

Railway bridge under Vyšehrad



Presentation content

- Basic description, bridge introduction
- A bit of history
- The current state of structures
- Preparation of reconstruction
- Relocation of the existing structures
- Current status of the project and its political theme
- Discussion and final summary

Railway bridge under Vyšehrad



Railway bridge under Vyšehrad

Location of the bridge

- The railway bridge lies on the transport corridor **Nuremberg – Pilsen – Prague – Olomouc – Vienna (AT) – Bratislava (SK)** and belongs to the busiest railway bridge structures in the Czech Republic
- It is included in the core network for passenger trains within the meaning of **Regulation (EU) No 1315/2013** on Union guidelines for the development of the Trans-European Transport Network (**TEN-T**)
- The bridge connects western Bohemia with the centre of Prague
- The bridge connects the large Prague railway stations Prague Main Railway Station (Praha hl. n.), Praha-Smíchov and Praha-Vrřovice



- A-09** kód stavby z interaktivní mapy Správy železnic
-  řešená stavba
 -  ostatní stavby
 -   most
 -   tunel
 -  žel. stanice
 -  žel. zastávka
 -  rušená původní trať



Railway bridge under Vyšehrad

Traffic load (trend of the number of trains)

- In 2015 – **216** trains per day
- In 2022 – **288** trains per day
- **In 2035 – 479** trains per day (prospect)
- **In 2055 – 421** trains per day (assuming the construction of underground tunnels)

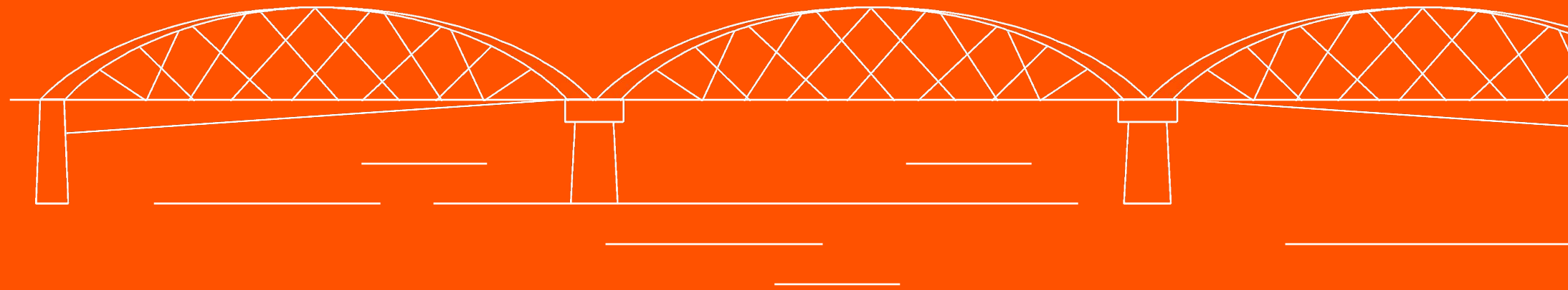
- It is now **impossible to introduce new lines** connecting the outskirts of Prague, as **requested by the capital city of Prague**

Railway bridge under Vyšehrad

Allowed axle load on the bridge is now 20 tons

- Previously, it was allowed to drive at a speed of 60 km/h.
- **Now, it is allowed to drive at 20 km/h, and only one train is allowed** on the bridge.
- Electric locomotives, which have a larger axle load, can only go on the bridge thanks to an exception.
- This is not a satisfactory situation for train operators or for transport customers

A bit of history



Railway bridge under Vyšehrad

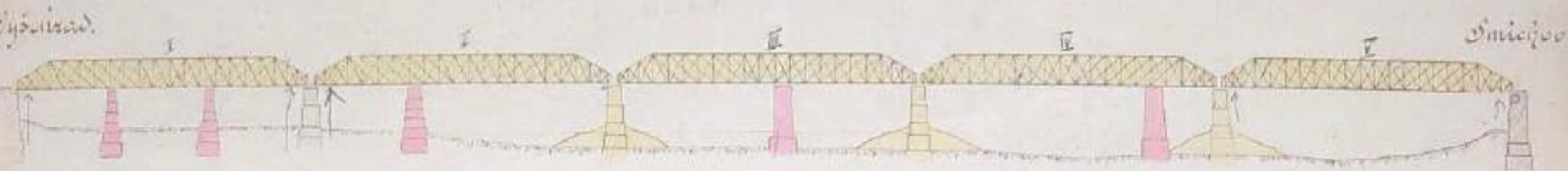
History of the bridge

- The bridge was built in 1901 as a **replacement for the existing inadequate single-track bridge**
- Modifications and repairs of the bridge were carried out in 1957, 1970, 1987, 2008, 2020 (never a major reconstruction)
- Throughout the lifetime of the bridge, there has been talks of the need for **increasing the capacity of this section** to three tracks (it is the last part of the entire section that has only two tracks)

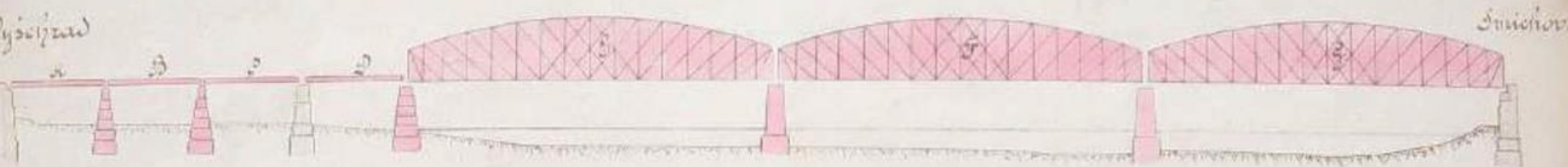


Reconstruction der Moiscanbrücke der Prager Verbindungsbahn.

Stand vor der Auswechslung.

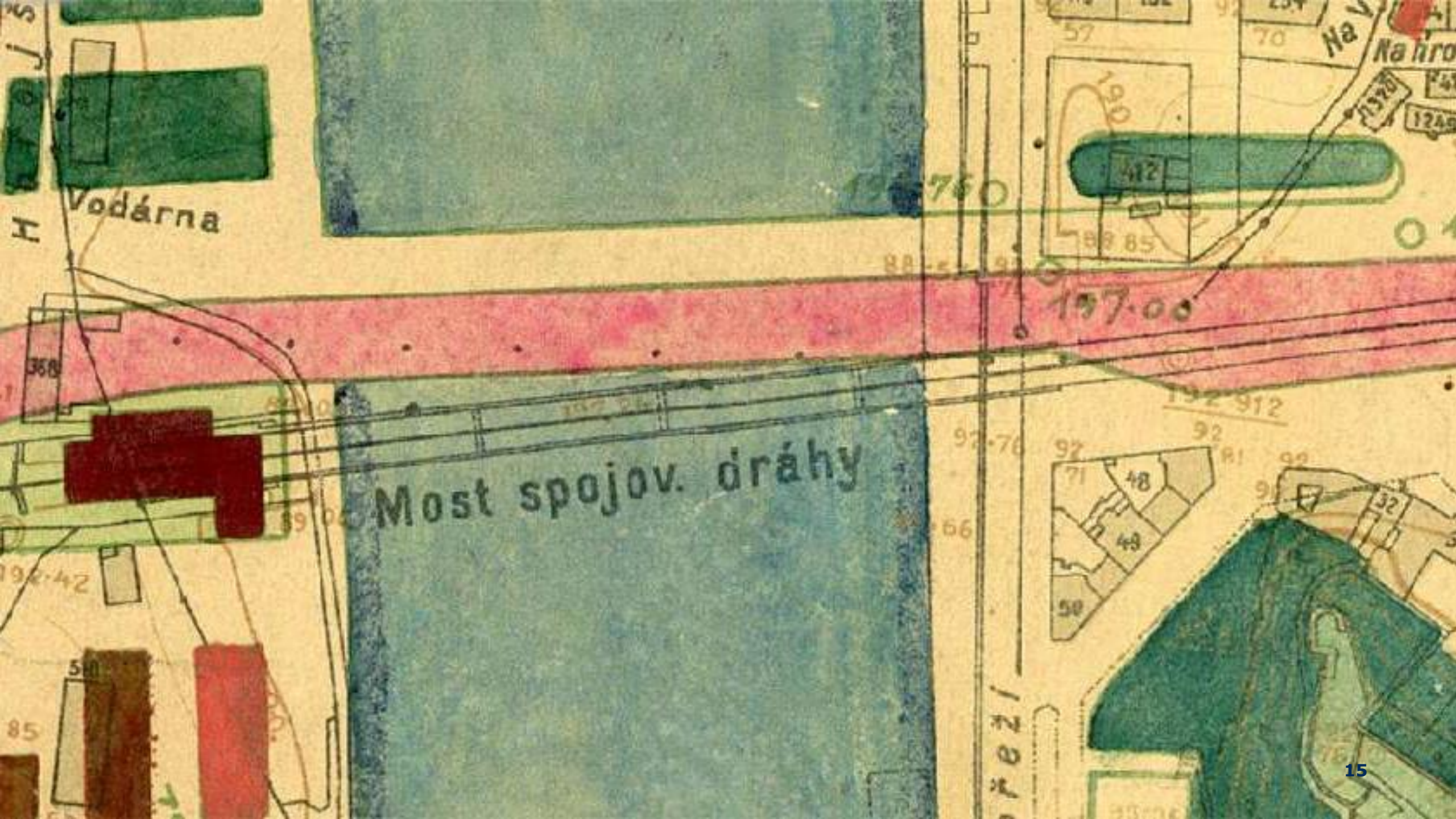


Stand nach der Auswechslung.









H
Vodárna

Vodárna

Most spojov. dráhy

197.00

97.76

192.912



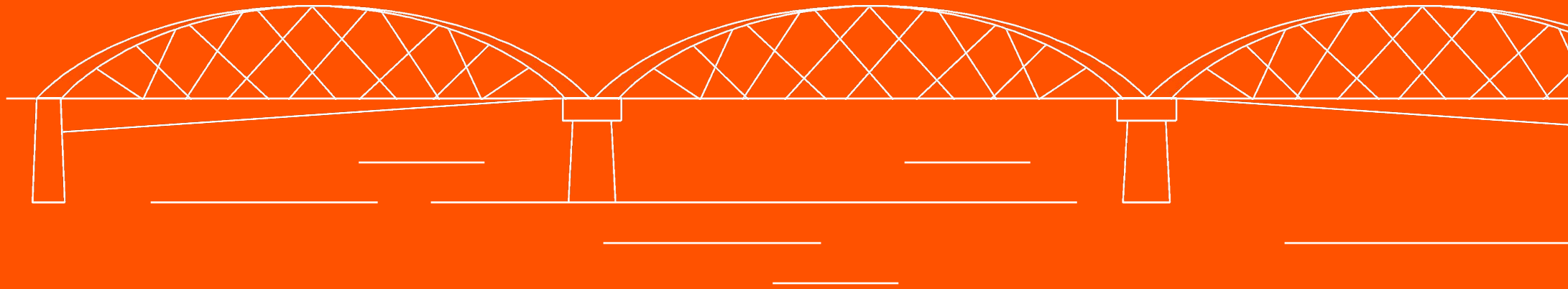
VOZE JIMPAK FAYRE'S SALES

RIVER SIDE COURT

VYTONSKÝ MOST

STOVE LOUKA

The current state of structures



Railway bridge under Vyšehrad

The current state of structures

- Age **123 years**
- Exceeded service life
- **Fatigue cracks in the structure**
- Weakening due to corrosion
- Deformed structure from **cyclic loading**

Crack in the longitudinal band



Crack in the longitudinal band



Lower belt corrosion



Detail



Losses of the lower belt to corrosion



Diagonal corrosion – detail



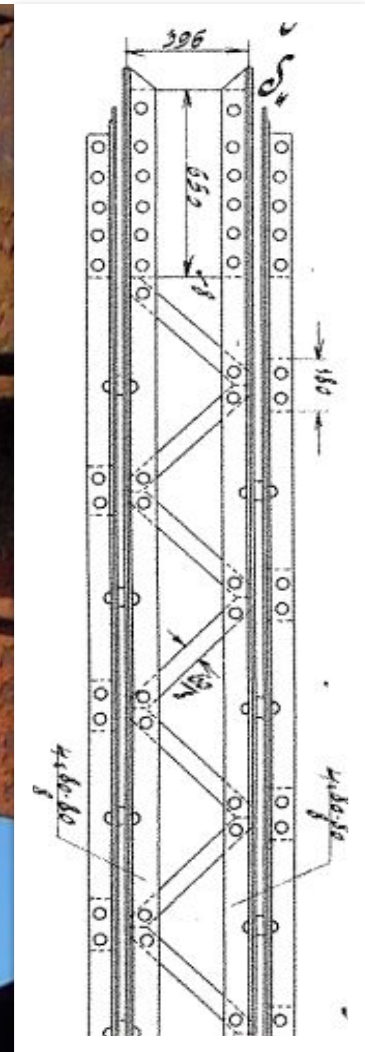
Losses of the diagonal to corrosion



Losses of the diagonal to corrosion



Main beam diagonal – segmented member



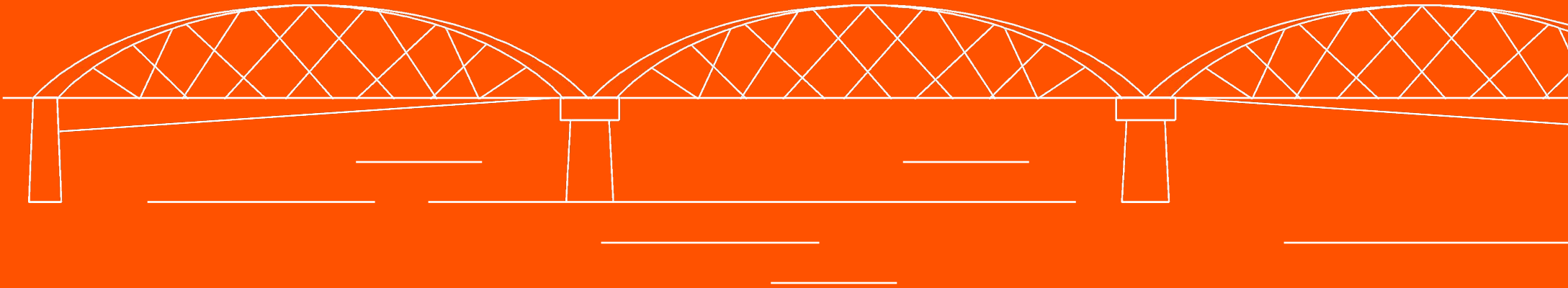
Deformed structure from cyclic loading



Deformed structure from cyclic loading



Preparation of reconstruction



Development during recent years

— 2015

- Study of the line reconstruction – **assumption of preservation of the bridge** with partial repair

— 2016 – 2018

— Preparatory documentation

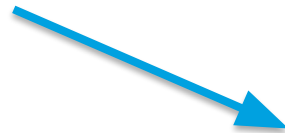
- Detailed survey of the structures (**every element was mapped**, the loss to corrosion verified, measured were proposed)

— 2019

- **Peer reviews** (validating the accuracy and assumptions of the 2018 survey)
- Discussion about the future of the bridge (**2 basic variants**)

Development during recent years – variants of the original structures

- Existing structures **with** railway traffic
 - **More than 70 % of the** original structure needs to be replaced
 - Service life of the existing structure approximately **30 years**
 - High **costs** (acquisition and operation)
 - Long construction/repair time (**long constraints during construction**)
 - Need for adding a 3rd track
- Existing structure **without** railway traffic
 - Existing structure will be preserved (**about 5 % of elements need to be replaced**)
 - The service life of the existing pedestrian and cycling structure will extend by approximately **another 50–100 years**
 - The cost of relocation and repair is the same as building a new connection
 - The construction time does not affect the railway traffic or the city centre
 - Necessity to move the structures to a new location



International architectural competition

had take into account **all the requirements and interests** in the given location, find new solutions, seek a society-wide consensus on the bridge design.

International architectural competition

Objectives

- Finding a bridge solution that meets current parameters
- Ensuring **safe and reliable operation**
- Obtaining a proposal that is based on an independent dialogue between experts and one that finds the **best compromise between the many**, often conflicting, **demands**

Commission

- Dependent: Správa železnic, the Capital City of Prague, Municipal District of Prague 5
- Independent: architects, urban planners, bridge engineers, Club for Old Prague

Assignment

- It took about **one year** to write the Brief that was subsequently approved by the Commission

The Competition Brief required 43 conditions to be met

The key conditions included

- Modern three-track solution with a capacity of **479 trains per day** in 2035 (two tracks are not sufficient)
- **New railway stop Výtoň** for convenient transfer to tram lines with the expectation of handling up to 9,000 passengers per day
- **Barrier-free connection of** the left and right banks of the Vltava River for pedestrians and cyclists
- A solution that respects the **conservation of the bridge**

Comprehensive transport & urban planning solution for the site



The winning design

- Replacement of original structures with new ones, preservation of other parts of the bridge
- **Compact urban bridge** (railway, cyclists, pedestrians, promenade, bus stop, sports, entertainment)
- Excellent connection on both sides of the Vltava River to the urban area
- Best compliance with the requirements of the Brief
- Least interventions to urban space
- Minimum impact on the **city skyline**



























20

ZONA



AVE



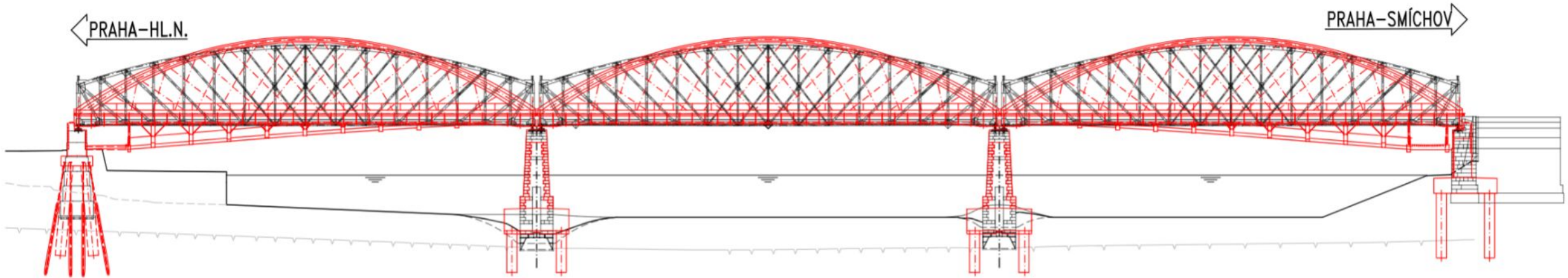


půjčovna

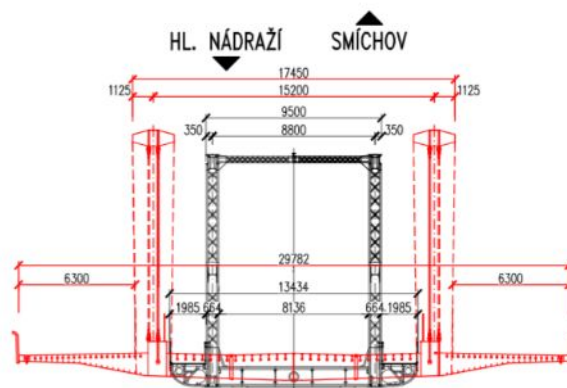
café

Comparison the existing and new structure

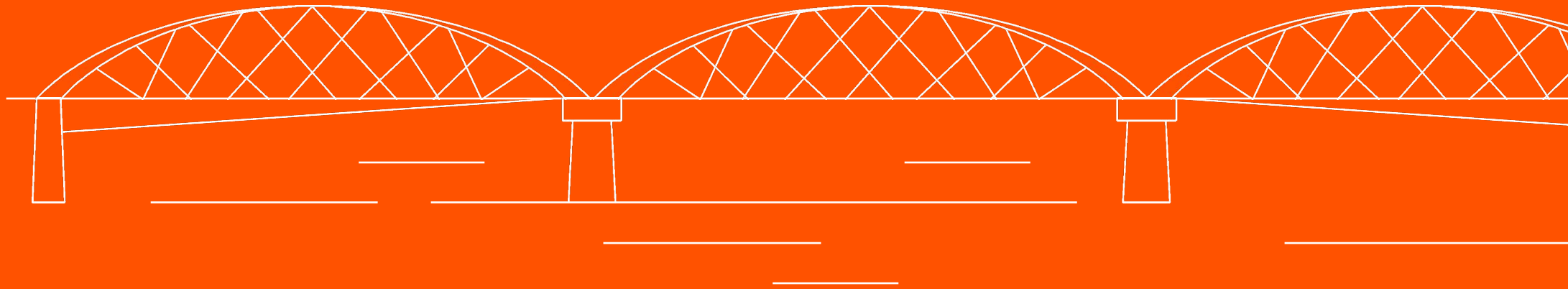
AXIAL SECTION



CROSS SECTION IN THE CENTRE OF THE BRIDGE



Relocation of the existing structure







Current status of the project and its political theme



Wave of attention after the announcement of the winning proposal

- The announcement of the winning proposal raised a wave of attention
- **Activist groups and associations** started popping up, some of them supporting the winning design, others calling for the competition to be cancelled and another variant chosen
- **Citizens' petitions for re-consideration of the intention to build new structures and petitions for the modernisation of the railway bridge at Výtoň emerged**
- The most visible of these associations are **NEBOURAT.CZ** and **Výtoň 21**
- Supporters include the Transport Association (passenger and freight railway carriers), the Chamber of Commerce of the City of Prague, the Prague Public Transit Company, the **National Council of Persons with Disabilities of the Czech Republic** and more

Wave of attention after the announcement of the winning proposal

- A lot of news and information was spreading through the media
- Some of the information was misleading, other resulted from lack of information
- The railway bridge under Vyšehrad has become an important topic that has been addressed across the public
- To confirm or refute the criticisms of the new proposal, the **International Technical Colloquium** was organised and advice requested from the independent expert group **JASPERS**, acting as an advisory body to the European Investment Bank (EIB)

Comparison of variants by the international expert organisation Jaspers

The study concluded that the **construction of a new three-track bridge:**

- will have a **service life of at least 100 years** (compared to 30 years)
- will be at least **40 % cheaper** than reconstruction (difference of CZK 1.1 billion)
- cause **less noise and vibrations**
- as opposed to reconstruction, it will allow full compliance with technical standards (TSIs)

Summary and discussion



Summary and discussion

- 1) **Správa železnic** is responsible for the **safe and reliable** operation of the bridge
 - The **current permitted speed** on the bridge is **20 km/h** on one track, passenger trains are restricted in this section (**some trains terminate in front of the bridge**), further restrictions are expected in the near future, there is a risk of **a traffic collapse of** public transport
- 2) **Over the past 20 years**, there have been numerous discussion about the bridge design while its **condition has been deteriorating**
 - These constant discussions make it impossible to move forward, every decision is reviewed
- 3) Many people have made it their **goal to save the existing steel structures of the railway bridge**. Among them are politicians, actors, doctors, athletes, lawyers, businessmen and some architects, **but no bridge engineer**. If we were to keep the old structures in place, the question is how much it would cost, how long it would last, and how much of the original structures would be left. The decision was made several years ago, but is still being contested.

Thank you for your attention

Railway bridge under Vyšehrad

Ing. Jiří Krouský

Project manager

Reconstruction of railway bridges under Vyšehrad

www.novymostvyton.cz