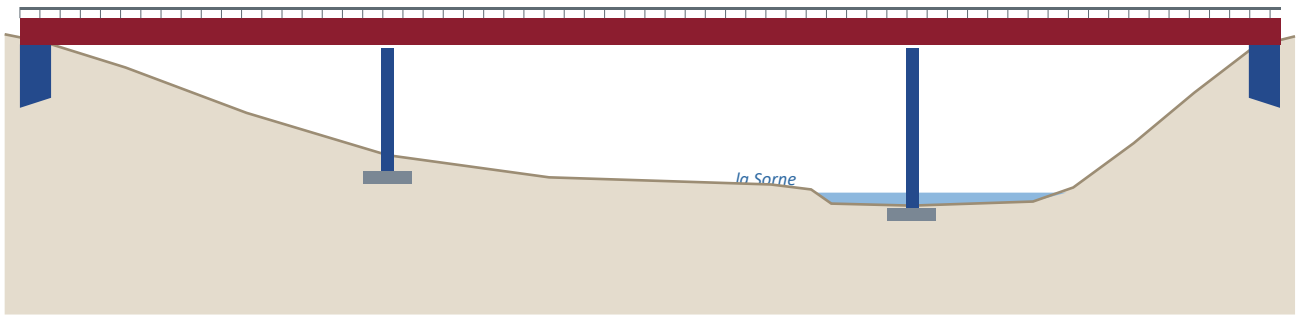


VILLE DE MONTVALLIER · Direction des travaux publics · Section des ouvrages d'art
Public Works Directorate · Bridges and Structures Section · Place de l'Hôtel-de-Ville 1 · Montvallier

Pont de la Sorne

Principal Inspection 2026 · *Inspection principale*

Structure OA-117 · Route cantonale RC 504, km 12.420 · Three-span post-tensioned concrete box girder, 1978



Client	Ville de Montvallier, Direction des travaux publics — Hélène Bovard, city engineer
Consultant	Montet Rives Ingénieurs SA, Rue du Pré-Fleuri 12, 1950 Sion
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Distribution	Client (3 paper copies, PDF), cantonal road department, archive OA-117

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1 Document control

This report records the principal inspection of the Pont de la Sorne carried out under the framework agreement TP-2024-031 between the Ville de Montvallier and Montet Rives Ingénieurs SA. It supersedes the draft version 1.0 issued for comment on 18 September 2026. Comments received from the Section des ouvrages d'art on 2 October 2026 have been incorporated. Questions about the report should be addressed to the Section des ouvrages d'art (ouvrages.art@montvallier.ch).

Version	Date	Description	Prepared	Checked	Approved
0.9	10.07.2026	Field data, defect list (internal)	J. Fournier	C. Rossier	—
1.0	18.09.2026	Draft for comment	C. Rossier	T. Varone	—
1.1	16.10.2026	Final report; client comments of 02.10.2026 included	C. Rossier	T. Varone	H. Bovard

Table 1 *Revision history of this report.*

Recipient	Organisation	Copies
Hélène Bovard	Ville de Montvallier, Section des ouvrages d'art	3
Road maintenance centre	Ville de Montvallier, Voirie, Rue des Ateliers 4	1
Cantonal road department	Service cantonal des routes, inspection unit	1
Archive OA-117	Montet Rives Ingénieurs SA, Sion	1

Table 2 *Distribution list.*

Abbreviations and units

AADT	Annual average daily traffic	**n**	Degree of compliance (SIA 269)
C0, C3	Abutments (culées) at chainage 0 and 120 m	**NWL**	Normal water level
CI	Condition index (0 – 100)	**P1, P2**	Piers
D-nn	Defect number in the catalogue	**UBIU**	Under-bridge inspection unit
HGV	Heavy goods vehicles	**W1 – W4**	Crack monitoring points
HQ100	Flood discharge with a return period of 100 years	**x**	Chainage in m from abutment C0
M1 – M10	Recommended measures	**m a.s.l.**	Metres above sea level

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2 Executive summary

The Pont de la Sorne remains safe for unrestricted traffic, but its condition has deteriorated since 2021 and two items require intervention in 2027.

The principal inspection of June 2026 covered every accessible part of the bridge, including the inside of the box girder, the pier foundations under water and the bearings. The structure was given an overall condition class of **3 (damaged)**, one class worse than in 2021. The deterioration is concentrated on three groups of elements: the expansion joint at abutment C3, the south cantilever between chainage 0+044 and 0+049, and the webs of the central span, where inclined cracks have widened steadily since 2006 (see Figure 12).

The structural assessment according to SIA 269 confirms a degree of compliance above 1.0 for bending and shear of the girder in all governing sections, so no load restriction is required. Locally, however, the reinforcement of the south cantilever has lost about 10 % of its section in the spalled zone, which brings the degree of compliance for transverse bending down to 0.97 (12). Until the repair is carried out, the outer footway strip above the damaged zone has been closed to service vehicles.

Key figures 2026

3
overall condition class (damaged)

65.7
condition index, down from 74.0 in 2021

14
defects recorded, 2 of them in class 4

CHF 1.38 m
estimated cost of measures M1–M10, excl. VAT

Ten measures are recommended, with an estimated total of CHF 1,376,700 excluding VAT. The two urgent measures, the replacement of the expansion joint C3 (M1) and the repair of the cantilever soffit (M2), should be executed together during the 2027 construction season to limit traffic disruption on RC 504. A detailed investigation of the web cracks (M5) should start before the end of 2026 so that its results are available when the repair contract is tendered.

Main conclusions

- No defect endangers structural safety in the short term; traffic can continue without restriction.
- Expansion joint C3 (class 4) lets de-icing water reach the bearing shelf, the anchorage zone and the abutment wall — it is the root cause of three secondary defects.
- Web crack widths in span 2 exceed the 0.20 mm criterion at two of four monitoring points.
- Chloride contents above the 0.40 % threshold were measured at the south cantilever and at abutment C3.
- Scour at pier P2 has reached 0.9 m at the upstream nose despite the 2019 rip-rap protection.

3 Introduction

3.1 Mandate and scope

The Ville de Montvallier inspects its bridges in a five-year cycle of principal inspections, completed by annual visual checks carried out by the road maintenance centre. The present inspection is the fifth principal inspection of the Pont de la Sorne since the introduction of the municipal structures management system in 2006[1]. Its purpose is to record the condition of each element, to assess the structural safety and serviceability under current traffic, and to propose the measures and budget needed for the next five years.

The scope covered the superstructure (inside and outside of the box girder), piers, abutments, foundations and river bed, bearings, expansion joints, drainage, surfacing, railings, vehicle restraint systems and services. Non-destructive testing and destructive testing was carried out at six locations selected from the 2021 findings. A

[1] The municipal system follows the principles of the Swiss standard SIA 269 *Existing structures* and the guideline of the cantonal road department for the surveillance of engineering structures (edition 2019).

structural re-assessment was made for the sections affected by the observed defects.

3.2 Documents consulted

- Original design calculations and drawings, Bureau technique Perrin & Zufferey, 1975–1977 (archive OA-117, 214 drawings).
- Rehabilitation project 2004: as-built drawings and waterproofing records.
- Principal inspection reports 2006, 2011, 2016 and 2021, with crack monitoring sheets.
- Scour protection project 2019 and bathymetric survey of the Sorne, March 2019.
- Traffic count RC 504, station 504-12, year 2025: AADT 14,800 vehicles, 7.2 % heavy goods vehicles.

3.3 Inspection team, access and conditions

The field work took place from 11 to 13 June 2026 in dry weather, with air temperatures between 18 °C and 24 °C. The team consisted of Camille Rossier (lead inspector), Julien Fournier (structural engineer), Sara Bitz (rope access technician, IRATA level 3) and Nicolas Pralong (commercial diver), accompanied on 12 June by Hélène Bovard for the city. Access to the outside of the girder was provided by an under-bridge inspection unit with a reach of 13 m, operated from the carriageway under a single-lane closure with temporary traffic lights. The box girder was entered through the manholes in the bottom slab at both abutments. Pier P2 was inspected from a boat and by the diver at a discharge of 4.2 m³/s.

The location of the structure is shown in Figure 1.

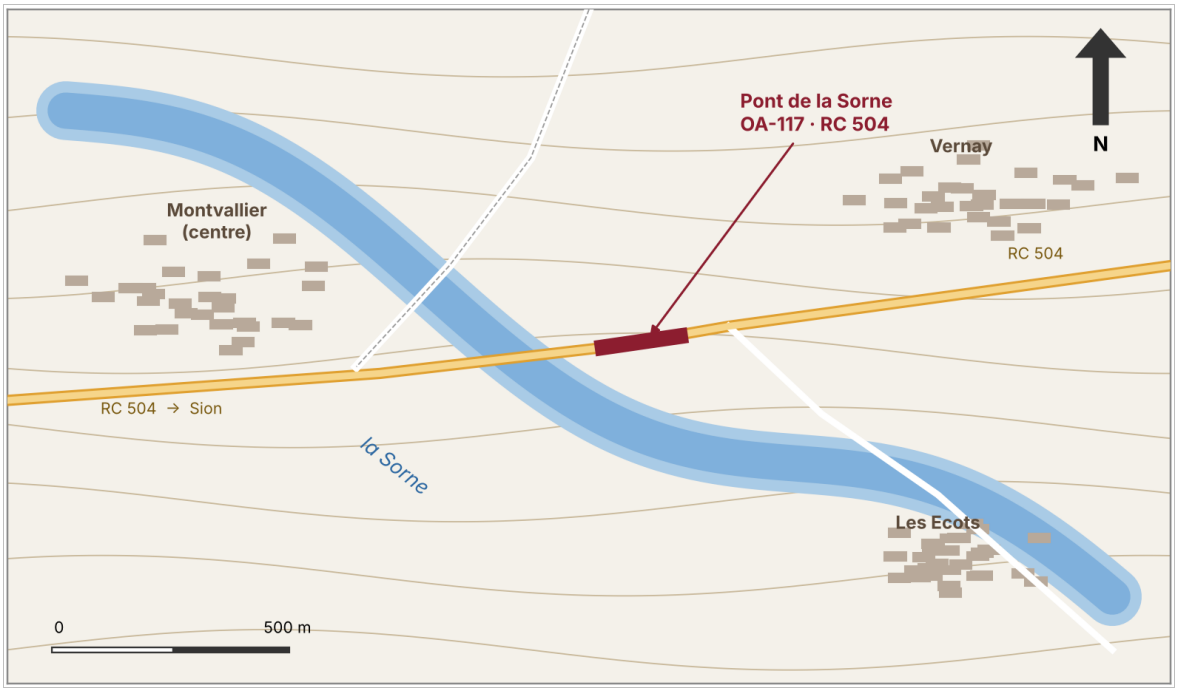


Figure 1 *Situation plan: the Pont de la Sorne carries RC 504 between Montvallier and Vernay.*

4 Description of the structure

4.1 General data

Item	Value	Item	Value
Structure number	OA-117	Year of construction	1976–1978
Road	RC 504, km 12.420	Owner	Ville de Montvallier

Item	Value	Item	Value
Obstacle crossed	la Sorne (river)	Design standard	SIA 162 (1968)
Static system	Continuous girder, 3 spans	Spans	34.00 + 52.00 + 34.00 m
Total length	120.00 m	Deck width	13.40 m
Cross-section	Single-cell box, h = 2.60 m	Carriageway	7.50 m, two lanes
Prestressing	24 tendons, 12 strands 15.7 mm	Concrete (design)	B 45/35 (≈ C35/45)
Piers	Wall type 6.00 × 1.20 m	Pier heights	P1 12.2 m · P2 15.9 m
Foundations	Bored piles Ø 1.20 m	Bearings	8 pot bearings
Expansion joints	Steel finger joints C0, C3	Traffic (2025)	AADT 14,800, 7.2 % HGV

Table 3 *General data of the Pont de la Sorne (OA-117).*

The bridge is a continuous post-tensioned concrete box girder of constant depth over three spans. The fixed point is at pier P1, so that the thermal movements are shared between the expansion joints at C0 (design movement ± 40 mm) and C3 (± 80 mm). The girder rests on two pot bearings per support line. Both piers are founded on bored piles in the moraine; pier P2 stands at the edge of the river bed and is exposed to scour, which was the reason for the rip-rap protection placed in 2019. The elevation and the typical cross-section are shown in Figure 2 and Figure 3.

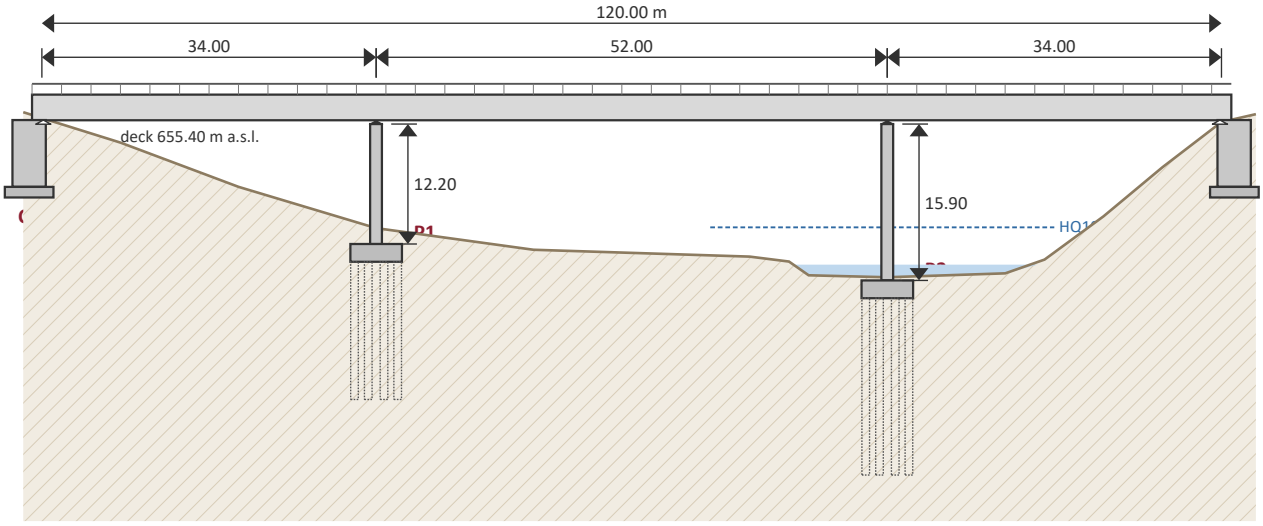


Figure 2 *Elevation of the Pont de la Sorne with spans, pier heights and water levels.*

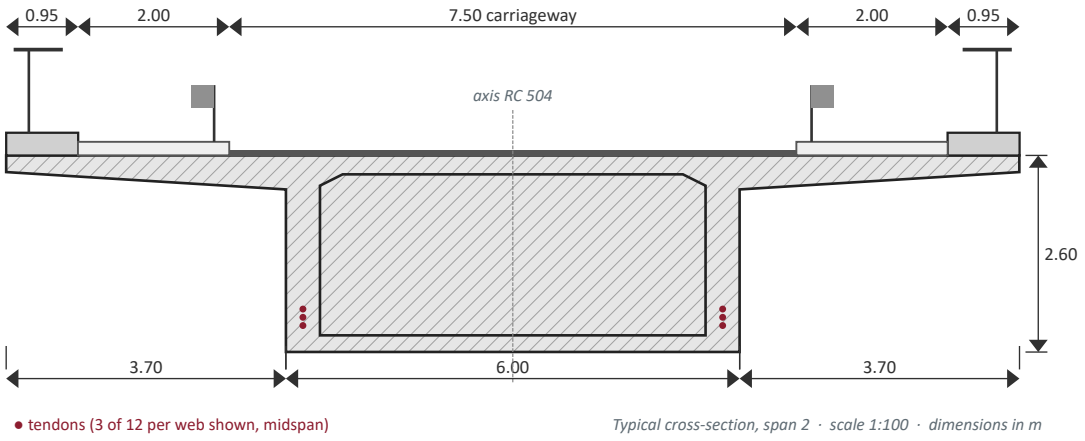


Figure 3 *Typical cross-section of the box girder (midspan of span 2), looking towards Vernay.*

4.2 History of interventions

Year	Intervention	Cost CHF
1976–78	Construction on falsework, three stages; post-tensioning from the abutments	4,850,000
1991	Replacement of the elastomeric joint C3 by a steel finger joint	186,000
2004	Rehabilitation: waterproofing, surfacing, edge beams, railings and drainage	2,140,000
2016	Cleaning and lubrication of the sliding bearings C0 and C3, coating repair at P1	48,000
2019	Scour protection at P2 (rip-rap 260 m³) after the flood of 14 August 2018	312,000
Total invested since construction (nominal)		**7,536,000**

Table 4 *Major interventions since construction (nominal costs, total computed by a table formula).*

5 Inspection method and condition rating

Each element was examined visually at arm's length, with hammer tapping of concrete surfaces, crack width measurement with a comparator card and a digital microscope (crack width), and photographs of every defect. Each defect received an identifier (D-01 to D-14), a location by chainage (from abutment C0) and a severity class. Each element was then rated on the five-class scale of 5, taking the most severe relevant defect and its extent into account.

Class	Designation	Désignation	Description	Typical action
1	good	bon	No or insignificant defects	Routine maintenance
2	acceptable	acceptable	Minor defects without influence on safety	Monitor, repair when convenient
3	damaged	endommagé	Defects that will grow if not treated	Repair within 5 years
4	poor	mauvais	Serious defects, serviceability affected	Repair within 1–2 years
5	alarming	alarmant	Safety may be affected	Immediate measures

Table 5 *Condition classes used for elements and defects (colour code used throughout this report).*

For the comparison between inspections, the element classes are combined into a condition index between 0 and 100, using weights that reflect the importance of each element for safety and durability:

$$CI = 100 - \frac{25 \cdot \sum w_i \left(c_i - 1\right)}{\sum w_i} \tag{1}$$

where c_i is the class of element i and w_i its weight (superstructure 0.50, substructure 0.30, equipment 0.20, distributed over the elements of each group). A structure in which every element is in class 1 has an index of 100; class 3 everywhere gives 50.

6 Findings by element

The ratings of 2026 are compared with those of 2021 in the three tables below. The remarks refer to the defect numbers (D-01 to D-14) of the catalogue in chapter 5.

6.1 Superstructure

The box girder is in a generally sound condition. The concrete surfaces inside the box are dry, with carbonation depths well below the cover. The observed deterioration is concentrated on the cantilevers, which carry the drainage, and on the webs of span 2.

Element	2021	2026	Trend	Main defects and remarks
Deck slab and waterproofing	2	2	= stable	D-02 moisture traces near gullies G3/G4
Cantilevers and edge beams	2	3	▲ worse	D-05 spalling with corroded bars; D-06 edge beam cracks
Webs	2	3	▲ worse	D-03, D-04 inclined cracks in span 2 up to 0.35 mm
Bottom slab	2	2	= stable	Isolated shrinkage cracks, dry
Diaphragms	1	2	▲ worse	Minor honeycombing at P2 manhole
Prestressing and anchorages	2	3	▲ worse	D-07 dampness at anchorage niche C3

Table 6 *Condition ratings of the superstructure.*

6.2 Substructure

Pier P1 and abutment C0 show no significant change. Abutment C3 is affected by the leaking expansion joint above it, and pier P2 by abrasion at the waterline and by scour at its upstream nose, which the diver measured at 0.9 m below the original bed level.

Element	2021	2026	Trend	Main defects and remarks
Abutment C0	2	2	= stable	Fine vertical cracks in the front wall, dry
Pier P1	1	2	▲ worse	Rust stains from tie wire, two small spalls
Pier P2	2	3	▲ worse	D-13 abrasion band at the waterline
Abutment C3	2	3	▲ worse	D-08 leaching and rust streaks below the joint
Foundations and river bed	2	3	▲ worse	D-13 scour 0.9 m at the upstream nose of P2
Wing walls and embankments	2	2	= stable	Vegetation on the south-east wing wall

Table 7 *Condition ratings of the substructure.*

6.3 Equipment

The equipment shows the clearest deterioration. The finger joint at C3 is the most critical item of the whole structure: two finger plates are loose and the drainage channel below the joint is torn.

Element	2021	2026	Trend	Main defects and remarks
Bearings C0 and P1	2	2	= stable	Coating damage, movements within range
Bearings P2 and C3	3	3	= stable	D-09 displaced sliding plate; D-10 corrosion of pot P2-N
Expansion joint C0	2	2	= stable	Debris in the gaps, watertight
Expansion joint C3	3	4	▲ worse	D-12 loose finger plates, torn drainage channel
Drainage	3	3	= stable	D-11 broken downpipe at P2
Surfacing	2	3	▲ worse	D-01 rutting up to 18 mm, longitudinal cracks
Railings and vehicle restraint	1	2	▲ worse	D-14 two posts bent by an impact
Footways and kerbs	2	2	= stable	Joint sealant missing over 14 m
Services (lighting, ducts)	1	1	= stable	No defect

Table 8 *Condition ratings of the equipment.*

The distribution of the fourteen defects by severity class is shown in Figure 4. Most defects are in class 3; the two class 4 defects are the joint C3 and the cantilever spalling.

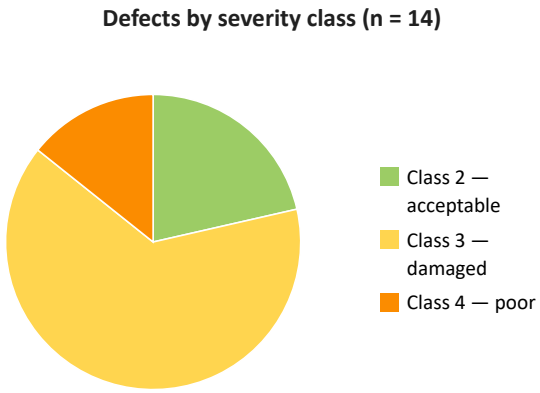


Figure 4 *Number of defects per severity class.*

7 Defect catalogue

The catalogue lists every defect recorded in 2026. Defects already recorded in 2021 keep their previous description, completed by the change observed. Photographs carry the inspector's card with the defect number, location and date; the 10 cm scale bar gives the order of magnitude.

No.	Element	Location	Description	Class
D-01	Surfacing	0+060 – 0+118, lane east	Rutting up to 18 mm, longitudinal cracks	3
D-02	Deck slab	Cantilever N, gullies G3/G4	Moisture traces at the soffit	2
D-03	Web N	Span 2, x = 58 – 66 m	Inclined cracks up to 0.35 mm, efflorescence	3
D-04	Web S	Span 2, x = 59 – 64 m	Inclined cracks up to 0.20 mm	3
D-05	Cantilever S	x = 44 – 49 m	Spalling 2.6 m², bars corroded, loss ≈ 10 %	4
D-06	Edge beam N	Railing posts 8 – 19	Cracks and small spalls at post anchors	2
D-07	Anchorage	Niche C3, tendon W-S-3	Dampness, rust staining of the cap	3
D-08	Abutment C3	Front wall	Leaching and rust streaks below the joint	3
D-09	Bearing C3-S	Abutment C3	Sliding plate displaced 38 mm, dry, corroded	3
D-10	Bearing P2-N	Pier P2	Corrosion of pot and anchor bolts, mortar bed cracked	3
D-11	Drainage	Downpipe at P2	DN 150 pipe broken, water on pier head	3
D-12	Joint C3	Lane towards Vernay	Two loose finger plates, torn channel	4
D-13	Pier P2	Waterline, upstream nose	Abrasion up to 25 mm, scour 0.9 m	3
D-14	Vehicle restraint	x = 101 m, south	Two posts bent by a vehicle impact	2

Table 9 *Summary of the defects recorded in 2026.*

7.0.1 D-03 Inclined cracks in the north web of span 2

Location: x = 58.0 – 66.0 m, lower half of the web · **Class:** 3 (2021: 3) · **Extent:** 5 cracks, total length 9.6 m

Five inclined cracks run at 35 to 45 degrees from the bottom slab towards the support P2. The widest crack, monitored as point W1 since 2006, measured 0.35 mm, compared with 0.25 mm in 2021. White efflorescence along the cracks shows that water has passed through them, although the inside of the box is dry today.

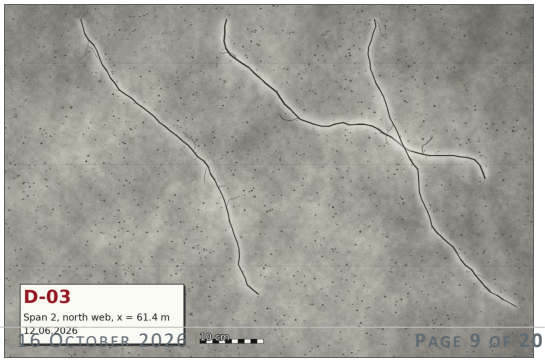


Figure 5 *D-03: inclined cracks with efflorescence, north web, span 2.*

The pattern is typical of combined shear and bending in a region where the tendon profile rises. Its slow but continuous growth is the reason for the detailed investigation proposed as measure M5.

7.0.2 D-04 Inclined cracks in the south web of span 2

Location: x = 59.0 – 64.0 m · **Class:** 3 (2021: 2) · **Extent:** 3 cracks, 5.1 m

The south web shows the same pattern with smaller widths (0.20 mm at monitoring point W3). The crack map drawn on site is reproduced in Figure 6; widths were measured at the marked points.

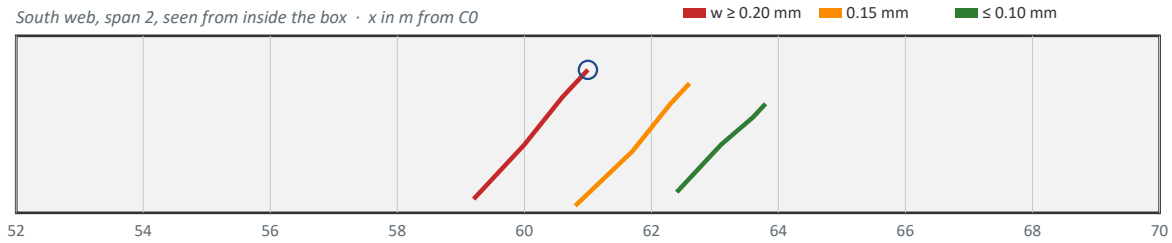


Figure 6 *D-04: crack map of the south web in span 2 with measured crack widths.*

7.0.3 D-05 Spalling with exposed reinforcement, south cantilever

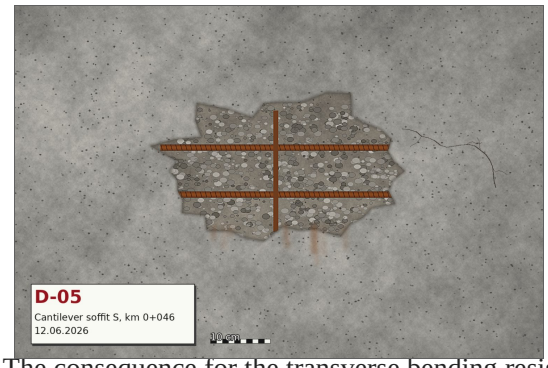


Figure 7 *D-05: spalled soffit of the south cantilever with exposed transverse bars.*

Location: soffit, x = 44.0 – 49.0 m, 0.4 – 1.6 m from the edge · **Class:** 4 (2021: 3) · **Extent:** 2.6 m², 9 bars exposed

The concrete cover has spalled over 2.6 m² below the drainage gully G2. Nine transverse bars Ø 16 mm are exposed; the measured loss of section reaches 1.6 mm on the diameter, about 10 % of the cross-sectional area. The half-cell potential survey shows an active corrosion zone of 14 m² around the spall, and the chloride content at the bar level is 0.62 % by mass of cement.

The consequence for the transverse bending resistance of the cantilever is evaluated in chapter 7. Hammer tapping revealed hollow-sounding areas of a further 3.8 m², which will spall in the coming winters if not repaired.

7.0.4 D-07 Dampness at the anchorage niche C3

Location: end block C3, anchorage W-S-3 · **Class:** 3 (2021: 2)

The grout cap of tendon W-S-3 is damp and stained with rust. Water from the joint C3 reaches the niche along the bearing shelf. No corrosion of the anchorage itself was visible after removal of the cap cover, but the niche must be dried and sealed when the joint is replaced.

7.0.5 D-08 Leaching and rust streaks at abutment C3

Location: front wall below the bearing shelf · **Class:** 3 (2021: 2) · **Extent:** ≈ 18 m²

The upper third of the front wall is permanently damp. Calcite leaching and rust streaks run down from the joint gap. The chloride content at 40 mm depth is 0.85 %, more than twice the threshold for corrosion of the reinforcement.



Figure 8 *D-08: leaching and rust streaks on the front wall of abutment C3.*

7.0.6 D-09 Displaced sliding plate, bearing C3-S

Location: abutment C3, south bearing · **Class:** 3 (2021: 3)

At an air temperature of 21 °C the upper sliding plate of bearing C3-S was displaced by 38 mm from the centre

position towards Vernay, where the theoretical value is 12 mm. The stainless sliding sheet is dry and the upper plate is corroded at its edges. The bearing still has a reserve of 42 mm before reaching its stop.

7.0.7 D-10 Corrosion of pot bearing P2-N



Location: pier P2, north bearing · **Class:** 3 (2021: 3)

Water from the broken downpipe (D-11) runs over the pier head. The pot, the base plate and the anchor bolts show general corrosion with local pitting; the mortar bed is cracked along its downstream edge. The bearing functions correctly: the elastomer pad is confined and no rotation restraint was observed.

Figure *9 D-10: pot bearing P2-N with corroded pot, base plate and anchor bolts.*

7 …ion joint C3

Location: lane towards Vernay · **Class:** 4 (2021: 3) · **Gap at 21 °C:** 62 mm

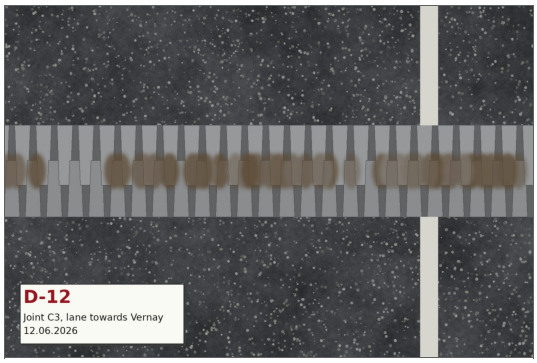


Figure *10 D-12: finger joint C3 with debris in the gaps; loose plates in the right half.*

Two finger plates of the eastbound lane are loose: one anchor bolt is missing and a second one has lost its pretension. The plates rattle under each heavy vehicle. The neoprene drainage channel below the joint is torn over 1.8 m, so that de-icing water falls directly onto the bearing shelf, the anchorage niche and the abutment wall (D-07, D-08, D-09). The loose plates were secured provisionally by the road maintenance centre on 14 June 2026.

7.0.9 D-13 Abrasion and scour at pier P2

Location: waterline and upstream nose · **Class:** 3 (2021: 2) · **Scour depth:** 0.9 m

Bed-load transport has abraded the concrete of pier P2 over a band 0.8 m high at the normal water level, to a depth of up to 25 mm. The diver found a scour hole 0.9 m deep in front of the upstream nose, where part of the rip-rap placed in 2019 has been displaced downstream (Figure 11). The top of the pile cap is still covered by 0.4 m of bed material.

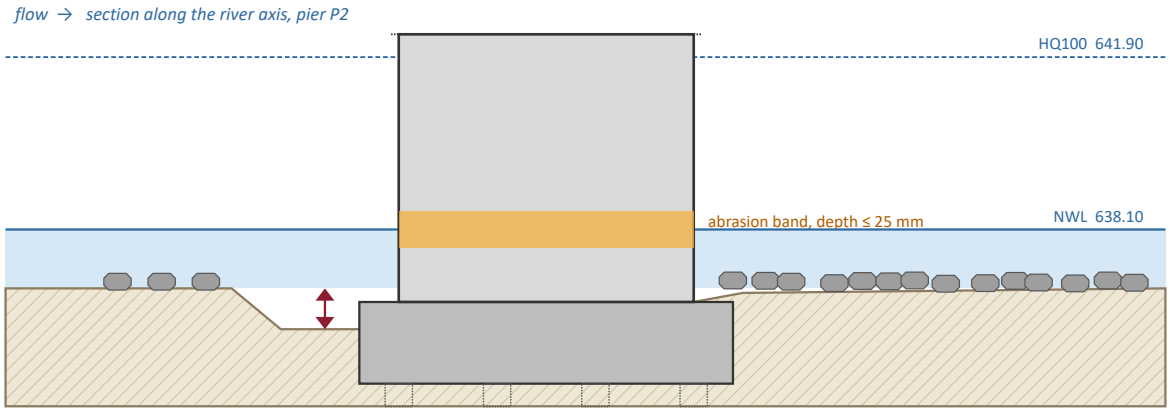


Figure 11 *D-13: scour and abrasion at pier P2, survey by the diver on 13 June 2026 (schematic).*

8 Monitoring and material testing

8.1 Crack width monitoring

Four crack monitoring points (W1 to W4) were installed in the webs of span 2 in 2006 and are read at each

principal inspection. The readings are listed below and plotted in Figure 12. The criterion of 0.20 mm is the crack width that the original design accepted under quasi-permanent loads.

Year	W1 N web x = 61.4	W2 N web x = 72.0	W3 S web x = 61.0	W4 S web x = 48.5
2006	0.10	0.10	0.05	0.10
2011	0.15	0.10	0.10	0.10
2016	0.20	0.15	0.15	0.10
2021	0.25	0.20	0.15	0.15
2026	0.35	0.25	0.20	0.15

Table 10 *Crack widths in mm at the monitoring points (shaded: above the 0.20 mm criterion).*

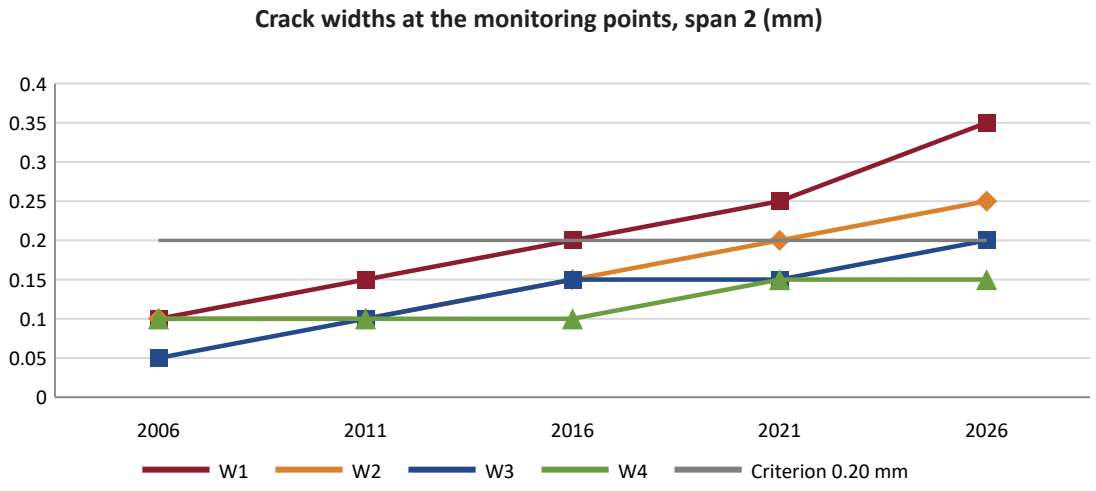


Figure 12 *Evolution of the crack widths 2006–2026 (embedded chart with its own data table).*

8.2 Material testing

Concrete cover, carbonation depth, chloride content and half-cell potential were measured where the visual inspection had shown signs of reinforcement corrosion, and at reference locations in sound concrete. Three cores were taken from the webs and the bottom slab to update the concrete strength used in the assessment.

Location	Test	Result	Criterion	Assessment
Cantilever S, x = 46 m	Concrete cover (40 readings)	24 – 41 mm, mean 31	≥ 30 mm	locally low
Cantilever S, x = 46 m	Chloride at 35 mm	0.62 %	0.40 %	critical
Cantilever S, x = 46 m	Half-cell potential	−380 to −470 mV	< −350 mV	active corrosion
Web N, span 2, x = 61 m	Carbonation depth	6 – 9 mm	< cover 38 mm	not critical
Web N, span 2, x = 61 m	Chloride at 35 mm	0.10 %	0.40 %	not critical
Bottom slab, span 2	Carbonation depth	4 – 7 mm	< cover 35 mm	not critical
Abutment C3, front wall	Chloride at 40 mm	0.85 %	0.40 %	critical
Abutment C3, front wall	Half-cell potential	−310 to −420 mV	< −350 mV	corrosion likely
Cores K1 – K3	Compressive strength	52.4 / 49.8 / 55.1 MPa	≥ 35 MPa	$f_{ck,act}$ = 45.2 MPa

Table 11 *Results of the material tests (chloride contents in % by mass of cement).*

The chloride profiles of Figure 13 show the typical decrease with depth. Near the drainage gully, the threshold of 0.40 % is exceeded down to a depth of about 45 mm, which is deeper than the bars. In the web, far from the

drainage, the profile stays below 0.15 % beyond 20 mm. The penetration follows the solution of Fick's second law,

$$C(x,t)=C_s\left(1-erf\left(\frac{x}{2\sqrt{D_{app}t}}\right)\right) \tag{2}$$

with a surface content C_s=1.62% and an apparent diffusion coefficient D_{app}=0.42·10^{-12} m²/s fitted to the cantilever profile after 22 years of exposure since the 2004 rehabilitation.

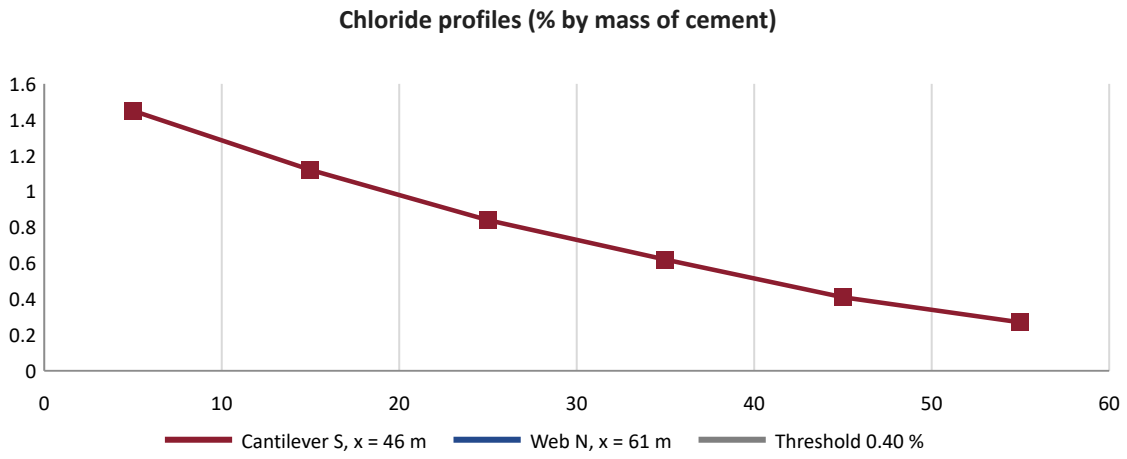


Figure 13 *Chloride profiles measured on drilled powder samples (XY chart).*

Carbonation progresses slowly. With a carbonation coefficient of 1.9 mm/√year derived from the web measurements, the depth after t=48 years is $x_c=K_c\sqrt{t}$=13.2 mm, far below the minimum cover; depassivation by carbonation is not expected within the remaining service life:

$$t_{dep}=\left(\frac{c_{min}}{K_c}\right)^2=\left(\frac{28}{1.9}\right)^2\approx 217 years \tag{3}$$

9 Structural assessment

The structural safety was verified according to SIA 269 using updated values for the actions and for the material properties. The load model is the road traffic model of SIA 261 with the adjustment factors for the actual traffic on RC 504 (α_{Q1}=0.9, α_{q1}=0.9)[2]. The design value of the action effect is

$$E_{d,act}=\gamma_G G_k+\gamma_P P_{act}+\gamma_Q\left(\alpha_{Q1}Q_{k1}+\alpha_{q1}q_{k1}\right) \tag{4}$$

and the degree of compliance n compares the updated resistance with this action effect:

$$n=\frac{R_{d,act}}{E_{d,act}}\geq 1.0 \tag{5}$$

9.1 Updated material properties

The compressive strength measured on the cores gives a characteristic value of 45.2 MPa. With the strength reduction factor η_{fc} of SIA 262 and a partial factor reduced to 1.35 thanks to the measured data, the updated design strength is

[2] Updated adjustment factors are permitted by SIA 269/1 when the traffic composition is known; the 2025 count shows no exceptional transports on RC 504.

$$f_{cd,act} = \frac{\eta_{fc} f_{ck,act}}{\gamma_{c,act}} = \frac{0.88 \cdot 45.2}{1.35} = 29.5 MPa \tag{6}$$

The losses of prestress were recalculated for 48 years with the measured creep and shrinkage parameters; the effective prestress is 0.91 P_0. The bending resistance of the girder sections follows from the equilibrium of the compression zone:

$$M_{Rd} = A_p f_{pd}\left(d_p - \frac{x}{2}\right) + A_s f_{sd}\left(d_s - \frac{x}{2}\right) \quad x = \frac{A_p f_{pd} + A_s f_{sd}}{0.85 b_{eff} f_{cd,act}} \tag{7}$$

and the shear resistance of the webs from the stirrups with a compression field inclination $\alpha = 30°$:

$$V_{Rd,s} = \frac{A_{sw}}{s} z f_{sd} \cot\alpha \tag{8}$$

9.2 Results

The results are summarised in 12. The degree of compliance is computed in the table itself from the action effect and the resistance, so that the values can be checked directly.

Section	Effect	$E_{d,act}$	$R_{d,act}$	*n*	Verification
Span 2, midspan	M (MN·m)	38.6	44.9	**1.16**	fulfilled
Support P1	M (MN·m)	-52.3	-58.4	**1.12**	fulfilled
Support P2	M (MN·m)	-51.8	-58.4	**1.13**	fulfilled
Web near P1, x = 36.5 m	V (MN)	6.84	7.21	**1.05**	fulfilled
Web near P2, x = 83.5 m	V (MN)	6.79	7.21	**1.06**	fulfilled
Cantilever S, sound	m (kN·m/m)	182.0	196.0	**1.08**	fulfilled
Cantilever S at D-05 (−10 % As)	m (kN·m/m)	182.0	177.0	**0.97**	not fulfilled

Table 12 *Degree of compliance n = R d,act / E d,act in the governing sections (n computed by table formulas).*

All girder sections reach a degree of compliance above 1.0; the smallest value, 1.05, concerns shear in the web near P1, where no cracks were found. In the cracked region of span 2 the shear verification gives 1.08 with the measured stirrup layout, provided that the tendons have not lost section. This assumption is the subject of the detailed investigation M5.

For the south cantilever, the loss of 10 % of the transverse reinforcement in the spalled zone reduces the bending resistance to 177 kN·m/m, below the action effect of 182 kN·m/m from the wheel loads of the service vehicles on the footway. The degree of compliance is 0.97. The deficit is small and local: it is covered by the provisional closure of the outer footway strip to vehicles, decided by the city on 19 June 2026, until the repair M2 restores the reinforcement.

10 Evolution of the condition

The condition index of the three element groups and of the whole structure is shown in Figure 14. After a slow decline between 2006 and 2016, the index dropped by 8.3 points in the last five years, mainly because of the equipment: joints, drainage and surfacing reach the end of the service life of the 2004 rehabilitation.

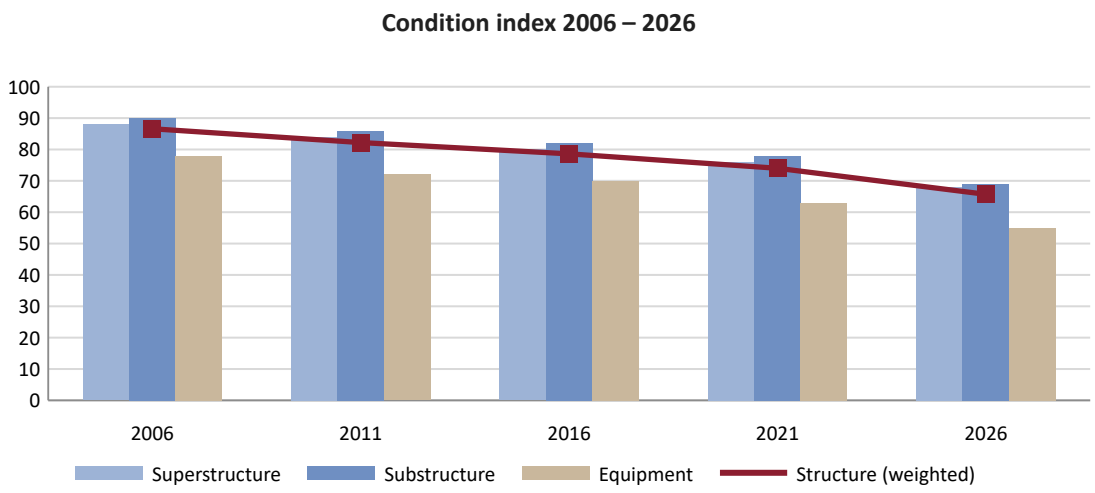


Figure 14 *Condition index by element group (columns) and for the whole structure (line).*

If no measures are taken, the index would fall below 55 by the next principal inspection in 2031, the threshold at which the municipal management system classifies a structure as requiring a general rehabilitation. With the measures of chapter 9, the index is expected to return to about 78.

11 Recommendations and cost estimate

The measures are listed in order of urgency. Costs are based on unit prices of comparable municipal and cantonal contracts awarded in 2024–2026 and include traffic management. They are accurate to ± 25 %.

No.	Measure	Deadline	Cost CHF
M1	Replace expansion joint C3, incl. drainage channel and niche	2027	285,000
M2	Repair south cantilever soffit (46 m², bars treated)	2027	138,000
M3	Replace downpipe at P2 and gullies G2 – G4	2027	24,500
M4	Bearings P2 and C3: coating, re-grouting, new sheet C3-S	≤ 2 years	96,000
M5	Detailed investigation of web cracks (tendon endoscopy)	2026/27	74,000
M6	Epoxy injection of web cracks in span 2 (62 m), after M5	≤ 2 years	41,000
M7	Pier P2: rip-rap 120 m³ and repair of the abrasion band	≤ 2 years	118,000
M8	Abutment C3: leaching removal, impregnation, drainage	≤ 5 years	52,000
M9	Surfacing renewal 1,610 m², local waterproofing repairs	≤ 5 years	212,000
M10	Monitoring: 4 crack gauges, annual readings, inspection 2028	continuous	18,500
	Subtotal measures		**1,059,000**
	Site installation and traffic management (8 %)		84,720
	Engineering, tendering and supervision (12 %)		127,080
	Contingencies (10 %)		105,900
	Total excluding VAT		**1,376,700**
	VAT 8.1 %		111,513
	Total including VAT		**1,488,213**

Table 13 *Recommended measures and cost estimate (sums and percentages are live table formulas).*

Measures M1 to M3 should be combined in a single contract with one period of traffic management. The replacement of the joint requires a closure of one lane for about six weeks; a temporary steel ramp can keep both directions open at night. Measure M5 should be awarded as an engineering mandate before the end of 2026, so that its conclusions on the tendons are known before the injection works M6 are specified.

Programme of measures 2026 – 2031

Measure	2026	2027	2028	2029	2030	2031
M1 Expansion joint C3		■				
M2 Cantilever soffit repair		■				
M3 Downpipe and gullies		■				
M4 Bearings P2 and C3		■	■			
M5 Investigation of web cracks	■	■				
M6 Crack injection, span 2			■			
M7 Scour protection P2		■	■			
M8 Abutment C3				■	■	
M9 Surfacing renewal					■	
M10 Monitoring	■	■	■	■	■	■
Intermediate inspection (I) and next principal inspection (P)			I			P

Table 14 *Indicative programme of the measures (orange: urgent measures M1 – M3 and M5).*

12 Conclusions

The Pont de la Sorne is in a damaged but safe condition. The girder has sufficient reserves in bending and shear; the only local deficit, in the south cantilever, is covered by the provisional restriction for service vehicles. The deterioration observed since 2021 has a single main source — water passing through the joint C3 and the drainage — and can therefore be stopped efficiently by the urgent measures M1 to M3.

The next principal inspection is due in June 2031. An intermediate inspection is recommended in 2028, after the repair works, to check the joint, the cantilever repair and the crack gauges installed under M10.

Sion and Montvallier, 16 October 2026

Prepared	Checked	Approved for the owner
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Lead inspector, Montet Rives Ingénieurs SA	Partner, Montet Rives Ingénieurs SA	City engineer, Ville de Montvallier

13 Annex A — Inspection checklist

The checklist records every item examined during the principal inspection, the method and the access used, and the resulting class. Items without observation are rated 1. The column *Ref.* links to the defect catalogue; the header row repeats on each page.

No.	Group	Element / item	Method	Access	Observation	Class	Ref.
01	Superstructure	Top slab inside box	Visual, hammer	Manhole C0/C3	Dry, isolated shrinkage cracks	2	—
02	Superstructure	Top slab soffit, cantilever N	Visual, moisture meter	UBIU	Moisture traces at G3/G4	2	D-02
03	Superstructure	Top slab soffit, cantilever S	Visual, hammer, cover	UBIU	Spalling 2.6 m², hollow 3.8 m²	4	D-05
04	Superstructure	Edge beam N	Visual, hammer	UBIU	Cracks at railing posts 8 – 19	2	D-06
05	Superstructure	Edge beam S	Visual, hammer	UBIU	Sound	1	—
06	Superstructure	Web N, span 1	Visual, crack width	Inside box	No cracks	1	—
07	Superstructure	Web N, span 2	Visual, crack width, microscope	Inside / UBIU	Inclined cracks ≤ 0.35 mm	3	D-03
08	Superstructure	Web N, span 3	Visual, crack width	Inside box	Hairline cracks ≤ 0.05 mm	1	—
09	Superstructure	Web S, span 1	Visual, crack width	Inside box	No cracks	1	—
10	Superstructure	Web S, span 2	Visual, crack width	Inside / UBIU	Inclined cracks ≤ 0.20 mm	3	D-04
11	Superstructure	Web S, span 3	Visual	Inside box	Sound	1	—
12	Superstructure	Bottom slab	Visual, carbonation	Inside box	Shrinkage cracks, dry	2	—
13	Superstructure	Diaphragm C0	Visual	Inside box	Sound	1	—
14	Superstructure	Diaphragms P1, P2	Visual	Inside box	Honeycombing at P2 manhole	2	—
15	Superstructure	Diaphragm C3	Visual	Inside box	Damp lower edge	2	—
16	Superstructure	Anchorage niches C0	Visual, cap removal (1)	Inside box	Dry, caps intact	1	—
17	Superstructure	Anchorage niches C3	Visual, cap removal (1)	Inside box	Damp cap W-S-3, rust staining	3	D-07
18	Substructure	Abutment C0, front wall	Visual, hammer	Ground	Fine vertical cracks	2	—
19	Substructure	Abutment C0, bearing shelf	Visual	Ladder	Debris, dry	2	—
20	Substructure	Pier P1, shaft	Visual, hammer	Rope access	Tie-wire rust stains, 2 spalls	2	—
21	Substructure	Pier P1, head	Visual	Rope access	Sound	1	—
22	Substructure	Pier P2, shaft	Visual, hammer	Rope access, boat	Abrasion band at waterline	3	D-13
23	Substructure	Pier P2, head	Visual	Rope access	Wet from downpipe	2	D-11

No.	Group	Element / item	Method	Access	Observation	Class	Ref.
24	Substructure	Pier P2, foundation	Diver, probing rod	Diving	Scour 0.9 m upstream	3	D-13
25	Substructure	Abutment C3, front wall	Visual, chloride, potential	Ground	Leaching, rust streaks	3	D-08
26	Substructure	Abutment C3, bearing shelf	Visual	Ladder	Wet, debris	3	D-08
27	Substructure	Wing walls	Visual	Ground	Vegetation SE wing wall	2	—
28	Substructure	Embankments and slopes	Visual	Ground	Stable	1	—
29	Equipment	Bearings C0-N, C0-S	Visual, displacement	Ladder	Within range, coating damage	2	—
30	Equipment	Bearings P1-N, P1-S (fixed)	Visual	Rope access	Sound	1	—
31	Equipment	Bearing P2-N	Visual	Rope access	Corrosion of pot and bolts	3	D-10
32	Equipment	Bearing P2-S	Visual	Rope access	Light corrosion	2	—
33	Equipment	Bearing C3-N	Visual, displacement	Ladder	Displacement 31 mm, dry	2	—
34	Equipment	Bearing C3-S	Visual, displacement	Ladder	Displacement 38 mm, corrosion	3	D-09
35	Equipment	Expansion joint C0	Visual, gap measurement	Carriageway	Debris, watertight	2	—
36	Equipment	Expansion joint C3	Visual, gap, tapping	Carriageway	Loose plates, torn channel	4	D-12
37	Equipment	Drainage gullies G1 – G6	Visual, flushing	Carriageway	G2 – G4 partly blocked	2	—
38	Equipment	Downpipes and collector	Visual	UBIU	Broken pipe at P2	3	D-11
39	Equipment	Surfacing	Visual, rut gauge	Carriageway	Rutting ≤ 18 mm	3	D-01
40	Equipment	Railings N and S	Visual, shaking test	Footway	Sound	1	—
41	Equipment	Vehicle restraint system	Visual	Carriageway	2 posts bent at x = 101 m	2	D-14
42	Equipment	Footways and kerbs	Visual	Footway	Sealant missing 14 m	2	—
43	Equipment	Lighting, ducts, signs	Visual	Footway	No defect	1	—

Table 15 *Inspection checklist of the principal inspection 2026 (UBIU: under-bridge inspection unit).*

14 Annex B — Bilingual glossary · Glossaire bilingue

The inspection was carried out in French and the field notes use French terms. The glossary gives the English terms used in this report with their French equivalents and a short definition.

abutment — *culée* End support of the bridge, retaining the embankment.

anchorage — *ancrage* Device transferring the force of a prestressing tendon to the concrete.

bearing — *appareil d'appui* Device transmitting loads from the girder to the support while allowing movement.

bottom slab — *dalle inférieure* Lower flange of the box girder.

box girder — *poutre caisson* Girder with a closed hollow cross-section.

cantilever — *porte-à-faux* Part of the deck slab projecting beyond the webs.

carbonation — *carbonatation* Reaction of the cement paste with CO_2 that lowers the alkalinity of concrete.

chloride content — *teneur en chlorures* Mass of chloride ions related to the mass of cement.

condition class — *classe d'état* Rating of an element on the five-class scale.

concrete cover — *enrobage* Distance between the reinforcement and the concrete surface.

crack width — *ouverture de fissure* Width of a crack measured at the surface.

degree of compliance — *degré de conformité* Ratio of updated resistance to updated action effect (SIA 269).

diaphragm — *entretoise* Transverse wall stiffening the box girder at supports.

drainage gully — *grille d'évacuation* Inlet collecting surface water from the carriageway.

edge beam — *bordure* Concrete beam at the edge of the deck carrying the railing.

efflorescence — *efflorescence* White deposit of salts carried to the surface by water.

expansion joint — *joint de chaussée* Device bridging the gap between deck and abutment.

footway — *trottoir* Raised walkway beside the carriageway.

half-cell potential — *potentiel électrochimique* Measurement indicating the probability of corrosion.

leaching — *lixiviation* Dissolution and transport of lime by water percolating through concrete.

pier — *pile* Intermediate support of the bridge.

pile cap — *semelle sur pieux* Concrete block connecting the foundation piles to the pier.

principal inspection — *inspection principale* Detailed inspection repeated every five years.

prestressing tendon — *câble de précontrainte* Bundle of strands tensioned to compress the concrete.

railing — *garde-corps* Barrier protecting pedestrians at the edge of the deck.

rip-rap — *enrochement* Layer of large stones protecting the river bed against scour.

scour — *affouillement* Erosion of the river bed around a foundation.

spalling — *éclatement du béton* Detachment of concrete fragments, often caused by corroding bars.

surfacing — *revêtement* Asphalt layers of the carriageway.

vehicle restraint system — *glissière de sécurité* Barrier retaining errant vehicles.

waterproofing — *étanchéité* Membrane protecting the deck slab from water and de-icing salt.

web — *âme* Vertical wall of the box girder carrying shear.

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