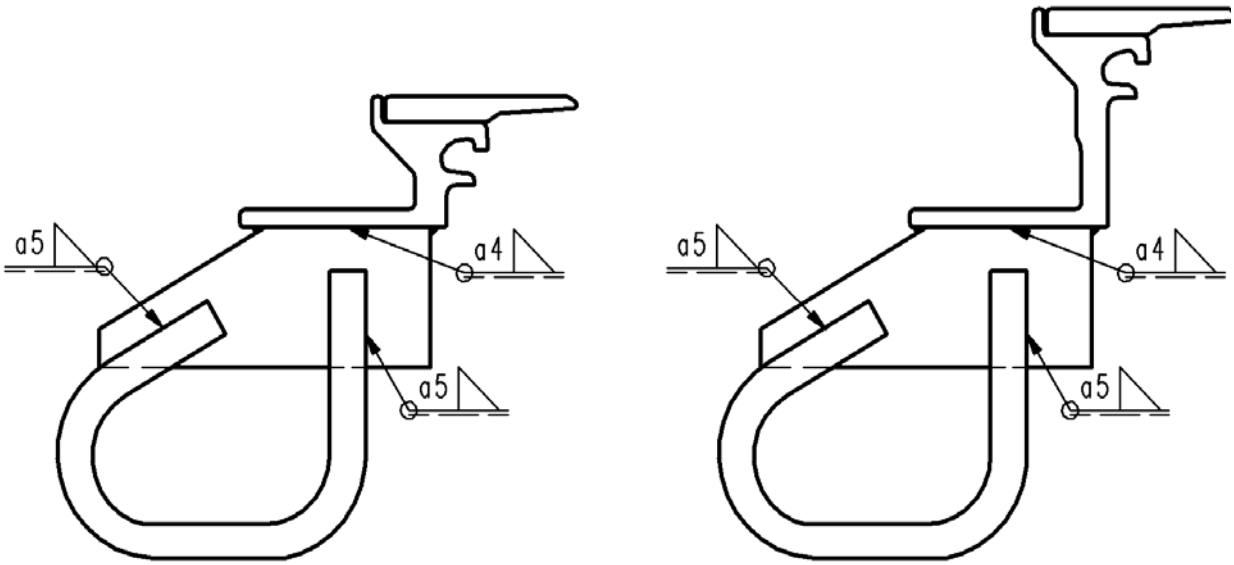
Table 4: Reaction forces resulting from movement capacity test

MAURER XC1 Expansion Joint	
Maximum tensile force in horizontal direction	+ 2,9 kN/m
Maximum compression force in horizontal direction	- 10,7 kN/m
Maximum compression force in horizontal direction (for max. transversal displacement acc. to Table 1)	- 53,9 kN/m
Maximum force in transversal direction	± 1,9 kN/m

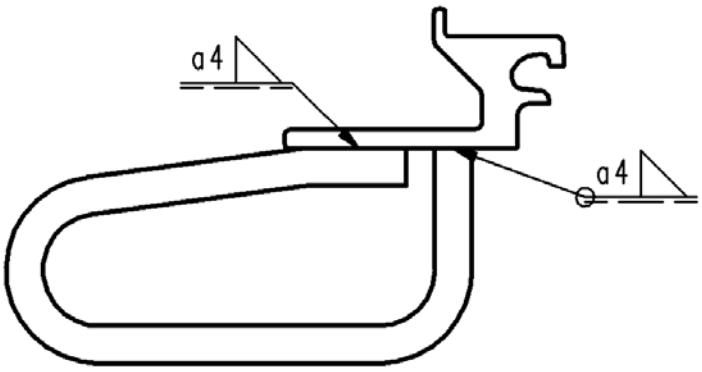
Table 5: Asphalt height

MAURER XC1 Expansion Joint with edge profile	Asphalt height a [mm]
MAURER Edge Profile XC1/70	70[1)] – 110[2)]
MAURER Edge Profile XC1/120	120[1)] – 160[2)]
MAURER Edge Profile D1/40 (for footpath only)	variable

1) asphalt height at edge profile
2) maximum asphalt height, if anchorage concrete is ramped (see Figure 1 and Figure 2)



Anchorage for carriageway



Anchorage for footpath

Figure 5: Location and thickness of welds according to EN ISO 2553

In its longitudinal axis the nosing expansion joint **MAURER XC1 Expansion Joint** consists of the carriageway, cyclist areas, or footpath, or their possible combinations, as depicted in Annex 1 of this ETA.

Provisions for proper installation (installation manual) of the **MAURER XC1 Expansion Joint** are provided for each delivered kit.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

The nosing expansion joint **MAURER XC1 Expansion Joint** is to be used in road bridges. It is used for the use categories vehicles, cyclists and pedestrians. The expansion joint system is designated to be applied in new structures as well as for refurbishment of structures.

The essential characteristics of the nosing expansion joint **MAURER XC1 Expansion Joint** are assessed for operating temperature of -40° C up to +45° C. This has been assessed on basis of material characteristics of the elastomeric sealing element and the steel elements, whereas for the use of steel elements for low temperatures EN 1993-1-10, Table 2.1, is relevant.

The use of the nosing expansion joint **MAURER XC1 Expansion Joint** according to this ETA is covering a maximum slope in traffic direction of 9%.

The use in moveable bridges (e.g. flap bridges, swing bridges) is not covered by this ETA.

The provisions made in this European Technical Assessment are based on a working life of the kit of 50 years (working life category 4 according to ETAG 032-1), provided that the kit is subject to appropriate use and maintenance as specified by the manufacturer in the maintenance instructions which follow every delivered kit. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

The working life of the nosing expansion joint kit is based on the assessment of resistance to fatigue according to the fatigue load model 1 ($FLM1_{EJ}$), meaning the fatigue life may be considered as unlimited according to ETAG 032 Part 1, Annex G, G3.1.

For the replaceable component elastomeric sealing element made of EPDM a working life of 25 years is indicated.

For corrosion protection the indications given in Table 6 of this ETA apply.

3 Performance of the product and references to the methods used for its assessment

3.1 Performance of the product

Table 6: Performance of the product in relation to the essential characteristics

Basic requirements for construction works	Essential characteristics	Method of assessment	Performance
BWR 1	Mechanical resistance	ETAG 032-4, Clause 5.1.1.2 with consideration of force parallel to joint axis	Mechanical resistance and stability is given for the product according to Annex 1 and Clause 1 in this ETA with the conditions given in Clause 3.1.1 in this ETA. Anchor forces are given in Annex 1.8 in this ETA.
	Resistance to fatigue	ETAG 032-4, Clause 5.1.1.3 in combination with ETAG 032-6, Clause 5.1.1.3.1	Resistance to fatigue is given for the product according to Annex 1 and Clause 1 in this ETA with the conditions given in Clause 3.1.1 in this ETA.
	Seismic behaviour	ETAG 032-4, Clause 5.1.1.4	According to Table 8 in this ETA.
	Movement capacity	ETAG 032-4, Clause 5.1.1.5	According to Table 1 in this ETA.
	Cleanability	ETAG 032-4, Clause 5.1.1.6	The nosing expansion joint is cleanable. The fixing of the elastomeric sealing element and the movement capacity is not influenced by the accumulation of debris.
	Watertightness	ETAG 032-4, Clause 5.1.1.8	Watertightness is given.
BWR 3	Content, emission and/or release of dangerous substances	ETAG 032-4, Clause 5.1.3	No performance assessed.
BWR 4	Allowable surface gaps and voids	ETAG 032-4, Clause 5.1.4.1.1	Declaration of allowable gaps in respect to the use categories, noise reducing plates and the range of angle β between traffic direction and longitudinal axis of the nosing expansion joint: Tables 2 and 3 in this ETA
	Level differences in the running surface	ETAG 032-4, Clause 5.1.4.1.2	Unloaded conditions: no level differences (including steps) greater than 3 mm are occurring. After loading: maximum deflection under load: <1 mm

Basic requirements for construction works	Essential characteristics	Method of assessment	Performance
Durability aspects	Corrosion	ETAG 032-4, Clause 5.1.7.1	Components made of steel: Corrosivity categories: C4 or C5 according to EN ISO 12944-2, dependent on the intended use. Corrosion protection systems: Durability range “high” (H) or “very high” (VH) acc. to EN ISO 12944-1 and EN ISO 12944-5 Exception: Stainless steel cover plate for footpath: CRC III (acc. to EN 1993-1-4, Annex A) Bolts, nuts and washers (see Annex 1.7): Hot dip galvanized acc. to EN ISO 10684 or grade A4 acc. to EN ISO 3506
	Chemicals: Resistance to de-icing salts	ETAG 032-4, Clause 5.1.7.1	Elastomeric sealing element: Durable
	Ageing resulting from: Temperature Ozone	ETAG 032-4, Clause 5.1.7.1	

3.1.1 Mechanical resistance and stability

Action categories covered by static calculation:
For the design situation ultimate limit state (ULS), the fundamental combinations of actions and the combination of actions for fatigue limit state (FLS) are considered.
For the design situation serviceability limit state (SLS) the characteristic combinations of actions and frequent combinations are considered.
Regarding optional actions, the accidental load on footpath, the accidental load on kerb and the seismic design situations according to ETAG 032-1, Annex G, are considered.

Assessment of mechanical resistance and resistance to fatigue applies for the following conditions:

Table 7: Preconditions for the assessment

Partial safety factors		Standard
γ_{M0}	1,0	EN 1993-2, Section 6.1
γ_{M2}	1,25	EN 1993-2, Section 6.1
γ_{M3}	1,25	EN 1993-2, Section 6.1
γ_{Mf}	1,15	EN 1993-1-9, Tab. 3.1
γ_{Ff}	1,0	EN 1993-2, Section 9.3
γ_{G}	1,35	ETAG 032-1, Section G.4.2.1
γ_{Q1}	1,35	ETAG 032-1, Section G.4.2.1
γ_{dE}	1,0	ETAG 032-1, Section G.4.2.1
Fatigue Load Model	FLM 1_{EJ}	ETAG 032-1
Dynamic amplification $\Delta\varphi_{fat}$	1,3	ETAG 032-4 in combination with ETAG 032-6
Dynamic upswing U_v	-0,3	ETAG 032-4 in combination with ETAG 032-6

Table 8: Seismic behaviour of **MAURER XC1 Expansion Joint** – maximum gaps during earthquake according to ETAG 032-1, Clause 4.1.1.4, for $\beta = 90°$

Approach according to ETAG 032-1, Table 4.1.1.4	**Maximum gap during earthquake**
Approach A1	100 mm
Approach A2	160 mm

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 AVCP system

According to the decision 2001/19/EC[1] of the European Commission, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V of Regulation (EU) No 305/2011) is 1.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in in the control plan deposited by the Technical Assessment Body Österreichisches Institut für Bautechnik.

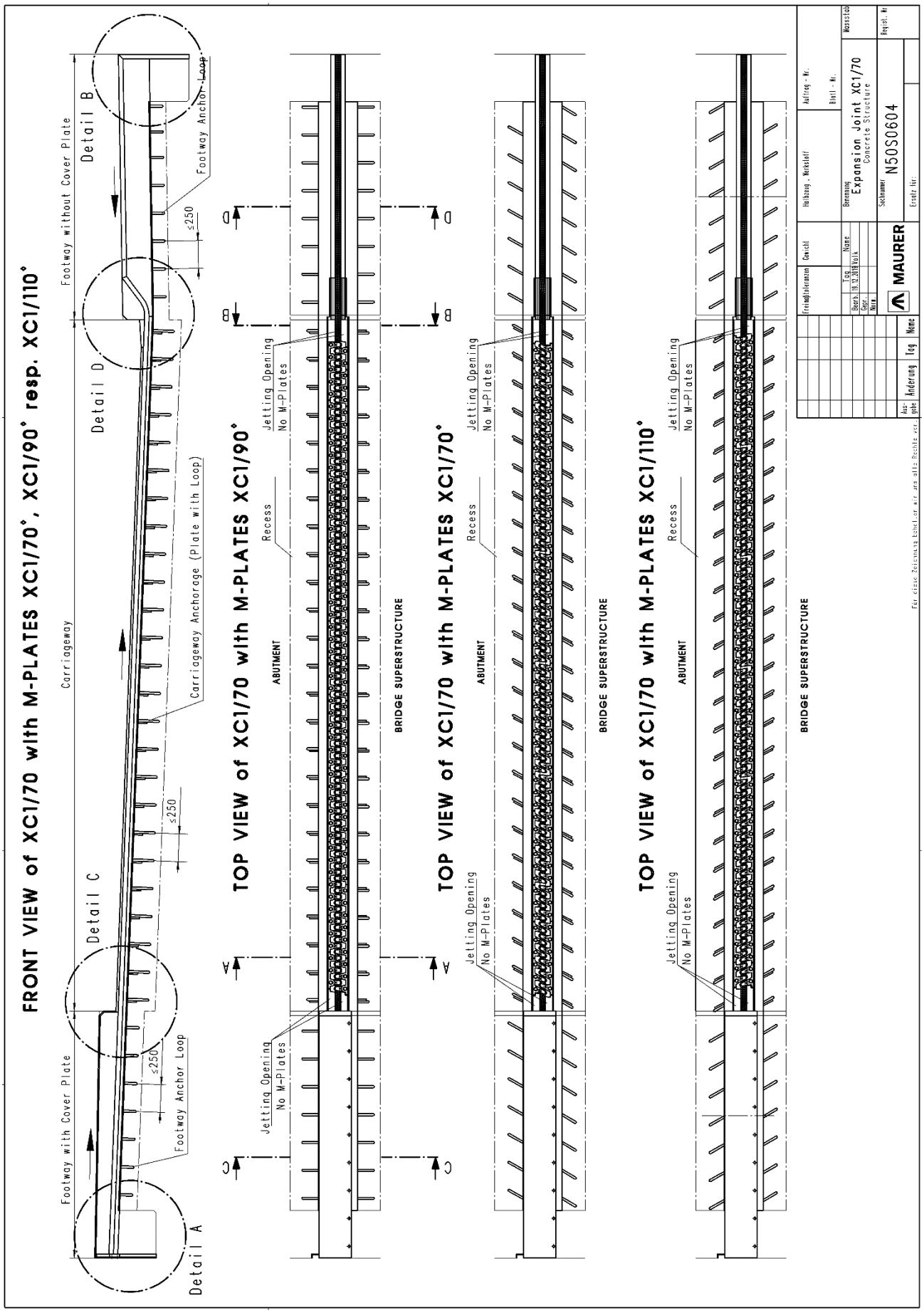
The notified product certification body shall visit the factory at least once a year for surveillance of the manufacturer.

Issued in Vienna on 30.06.2020
by Österreichisches Institut für Bautechnik

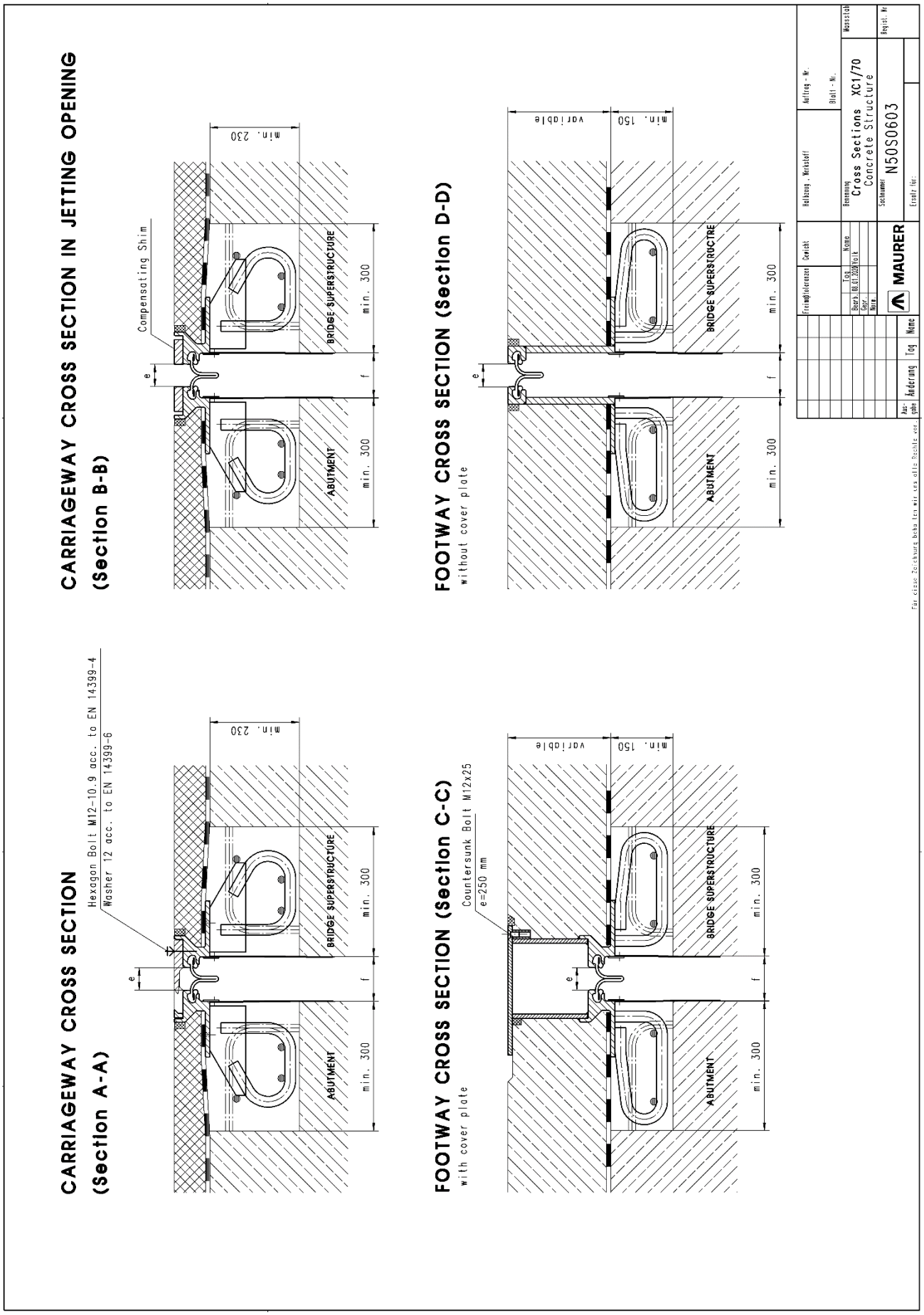
The original document is signed by

Rainer Mikulits
Managing Director

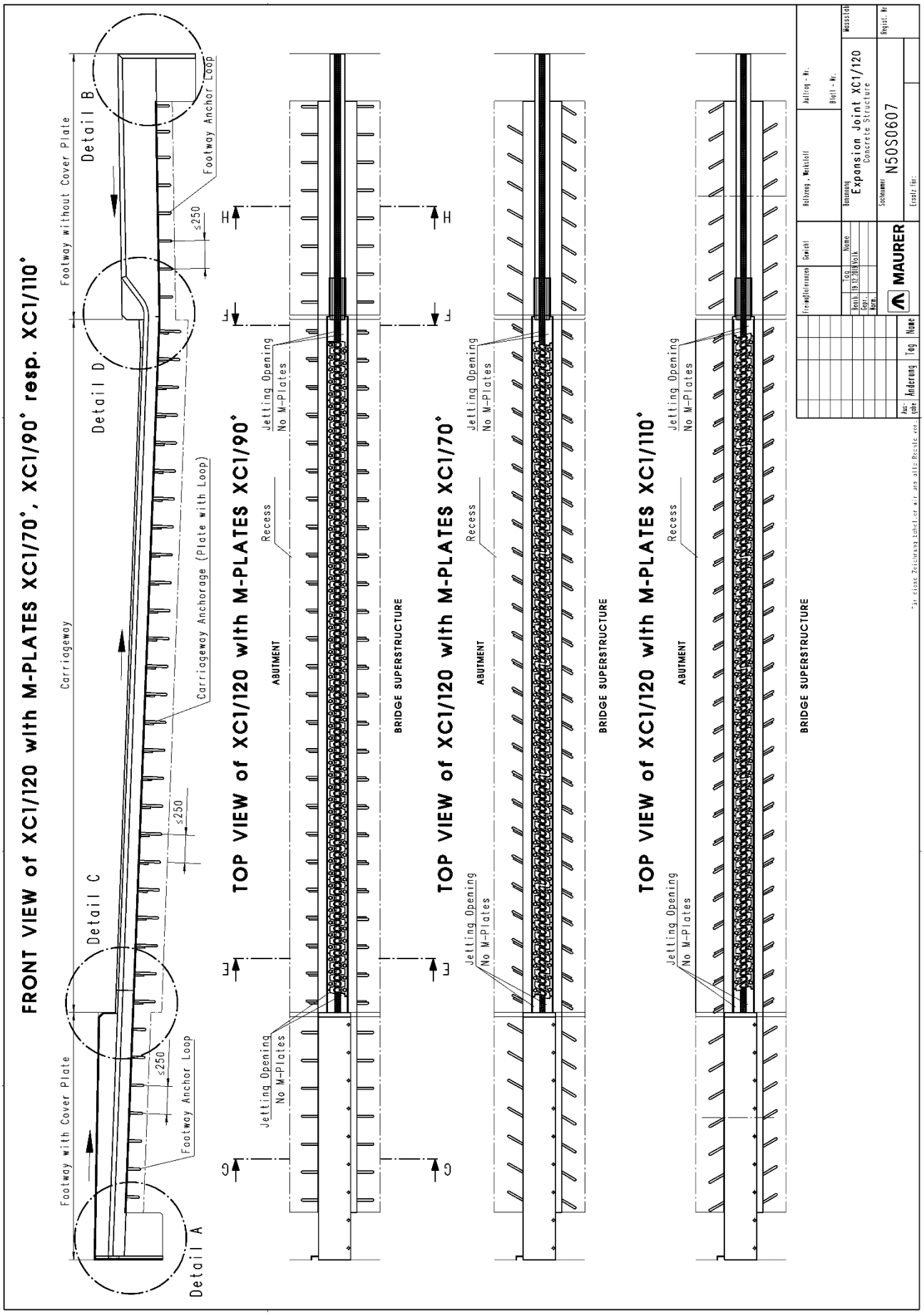
[1] Official Journal of the European Communities N° L 005, 10.1.2001, p. 6-7



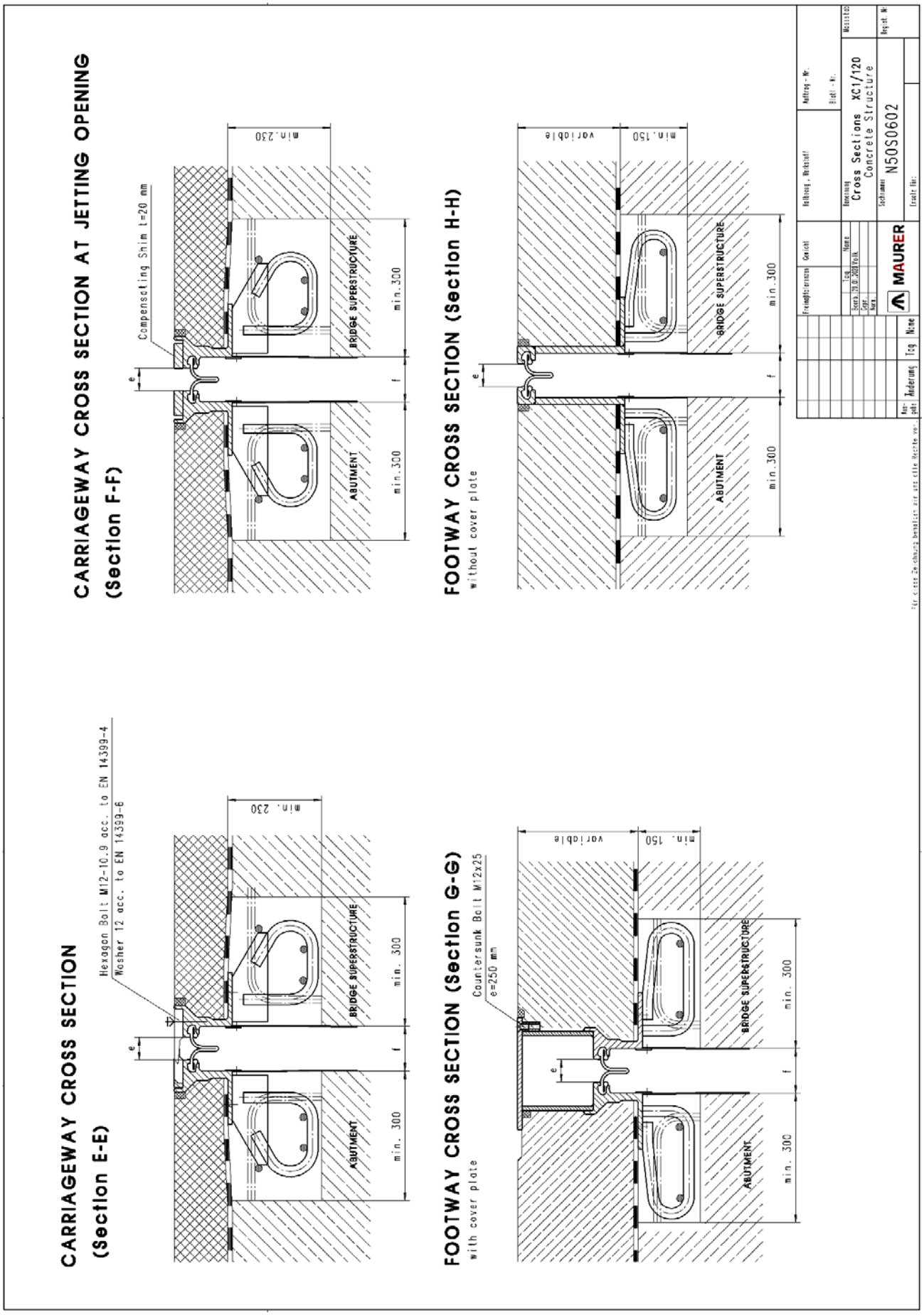
MAURER XC1 Expansion Joint with Edge Profile XC1/70 **Front View and Top View**	**Annex 1.1** of European Technical Assessment ETA-20/0028



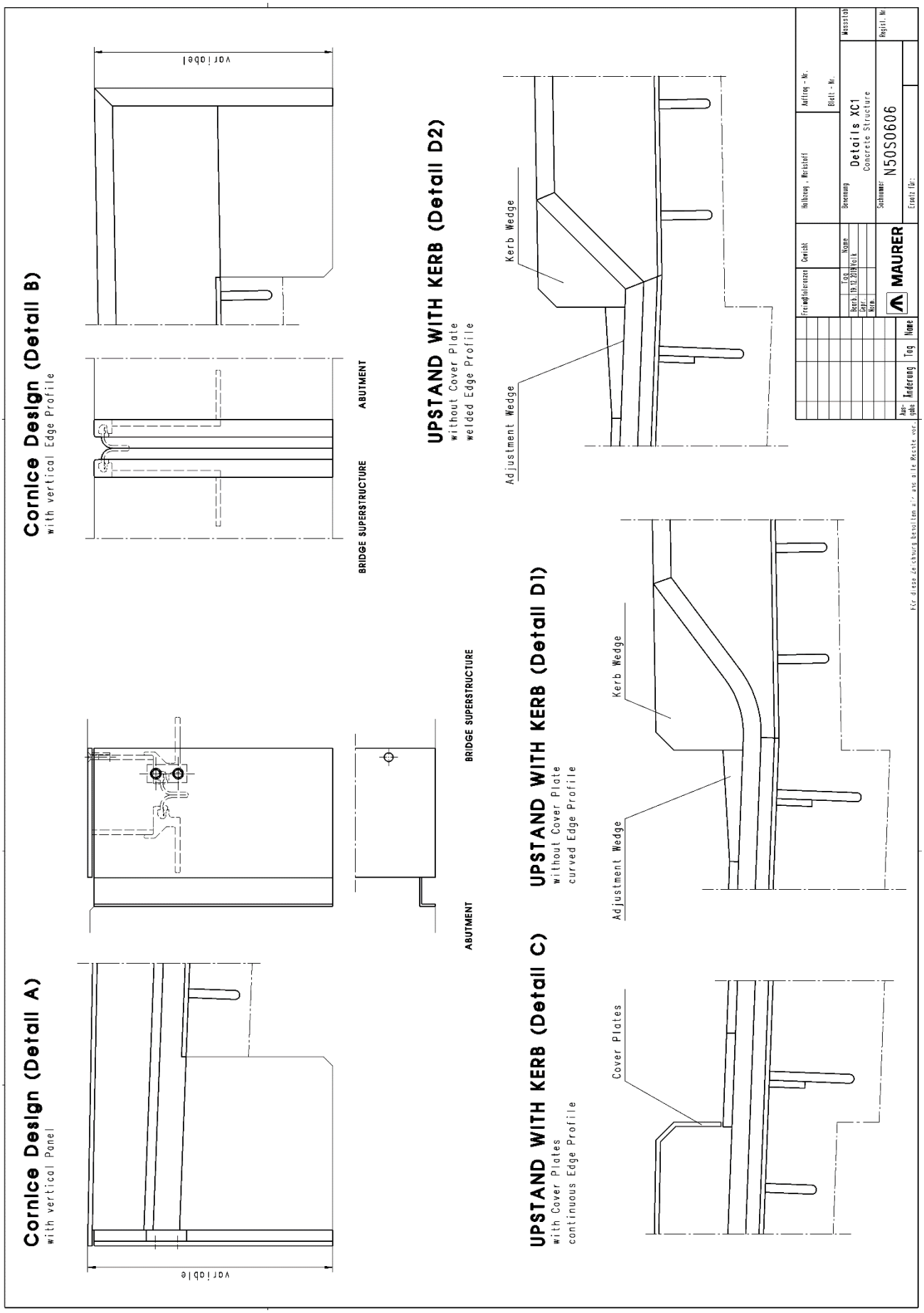
MAURER XC1 Expansion Joint with Edge Profile XC1/70 Standard Cross Sections	**Annex 1.2** of European Technical Assessment ETA-20/0028



MAURER XC1 Expansion Joint with Edge Profile XC1/120 **Front View and Top View**	**Annex 1.3** of European Technical Assessment ETA-20/0028

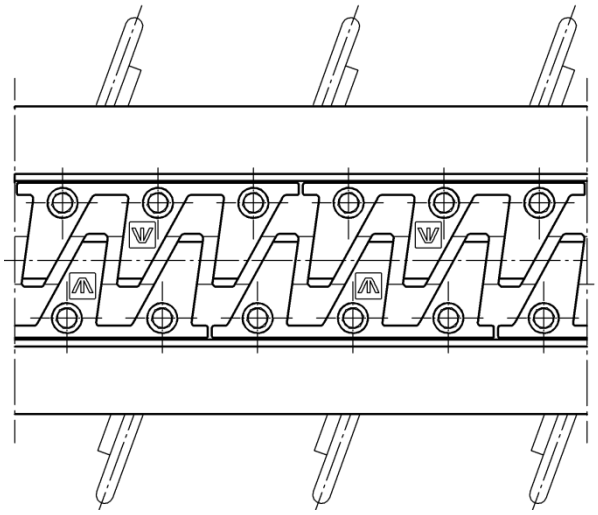


MAURER XC1 Expansion Joint with Edge Profile XC1/120 **Standard Cross Sections**	**Annex 1.4** of European Technical Assessment ETA-20/0028

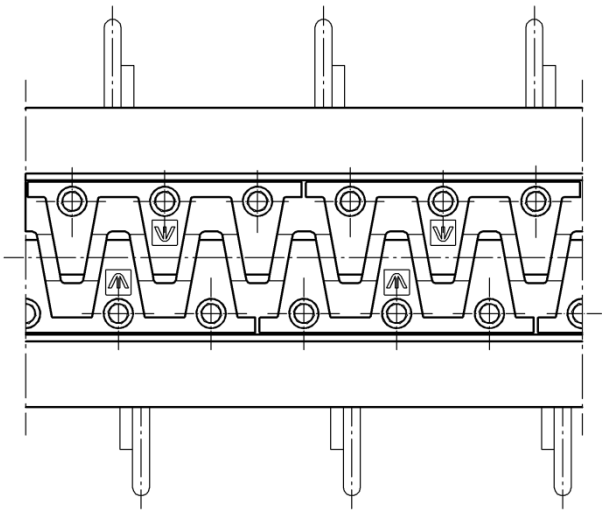


MAURER XC1 Expansion Joint **Kerb Details and Cornice Details**	**Annex 1.5** of European Technical Assessment ETA-20/0028

M-PLATES XC1/70°



M-PLATES XC1/90°



M-PLATES XC1/110°

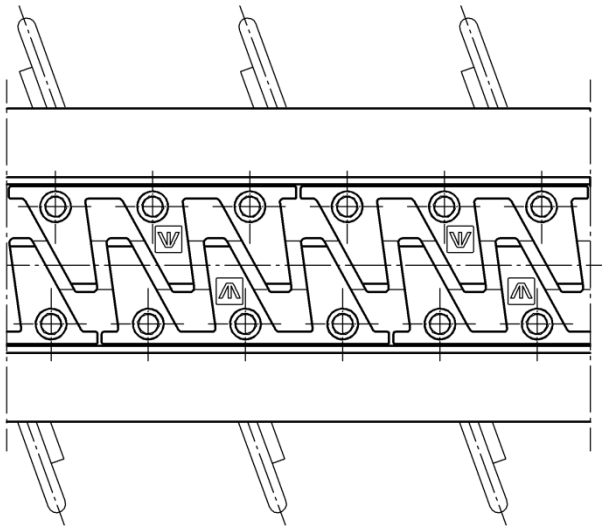


Table 9: Component List

Pos.	Designation	Material	Dimension w x h resp. t [mm]
1	Sealing Element 100	EPDM	-
3a	Edge Profile XC1/70	S355J2+N	150 x 80
3b	Edge Profile XC1/120	S355J2+N	145 x 130
3d	Edge Profile D1/40	S235J2+N	40 x 40
4a	M-Plate XC1/90°	S355J2+N	123 x 20
4b	M-Plate XC1/70°	S355J2+N	123 x 20
4c	M-Plate XC1/110°	S355J2+N	123 x 20
5a	Fastening of noise reducing plates (Bolt and washer)	10.9 300HV	M12 12
6	Carriageway Anchor Plate	S235JR+AR	t = 15
7	Carriageway Anchor Loop	S235JR+AR	∅20
8	Footpath Anchor Loop	S235JR+AR	∅20
9	Footpath Cover Plate (Stud Plate)	S235JR+AR resp. 1.4571	t = 10 resp. 12
10	Fastening of the Footpath Cover Plate (Bolt)	A4	M12
11	Fastening of the Footpath Cover Plate (Nut)	1.4301	20 x 20
12	Vertical Plate for height compensation for Edge Profiles XC1/70 resp. XC1/120	S235JR+AR	t = 5 resp. 10
13	Vertical Plate for height compensation for Edge Profile D1/40	S235JR+AR	t = 5 resp. 10
14	Horizontal Plate for Edge Profile D1/40	S235JR+AR	t = 5 resp. 10
	Plates for jetting opening, kerb, cornice	S235JR+AR	t = 20, 25 resp. 50
	Fastening (Bolt, Washer)	A4 A4	M12 12

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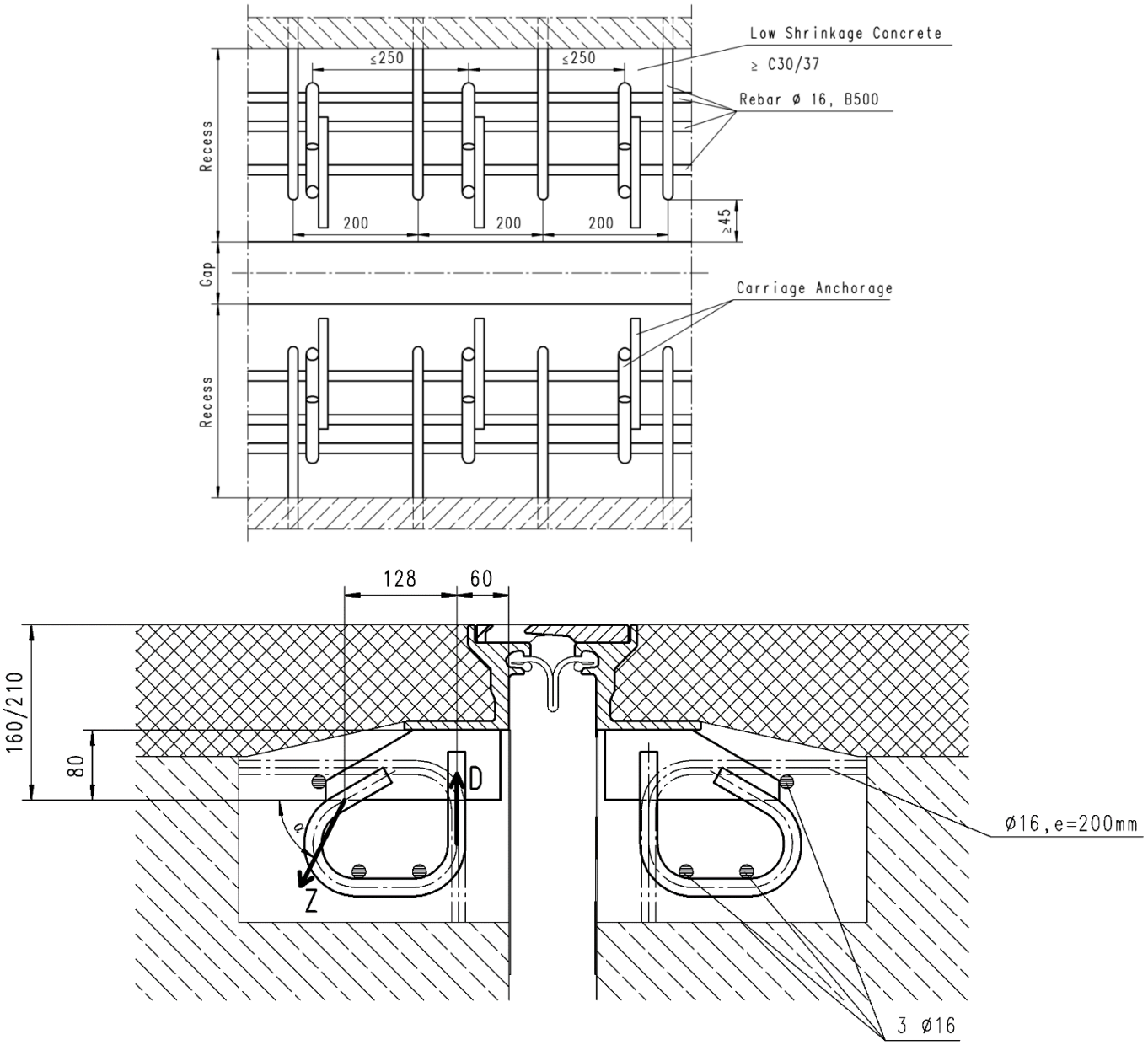
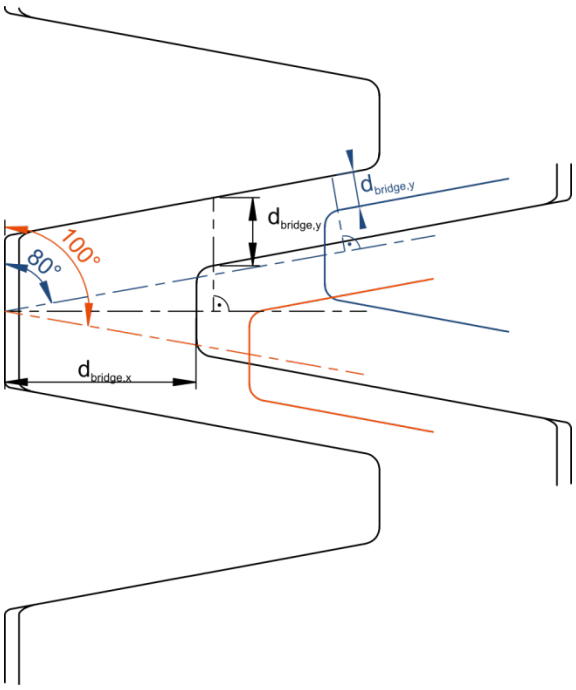


Table 10: Anchorage Forces

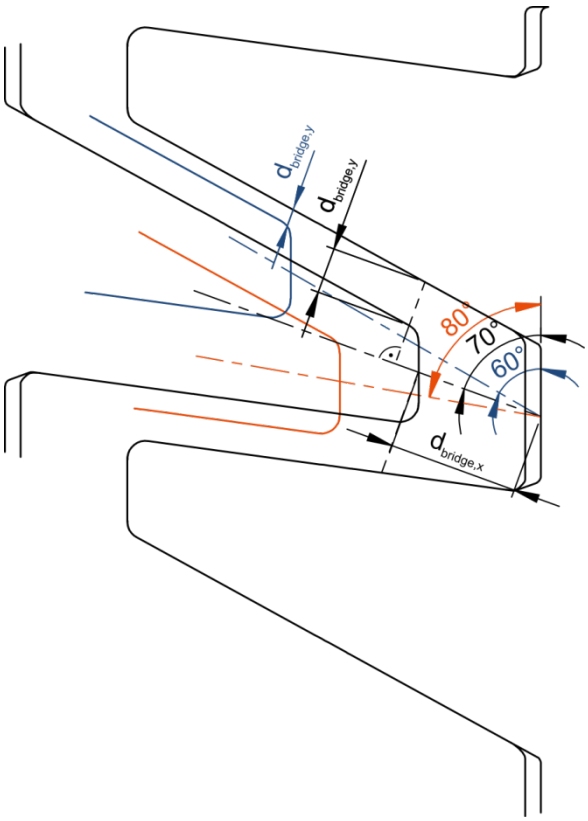
	XC1 / 70				XC1 / 120			
	Z_d [kN]	α_d [°]	D_d [kN]	Y_d [kN]	Z_d [kN]	α_d [°]	D_d [kN]	Y_d [kN]
ULS	51	90	132	8	51	90	132	8
SLS	55	77	114	6	60	79	119	6
FAT	50	77	102	0	55	78	107	0
SEISMIC	30	71	52	5	33	73	56	5

Table 11: Material characteristics of the elastomeric sealing elements made of EPDM

Material characteristic	Technical specification	Declaration
Density	ISO 1183-1	Laid down in technical documentation deposited with the Technical Assessment Body Österreichisches Institut für Bautechnik (OIB)
Hardness IRHD	ISO 48-2	
Tensile strength	ISO 37	
Elongation at break	ISO 37	
Tear resistance	ISO 34-1, Method A	
Thermogravimetric characteristics (TGA)	ISO 9924-1	
Compression set	ISO 815-1 (conditions acc. to ETAG 032-4, Table 5.2)	
Brittleness test	ISO 812, procedure B	≤ -55°C



a) M-Plates XC1/90°



b) M-Plates XC1/70°/110°

	M-Plates XC1/70°			M-Plates XC1/90°			M-Plates XC1/110°		
α [°]	60	70	80	80	90	100	100	110	120
$d_{bridge,x}$ [mm]	zul. ± $d_{bridge,y}$ [mm]								
0,0	0,0	0,0	0,0	0,0	9,7	0,0	0,0	0,0	0,0
1,3			7,2		9,9		7,2		
1,7			7,3	9,5	10,0	9,5	7,3		
2,5		6,9	7,4	9,5	10,1	9,5	7,4	6,9	
3,7	6,4	7,1	7,4	9,5	10,4	9,5	7,4	7,1	6,4
5	6,3	7,3	7,5	9,6	10,6	9,6	7,5	7,3	6,3
10	6,2	8,1	7,7	9,6	11,5	9,6	7,7	8,1	6,2
20	6,0	9,6	8,0	9,7	13,4	9,7	8,0	9,6	6,0
30	5,8	11,2	8,4	9,8	15,2	9,8	8,4	11,2	5,8
40	5,6	12,7	8,8	9,9	17,1	9,9	8,8	12,7	5,6
50	5,4	14,2	9,2	9,9	18,9	9,9	9,2	14,3	5,4
60	5,2	15,8	9,6	10,0	20,8	10,0	9,6	15,8	5,2
70	5,0	17,3	10,	10,1	22,6	10,1	10,	17,3	5,0
80	4,8	18,9	10,3	10,2	24,5	10,2	10,3	18,9	4,8
90	4,5	20,4	10,7	10,3	26,4	10,3	10,7	20,4	4,5
100	4,3	22,0	10,9	10,4	28,2	10,4	10,9	22,0	4,3
101	4,3	22,2	11,2	10,4	-	10,4	11,2	22,2	4,3
106	4,2	22,9	-	-	-	-	-	22,9	4,2
115	4,0	-	-	-	-	-	-	-	4,0

Reference documents

ETAG 032-1 Guideline for European technical approval (ETAG) No 032 “Expansion joints for road bridges, Part 1: General”, edition May 2013, used as European Assessment Document (EAD)

ETAG 032-4 Guideline for European technical approval (ETAG) No 032 “Expansion joints for road bridges, Part 4: Nosing expansion joints”, edition May 2013, used as European Assessment Document (EAD)

ETAG 032-6 Guideline for European technical approval (ETAG) No 032 “Expansion joints for road bridges, Part 6: Cantilever expansion joints”, edition May 2013, used as European Assessment Document (EAD)

EN 206:2013+A1:2016 “Concrete - Specification, performance, production and conformity”

EN 1993-1-4:2006+A1:2015 “Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels”

EN 1993-1-9:2005+AC:2009 “Eurocode 3: Design of steel structures - Part 1-9: Fatigue”

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EN 10088-1:2014 “Stainless steels - Part 1: List of stainless steels”

EN 10363:2016 “Continuously hot-rolled patterned steel strip and plate/sheet cut from wide strip - Tolerances on dimensions and shape”

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EN 14399-6:2015 “High-strength structural bolting assemblies for preloading - Part 6: Plain chamfered washers”

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EN ISO 12944-2:2017 “Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments”

EN ISO 12944-5:2018 “Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems”

ISO 34-1:2015 “Rubber, vulcanized or thermoplastic - Determination of tear strength - Part 1: Trouser, angle and crescent test pieces”

ISO 37:2017 “Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties”

ISO 48-2:2018 “Rubber, vulcanized or thermoplastic - Determination of hardness – Part 2: Hardness between 10 IRHD and 100 IRHD”

ISO 812:2017 “Rubber, vulcanized or thermoplastic - Determination of low-temperature brittleness”

ISO 815-1:2014 “Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures”

ISO 1183-1:2019 “Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method”

ISO 9924-1:2016 “Rubber and rubber products - Determination of the composition of vulcanizates and uncured compounds by thermogravimetry - Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers”