

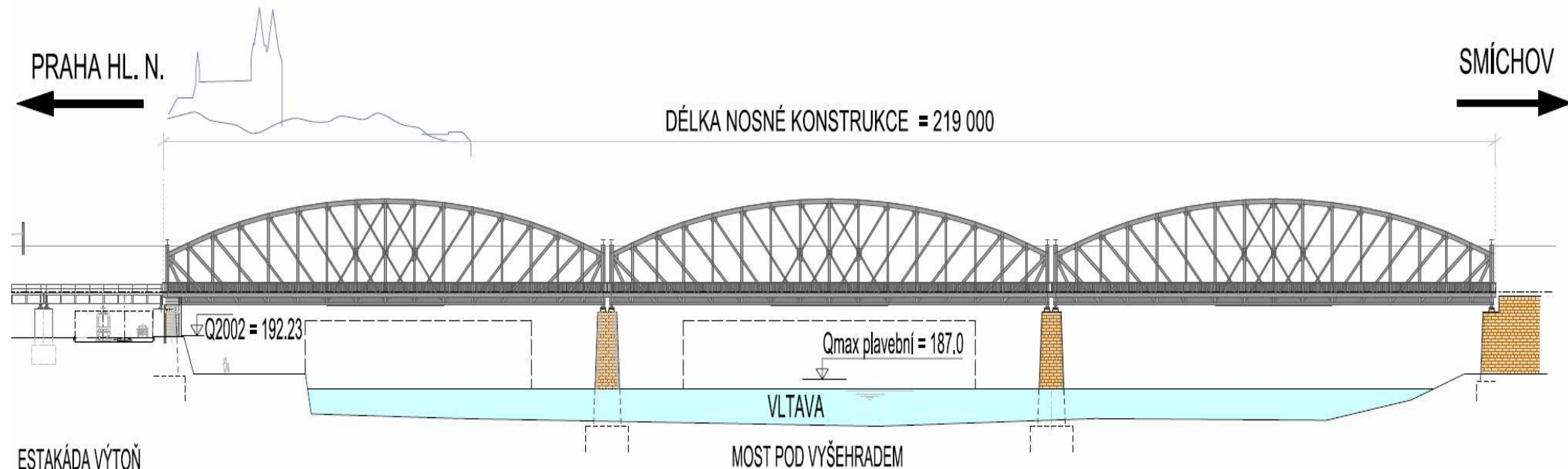


Existing condition of the bridge

Pavel Ryjáček

History of the structural works

- **1874** single track railway bridge (first railway bridge over river)
- **1901** new double track railway bridge over Vltava river
- overall weight of steel construction of the bridge 3 x 565 t ~1700 t
- **1970** replacement of top horizontal wind bracing, reduction of vertical cross bracing and replacement of portal bracing
- **1987** addition of horizontal breaking bracing and strengthening of stringers
- 1.10.1901 → 2026 = **125** years



Preparing works for the reconstruction



- **Optimization of the Praha – hlavní nádraží – Praha Smíchov section**
- **2003** Feasibility study (additional track)
- 2007 Preliminary design
- 2008 Feasibility study of Výtoň station
- 2011 Update of feasibility study
- 2015 Update of feasibility study
- 2018 Update Preliminary design
- 2021 The architectural competition
- 2022 The winning design of the bridge (2T engineering, Ltd.)
- 2023 Architectural study
- **2025** Decision of the prime minister to reconstruct the existing bridge
- **2026 Design for the temporary bridge**
- - **22** years – plus at least **10** years ahead – **32** years

Corrosion survey

- Investigation of corrosion weakening
- Description of weakening - example - sheet of bottom chord

PRŮZKUM KOROZNÍHO OSLABENÍ PRVKŮ OK

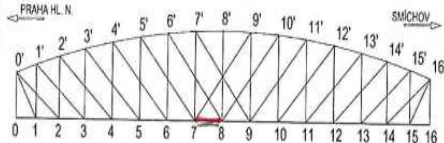
PRVEK: DOLNÍ PÁS U1-16

NK Č.: 2 (2) PŘÍHRADA Č.: 8

ŽEL. MOST V KM 3,706 PŘES VLTAVU TRATI PRAHA HL. N. - SMÍCHOV

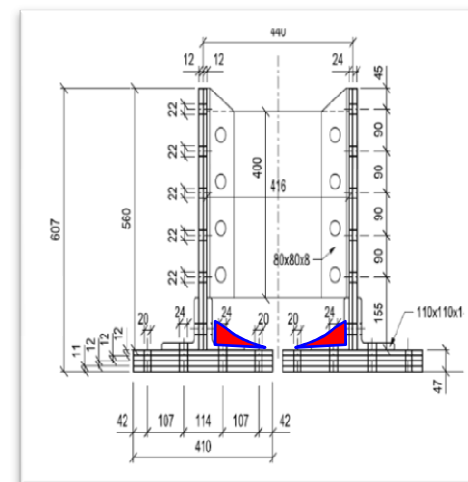
STRANA: (L) / P DATUM:

SCHEMA KONSTRUKCE:



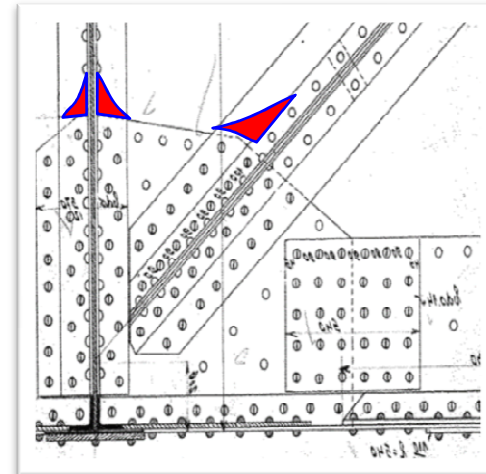
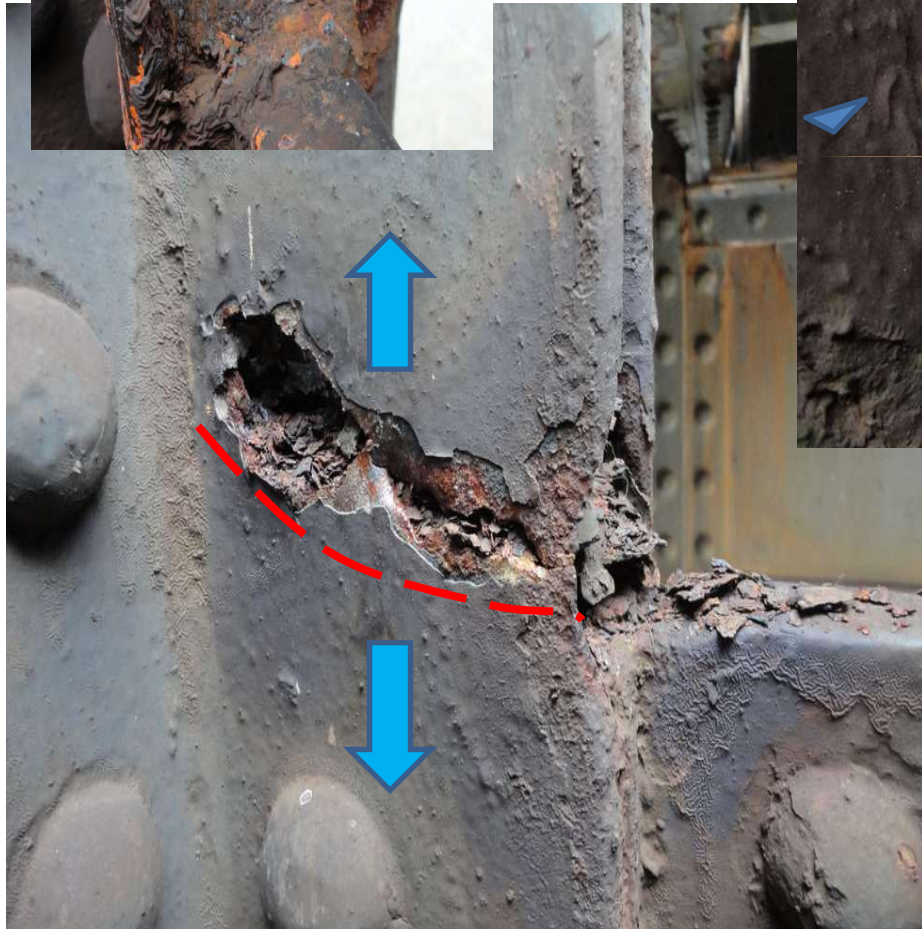
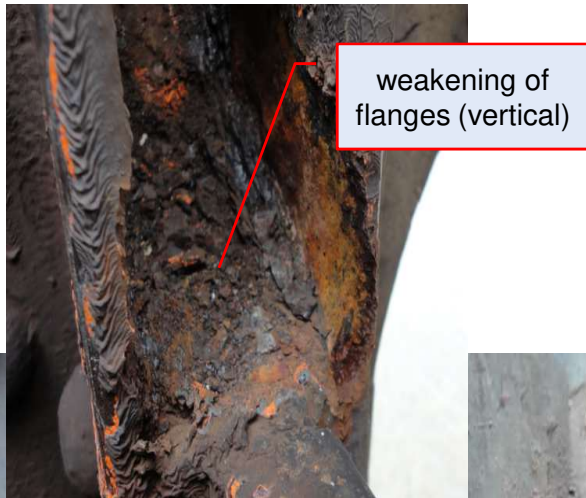
KOROZE PRUTU [mm] - SCHÉMA PRŮŘEZU		KOROZE PRUTU [mm] - SCHÉMA PRŮŘEZU		KOROZE PRUTU [mm] - SCHÉMA PRŮŘEZU	
0.0		0.5		1.0	
DL		DL		DL	
DP		DP		DP	

SCHÉMA POLOHY POŠKOZENÍ KORÓZÍ [RELATIVNĚ K DÉLCE]:					
SP:	(1) oslabení 2 mm	(3) oslabení 2 mm	(6) oslabení 3 mm		
DP:	(2) mezipřímek 80 mm oslabení 3 mm	(4) mezipřímek 60 mm oslabení 3 mm	(7) mezipřímek 80 mm oslabení 3 mm		
DL:					
DL:					



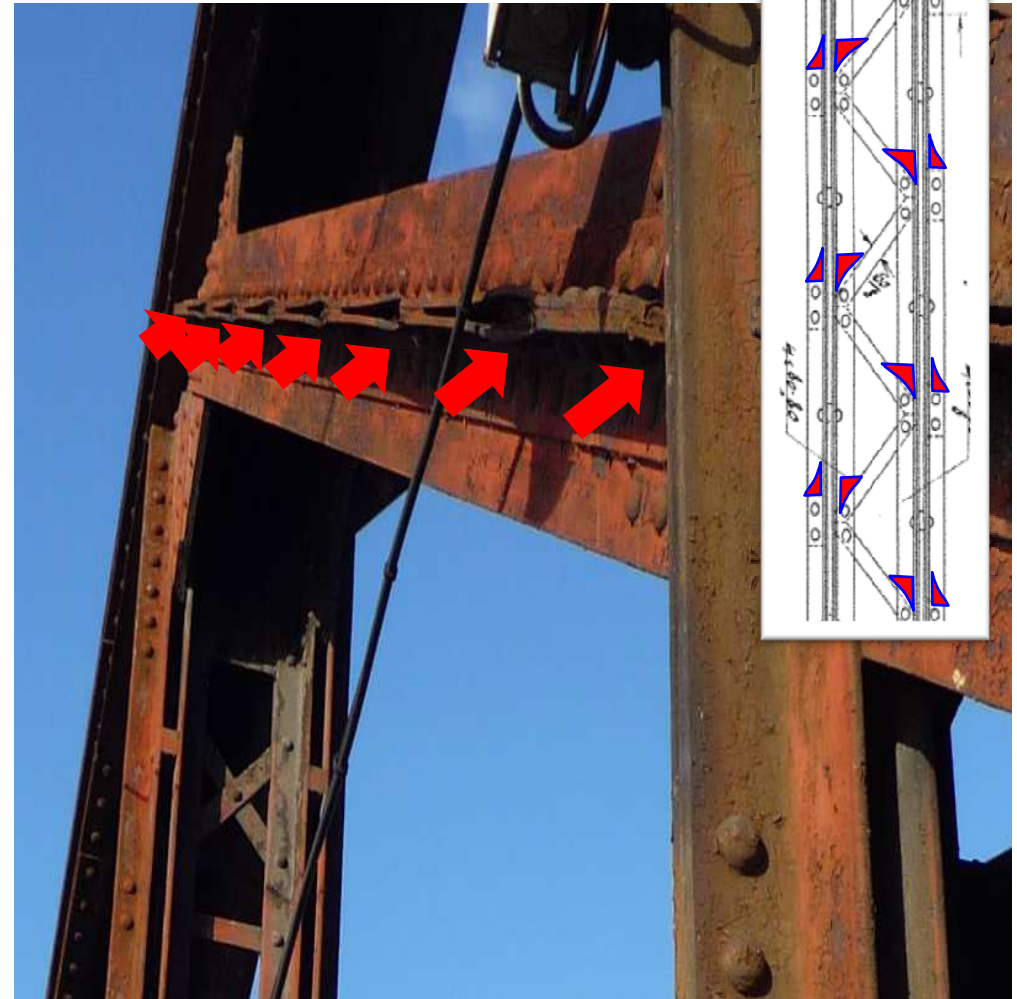
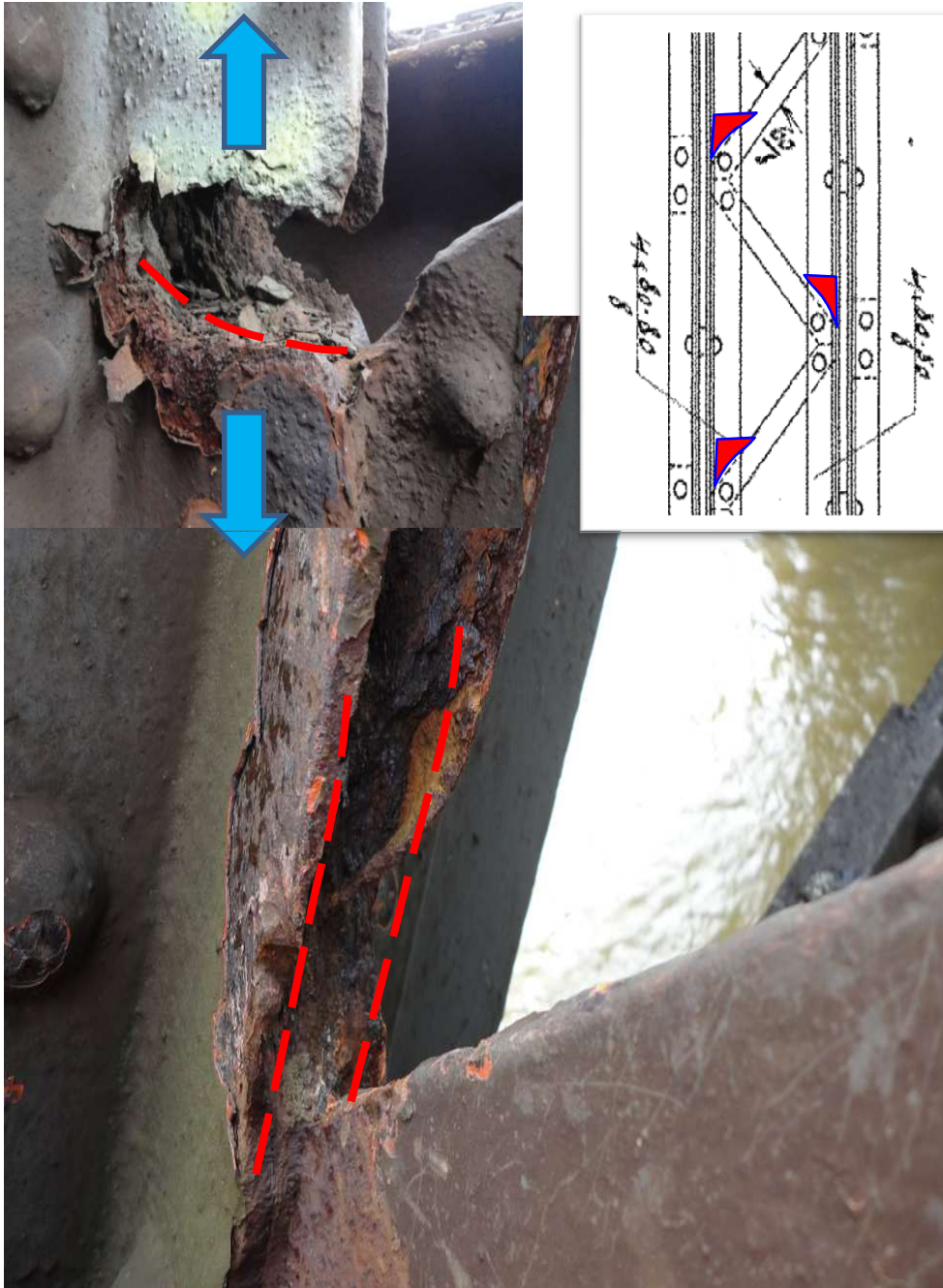
Corrosion survey

- Main girder – verticals - diagonals



Corrosion survey

- Main girder – verticals – diagonals



Corrosion survey

- Cross beams



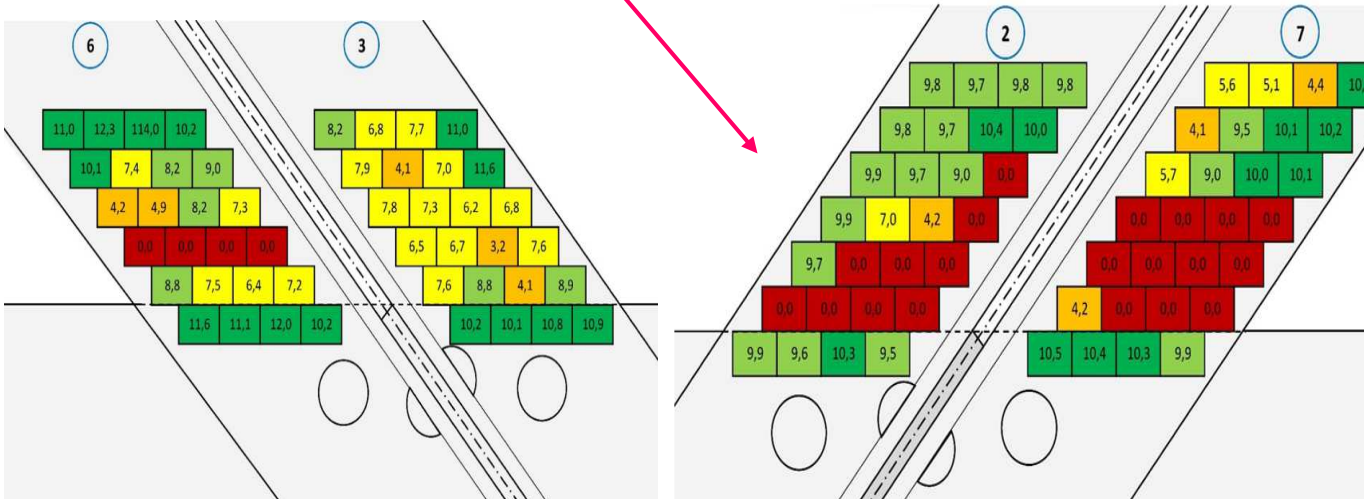
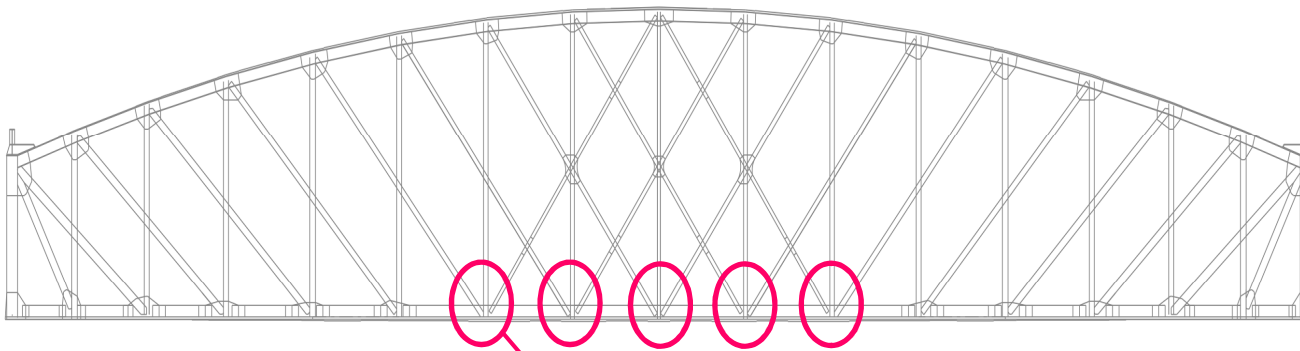
stringers - fatigue crack - length **185**



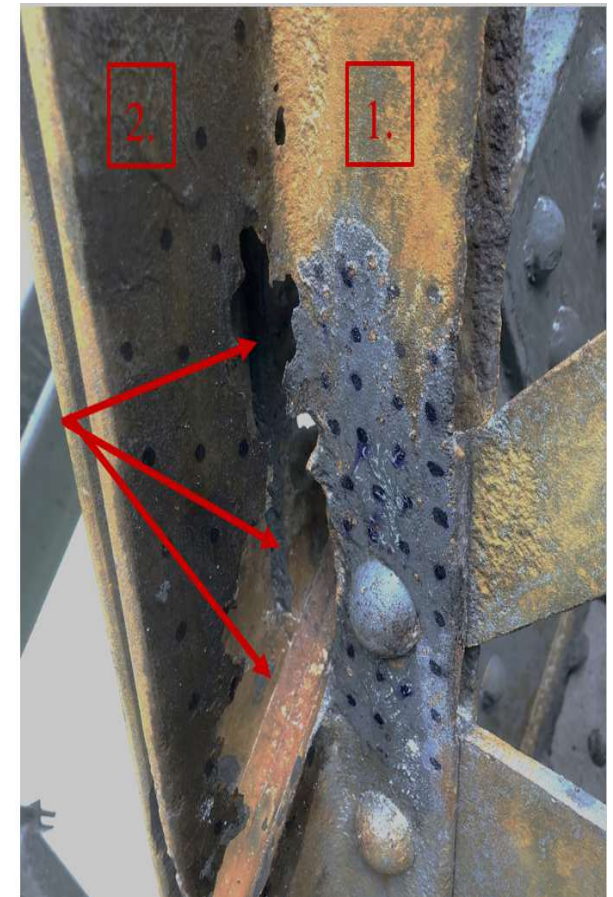
stringers - fatigue crack - length **580**
mm

Corrosion survey 2023

- Detailed corrosion survey (2023)
- Critical joints - diagonal x bottom chord



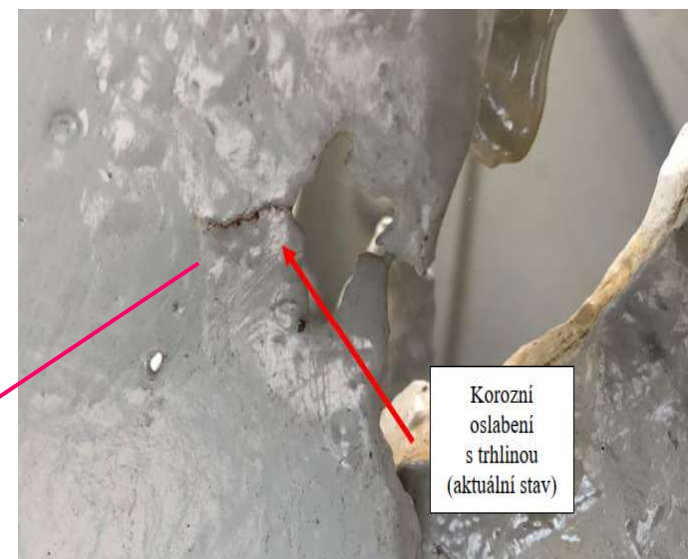
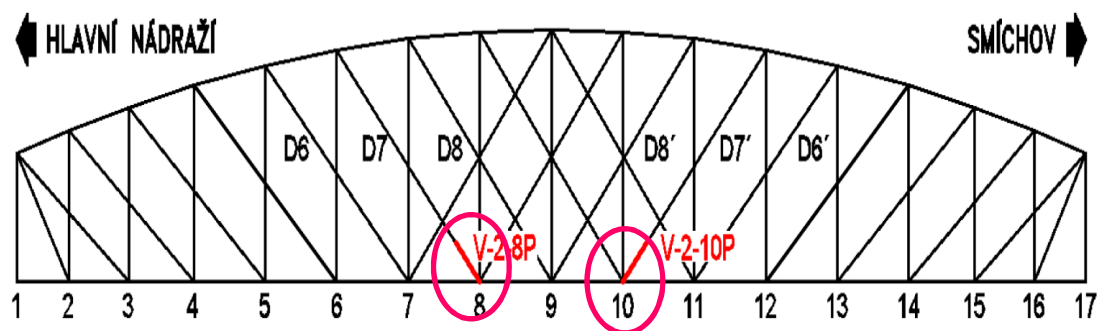
Diagonals (flange thickness in mm)



Diagonals flanges (raster measurement)

Corrosion survey 2023

- Fatigue – stress corrosion cracks – found in several places



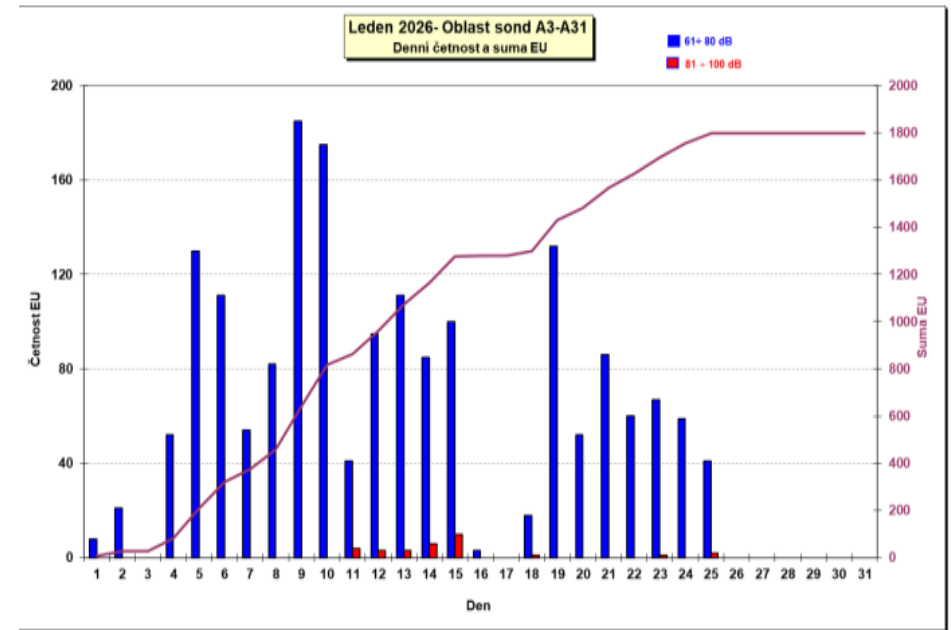


What structural reinforcements on the bridge are needed

- the protective coating is non-functional
- typical defects of riveted bridges (highly weakened flanges)
- plastic deformations of diagonals (flanges) by rust
- new fatigue cracks in strengthened top flange of **stringers** (2018+2025)
- new **fatigue cracks** in flange of **diagonals** (2024)
- development of **corrosion** loss in time will accelerate

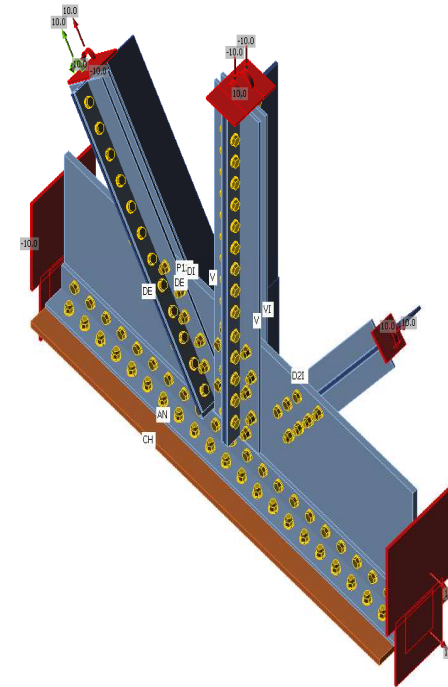
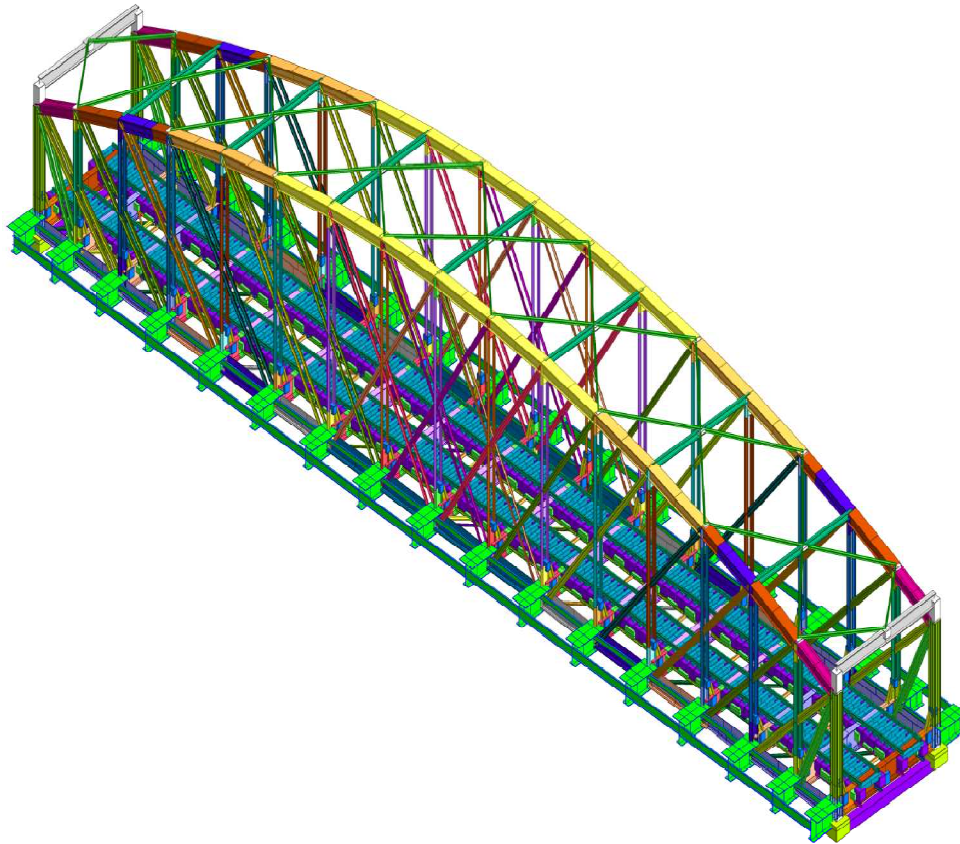
Permanent monitoring system

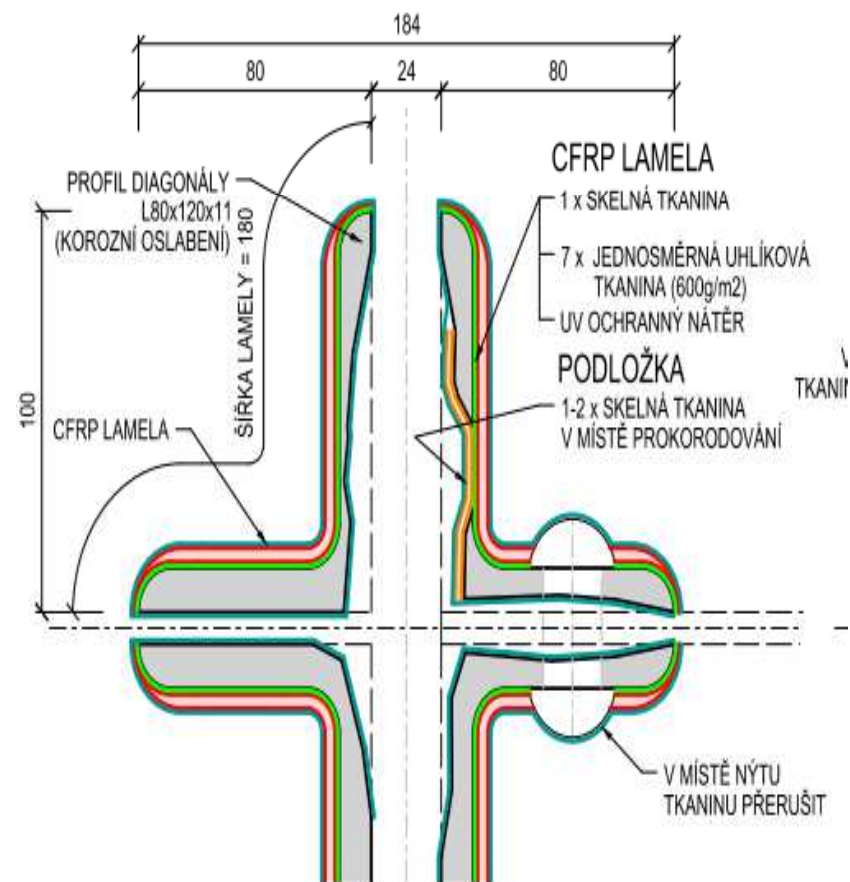
- Acoustic emission system AE-ACES20, 16 sensors
- 48 strain gauges, 12x accelerometer
- 6 displacement sensors on bearings
- 5 temperature sensors
- 2x dynamic dataloggers EMS DV 803
- Principle
 - acoustic emission
 - monitoring redistribution of forces in diagonals because of their failure and force redistribution



Assessment of the bridge

- Load capacity assesment – on the FEM 3D model, validated by static and dynamic tests
- Line class **C2/20**, since 2023 only on one track





Fatigue details stabilization

- CFRP strengthening – Sikawrap 301 + Sikadur 330+370
- Planned in summer 2026
- Ongoing experiments on the FCe CTU



Conclusion remarks - constrains

- It is required profile **ZG-C** – for all tracks as a minimum, already reduced from VMP 2,5
- Traffic class **D4** is not for freight trains, but for electric locomotives for passenger trains – they are listed in D4 (22,5t/axle)
- 2 north tracks are for Prague - Main station line – 80% off traffic
- Southern track – 20% of trains
- Tram line requires min. 4,5 m – so new track must be higher – temporary bridge is planned to be 1,15 m higher





Thank you for your attention