



**EUROPEAN CONVENTION FOR  
CONSTRUCTIONAL STEELWORK  
Bridge Committee**



**Steel temporary bridges for quick  
infrastructure repair after  
catastrophic events**

ECCS Bridge Committee



## PREFACE

The webinar, where the eBook was created, was focusing on recent catastrophic events, where the environmental actions impacted the bridge infrastructure heavily. As an example, the flood in Libya, earthquake in Turkey etc. were mentioned. In all those cases, the fast repair with temporary bridges is essential for any help, including the medical help, food supply and transport of the rescue equipment.

This publication also shows, how the constructional steelwork industry can help to solve those critical situations and help in the areas, where needed. The good examples can be shown in the applications all around the world.

A handwritten signature in blue ink, appearing to read 'Pavel Ryjáček', is positioned above the printed name.

Pavel Ryjáček  
Bridge committee ECCS, Chair



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**1. WELCOME WORDS AND ECCS INTRODUCTION**  
*VÉRONIQUE DEHAN*



**ECCS  
CECM  
E K S**

# **European Convention for Constructional Steelwork**

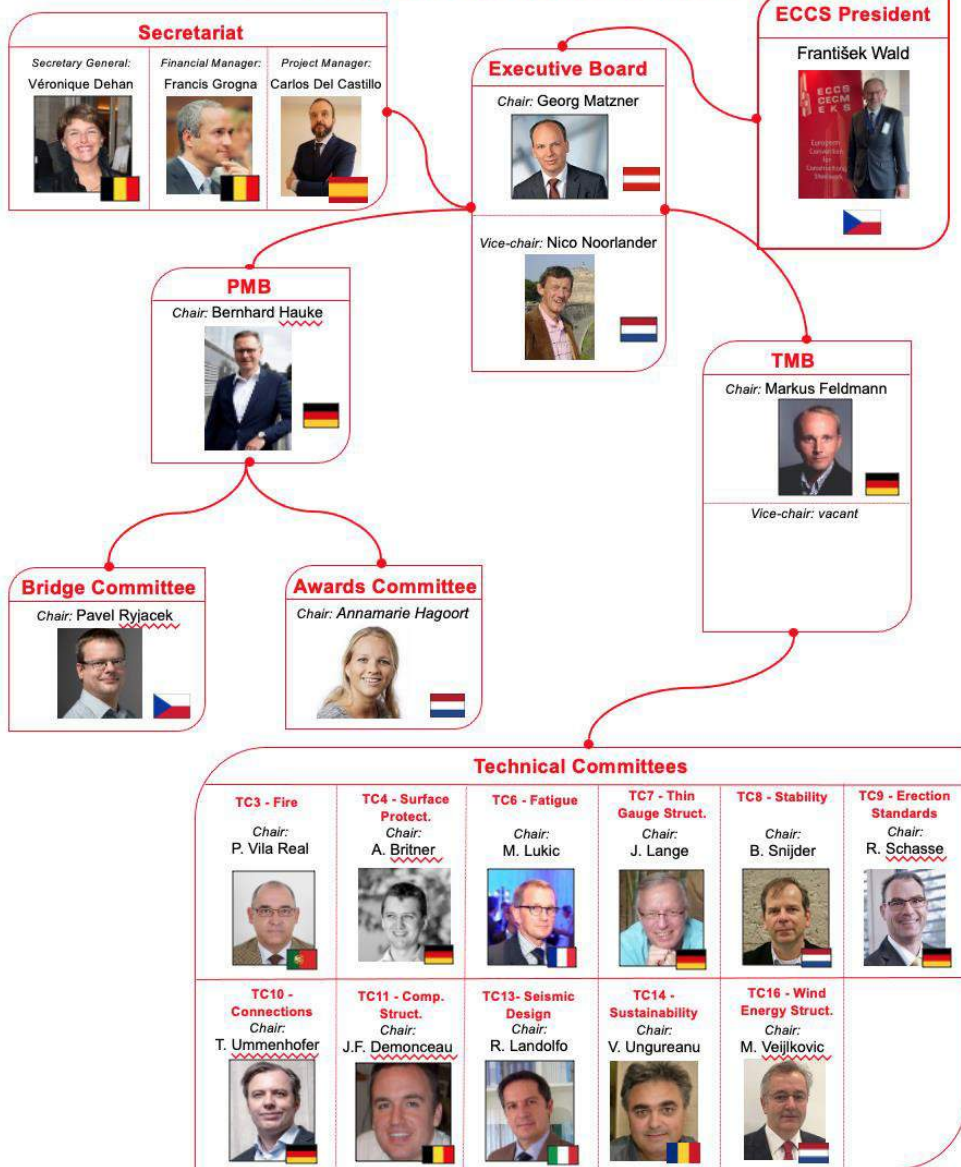
**ECCS presentation of activities  
19 March 2024**

## ***ORIGINS OF ECCS***

- Set up in **1955** in parallel with the European Coal and Steel Community (ECSC)
- Federation of **15 National Associations** (Full Members) + 14 Associate Members
- ECCS = **THE** sole European Platform gathering the steel producers, the steelwork contractors, the European research organisations and the academic world



# ECCS ORGANOGRAM 2023-2024



# MISSION

- To develop an **EFFECTIVE** technical and promotional network for **SUSTAINABLE** use of steel in the construction sector through our 10 TCs and two ACs in close collaboration with CEN and ISO.
- To **IMPROVE** competitiveness and innovation in the construction through a series of research projects;
- To **REPRESENT** the profession and continue to be the **REALIABLE PARTNER** on European and International level through the presence on various platforms at European and Global level (ECCREDI, CEN, ISO, DG GROW, etc)



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

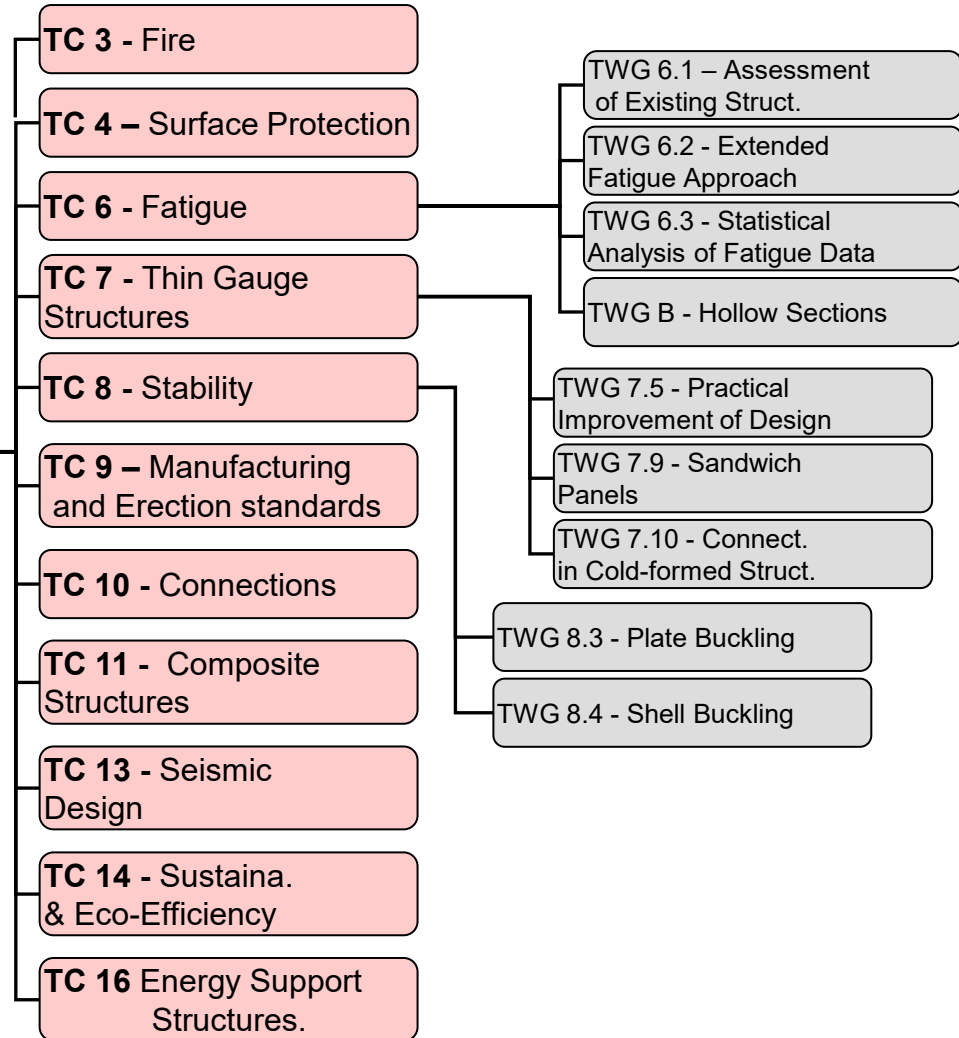




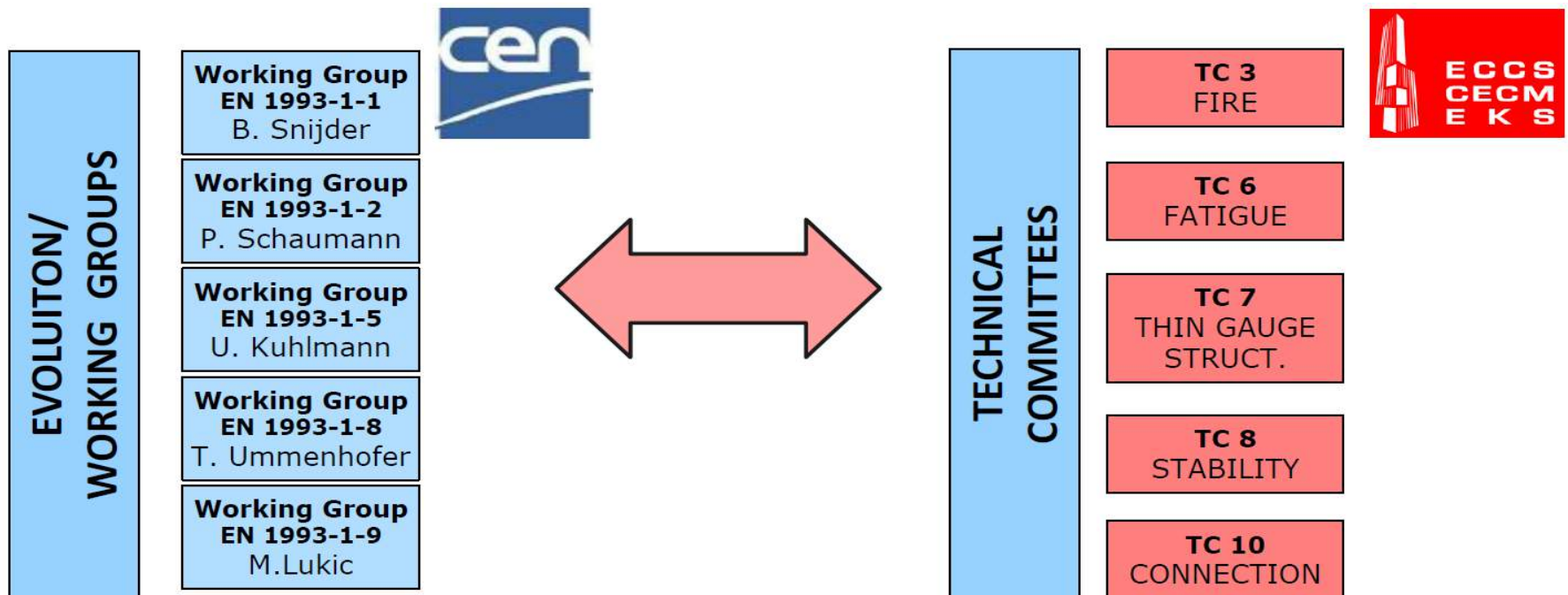
# TECHNICAL ACTIVITIES

**11 ECCS Technical Committees comprise over 350 experts**

**TMB**  
Technical Management Board



# TECHNICAL ACTIVITIES



Exchange of experts - Common meetings, use of ECCS-Internet-Platform, common dissemination, common research projects

# TECHNICAL ACTIVITIES

## Publications

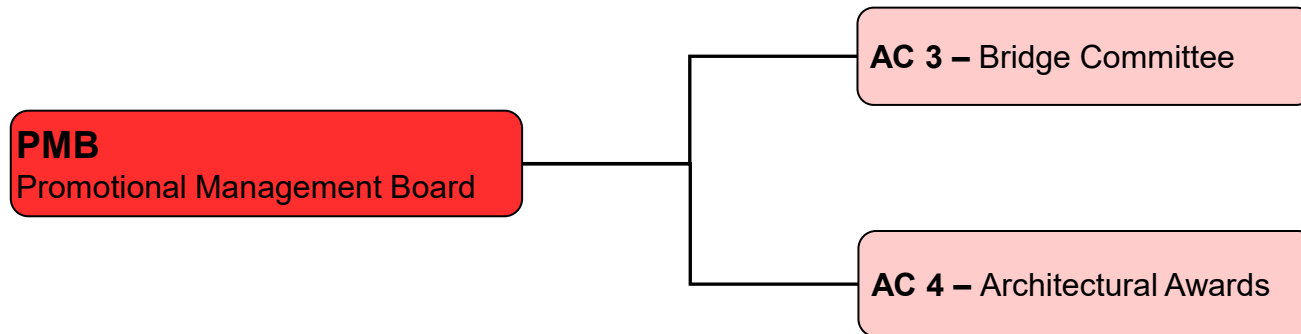
(see [www.steelconstruct.com](http://www.steelconstruct.com) Online Bookstore):

- ECCS Eurocode Design Manuals;
- ECCS Training Courses/webinars;
- Coordination/participation in **EU** research projects



# PROMOTION ACTIVITIES

## 2 ECCS Advisory Committees



**NEW** : - WG on **Policy** and  
- WG on **Communication on Sustainability** of Steel Construction

# PROMOTIONAL ACTIVITIES

## ➤ Bridges:



- International Symposium on Steel Bridges
  - Publications on the use of weathering steel in bridges

## ➤ Awards:

- European Steel Design Awards;
- European Steel Bridge Awards;
- European Student Architectural Award;
- Charles Massonnet Award.



# PROMOTIONAL ACTIVITIES

➤ **Conferences :**

[www.eurosteel2023.org](http://www.eurosteel2023.org)



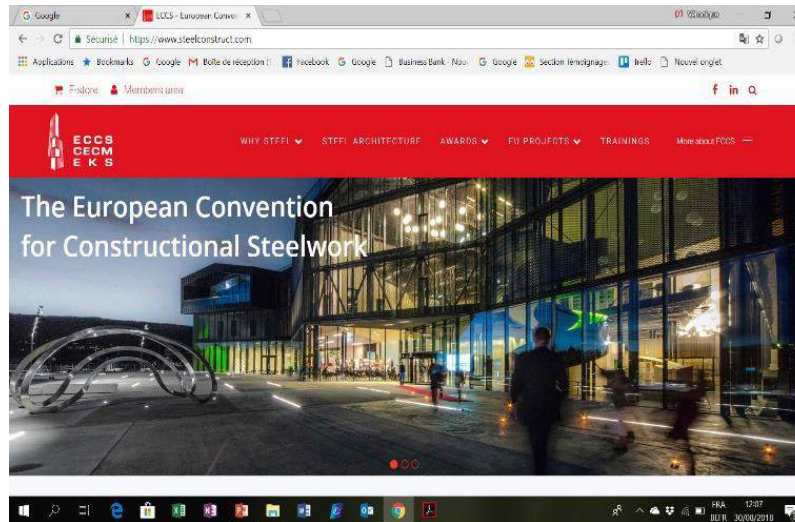
# PROMOTIONAL ACTIVITIES

## ➤ Dissemination of Knowledge:

-website: [www.steelconstruct.com](http://www.steelconstruct.com)

-electronical newsletter **Steelconstruct.com**

-quarterly Journal Steel Construction, Design and Research



# PROMOTIONAL ACTIVITIES

## ➤ Dissemination of Knowledge:



Life-cycle driven design of steel structures for reduced embodied carbon



By Alper Kanyılmaz,  
Politecnico di Milano, Italy

**SAVE THE DATES**

23, 25, 30 January  
and 01 February

**Online training - Four 12**

Contact: [francis.grogna@steelconstruct.com](mailto:francis.grogna@steelconstruct.com)



**SOLD OUT !**  
25 March 2024  
14:00 – 16:10



Moderator:  
Prof. Pavel Ryjáček, CTU, Prague



**Steel temporary bridges  
for quick infrastructure repair  
after catastrophic events**

**Sorry, no seat left !**

However the webinar will be recorded. More information will follow. For any question: [francis.grogna@steelconstruct.com](mailto:francis.grogna@steelconstruct.com)





# NETWORKING

ECCREDI



ESTEP



ECTP



LIAISON COMMITTEE



EUROFER



WORLDSTEEL



JRC, CEN and ISO



# NETWORKING – Major European steelwork contractors meeting





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Secretary General

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Website: [www.steelconstruct.com](http://www.steelconstruct.com)



## 2. THE EARTHQUAKE IN TURKEY – LESSONS LEARNED

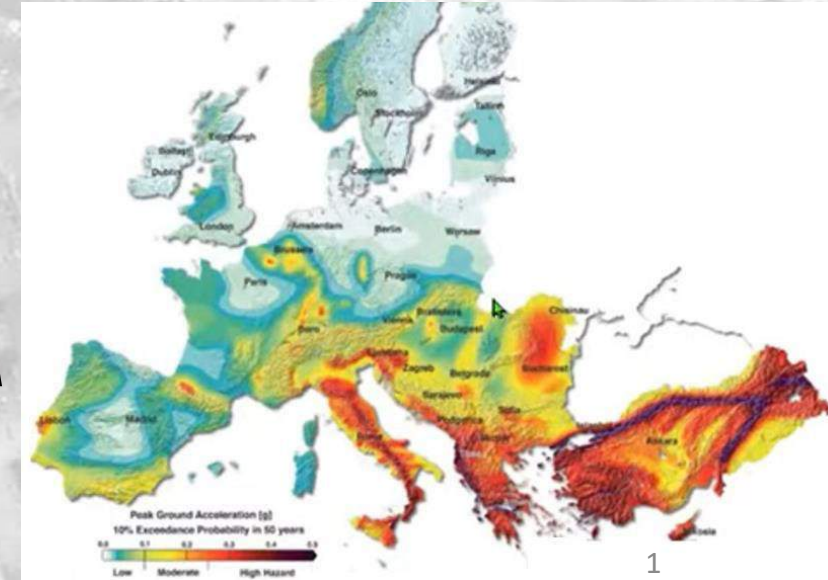
*YENER GURES*

## Steel Temporary Bridges for quick infrastructure repair after catastrophic events

*Earthquake in Türkiye - Lessons Learned*

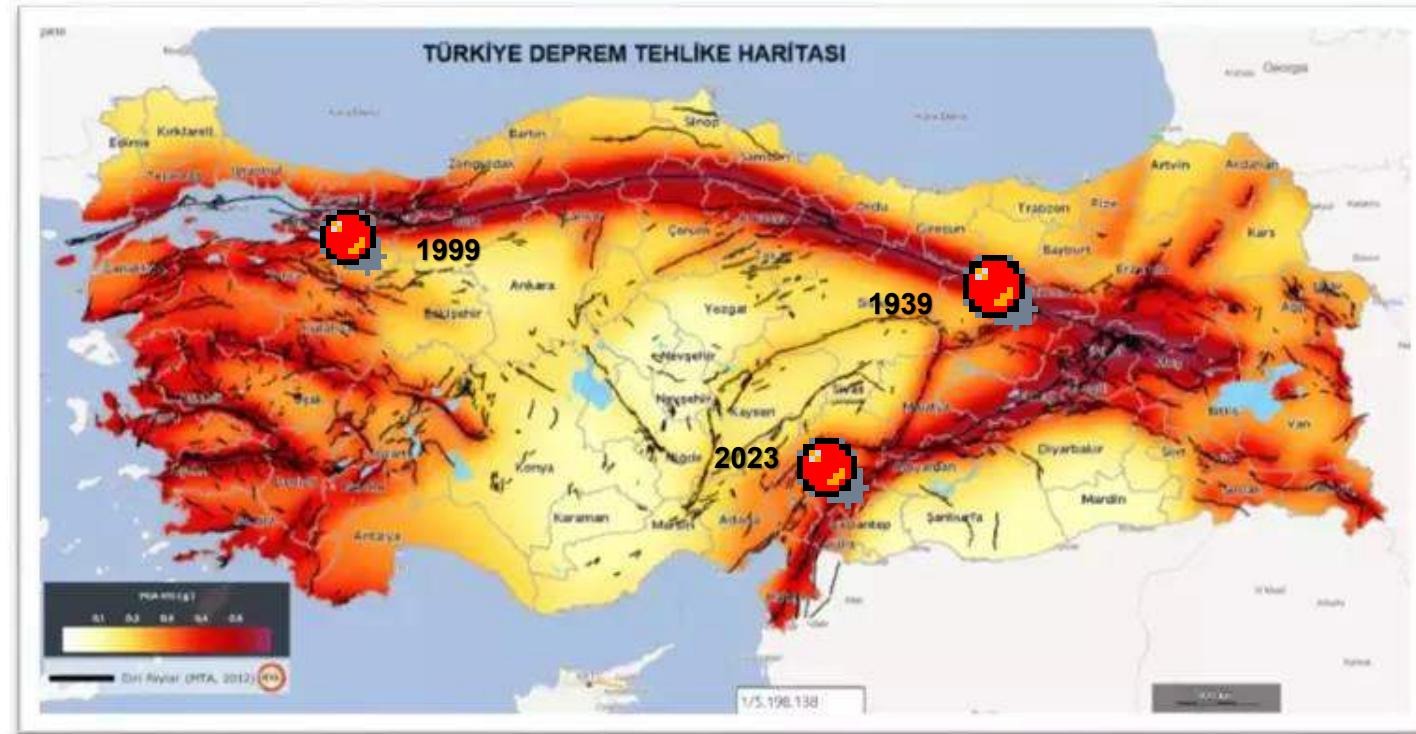
*February 6, 2023*

*H. Yener Gür'eş, President of TUCSA*

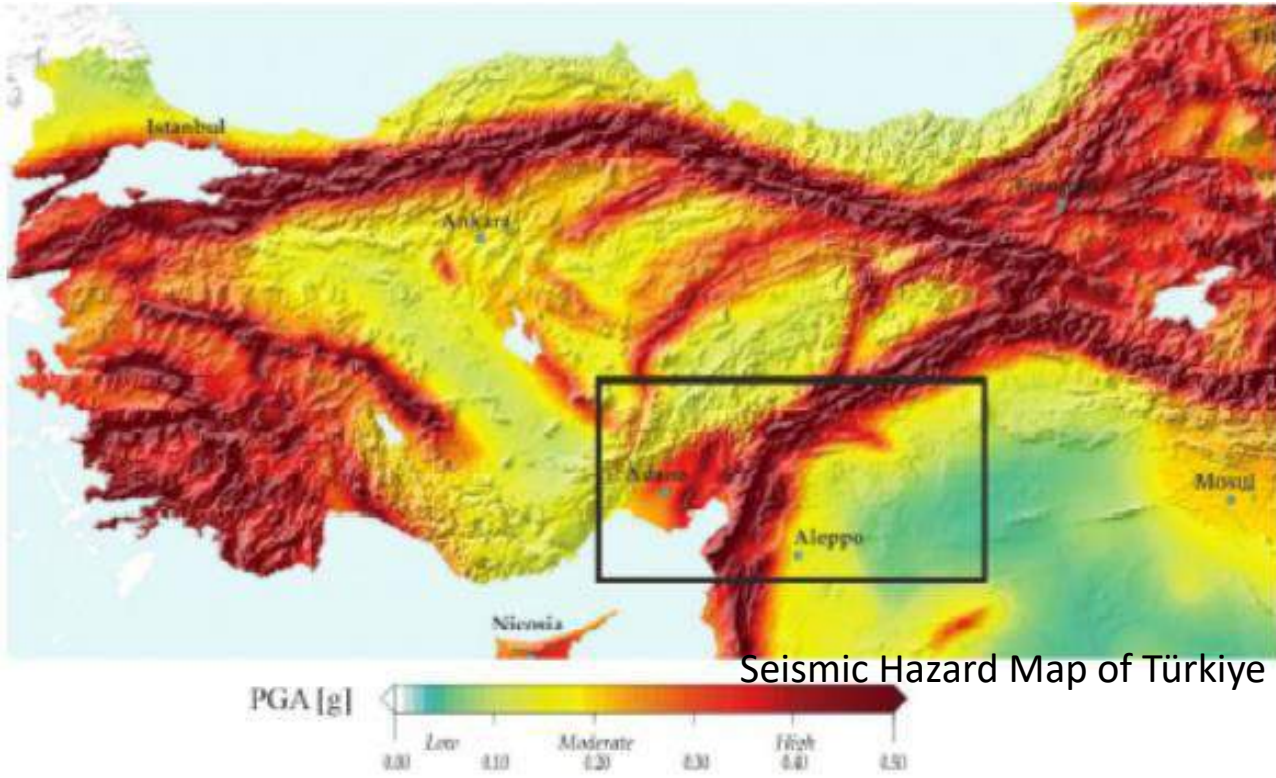


# The biggest three earthquakes in Türkiye within the last century

- **26 December 1939:** Erzincan earthquake with a magnitude of 7.9 Mw occurred. Death toll was **32.962** (%**0.185** of the population of 17,820,950).
- **17 August 1999:** **26 December 1939:** Grand Marmara earthquake with a magnitude of 7.4 Mw occurred. Death toll was **18.373** (%**0.028** of the population of 65,537,749).
- **6 February 2023:** Kahramanmaraş earthquake with a magnitude of 7.7 and 7.6 Mw occurred. They were followed by Hatay earthquake on the 20<sup>th</sup> of February. Total death toll was **55.000** (%**0.064** of the population of 85,372,377)

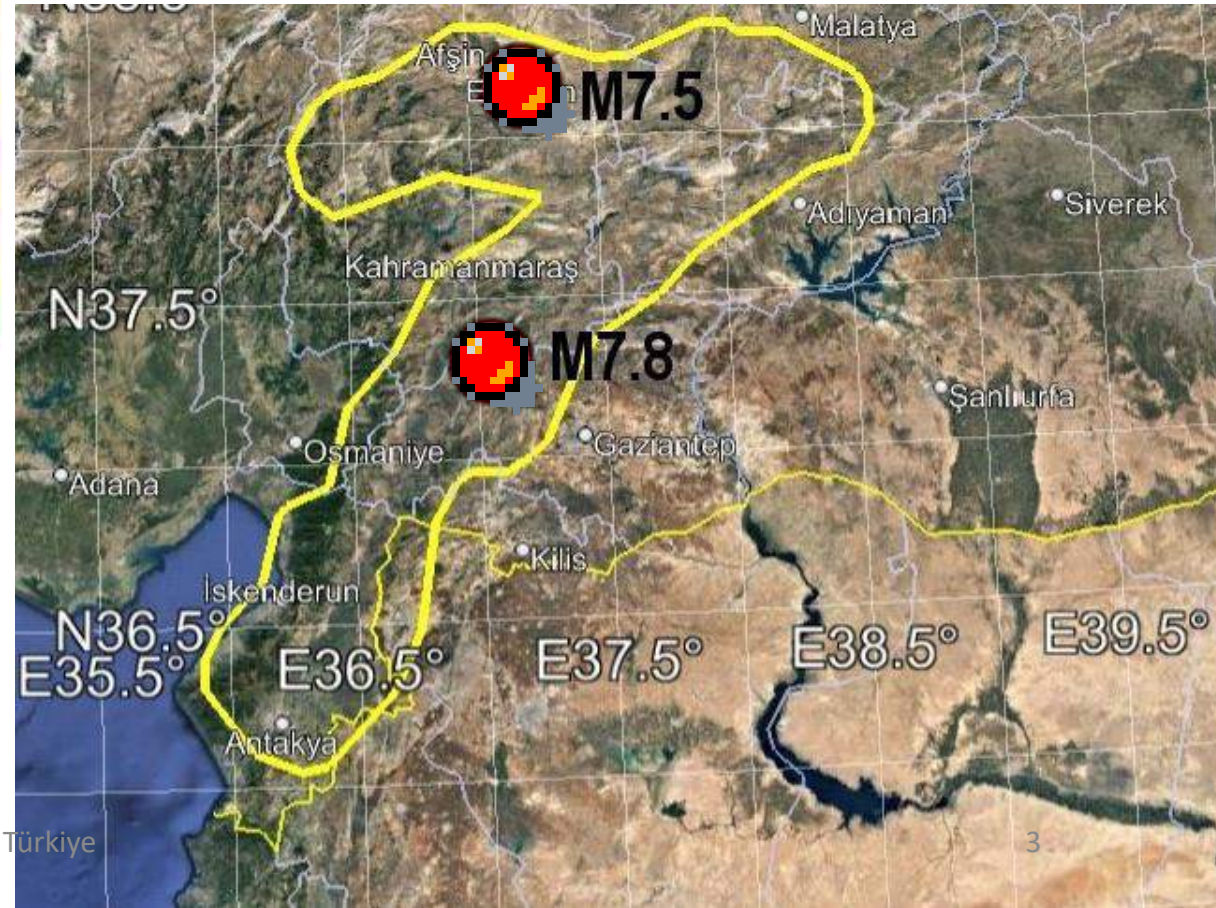


# February 6, 2023 Earthquake in South-Eastern Türkiye



At 4:17 a.m., a magnitude-7.8 earthquake struck near Kahramanmaraş Pazarcık Town. 8.6km

This earthquake was followed by a second earthquake of magnitude 7.5 about 9 hours later at 1:24 p.m. with the epicenter in Elbistan Town 9.7km



The earthquake hit the provinces of Kahramanmaraş, Adıyaman, Hatay, Osmaniye, Gaziantep, Kilis, Şanlıurfa, Diyarbakır, Malatya, Adana, and Elazığ

*Construction Types in the Area  
(According to the official report dated 18 March 2023)*

*There were 5,649,317 buildings in 11 cities effected by the earthquake  
Percentages below are for all types of buildings (including industrial and commercial) / residences*



**RC Buildings                    82 %    /    %95.2**



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***Precast Buildings 3.6 % /    %0.6***

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***Stone Masonry Buildings 3.5 %/1.3%***

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***Steel Buildings        2.4% /   0.4%***

*Construction Types in the Area  
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*Precast Buildings    3.6 % /   0.6%*

*Stone Masonry Buildings 3.5 %/ 1.3%*

*Steel Buildings        2.4 % /   0.4%*

***Others                    3.8 % /   2.3%***

*Timber Buildings*

*Rock carved Structures*

*Barns, Shades etc.*

# Losses during the Earthquake in the South-East Türkiye

In accordance with the official figures:

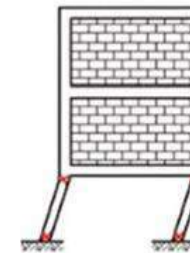
- 55 thousands people died.
- 518,009 buildings were collapsed or heavy damaged (9.2 %)
- 131,577 buildings were of medium level damaged
- 1,279,727 buildings were slightly damaged
  
- No steel structure collapsed
- 3 steel residences were heavily damaged
- Industrial steel buildings performed very well performance

## *Performance of RC Structures*

More than 1000 buildings constructed after 2000 were heavily damaged or collapsed

The damages and collapses were due to:

- Intensity of the ground motion, excessive settlements and bearing capacity failures of soil - seismic soil liquefaction
- Structural system design
  - insufficient steel reinforcement detailing
  - presence of soft story in the ground level or above the plinth
- Construction quality
  - the use of smooth reinforcing bars
  - low concrete strength
  - not properly applied beam-column joint
  - violating the code given performance objective
- Wrong government decisions- Zoning amnesty
- Later interventions
  - taking out of infill walls causing- inter-storey strength irregularity (weak storey)
  - cutting of columns on the ground floor or basement



# *Performance of RC Structures*



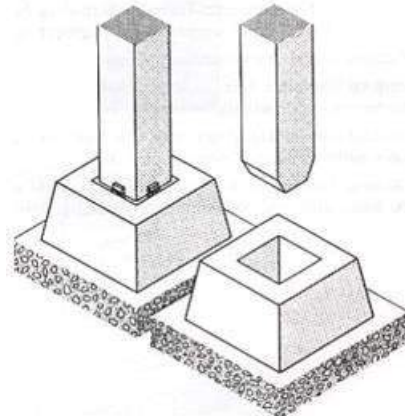
# Performance of Prefabricated Buildings



Industrial Regions in Kahramanmaraş and Gaziantep have many precast concrete buildings with one or two stories- 7,5mx20m

The building frame columns are fixed at the base with a socket connection

The prestressed (for long spans) roof girders are pinned to the column corbels usually with two grouted anchors embedded into the corbels



Two buildings that were under construction collapsed due to overturning of the girders

Earthquake in Türkiye

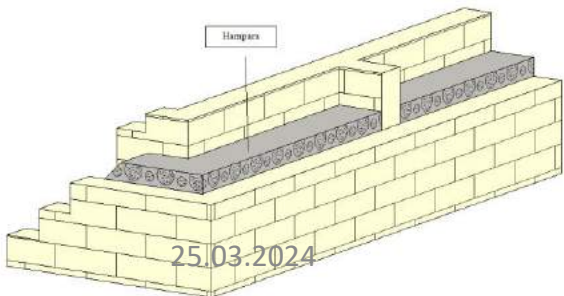




# Stone Masonry Buildings

Masonry construction constitutes the second largest type in Turkish building inventory.

The masonry construction in the area is stone masonry constructed during 15<sup>th</sup> – late 19<sup>th</sup> C. having 2 faced wall filled with rubble and mortar.

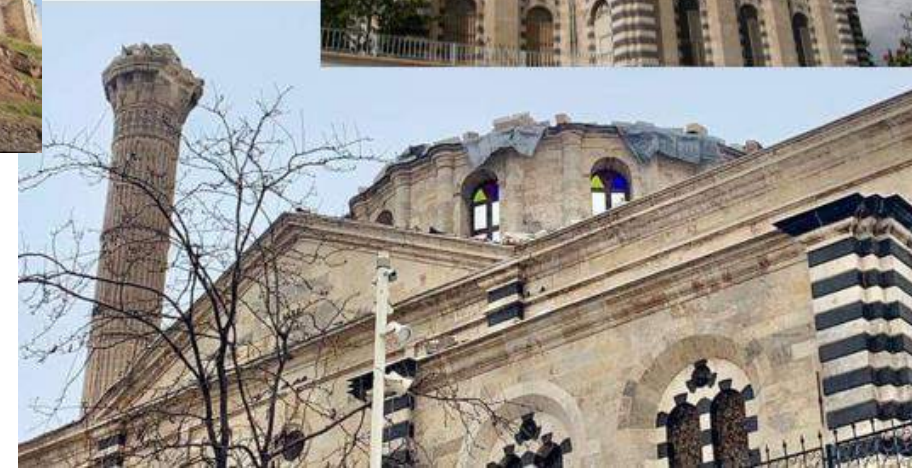


Earthquake in Türkiye

# *Performance of Stone Masonry Buildings*



Gaziantep

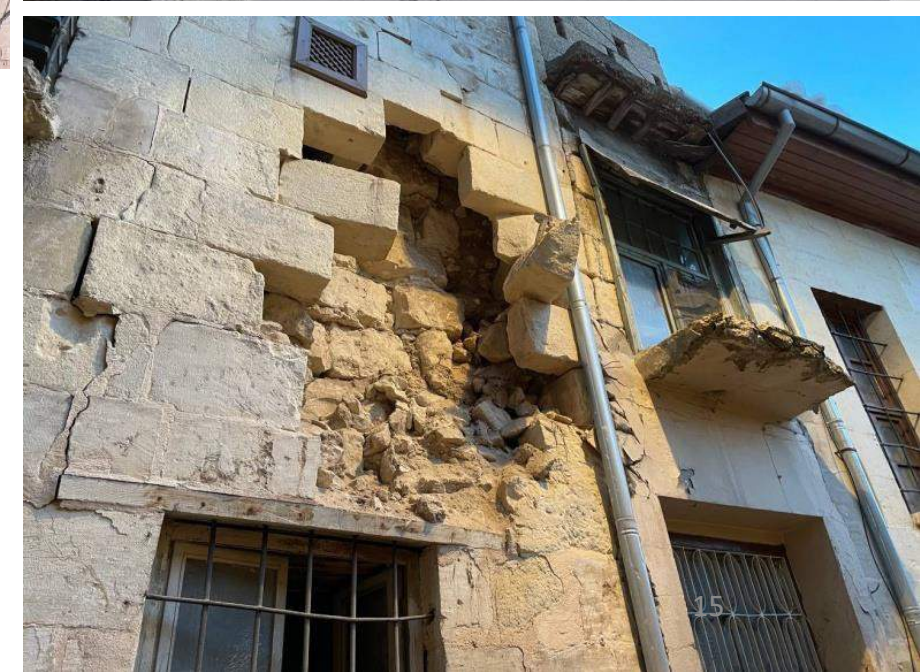


Many historical masonry buildings suffered heavy damage or collapse due to strong shakings under the two earthquake motions.

# *Performance of Stone Masonry Buildings*



Gaziantep



25.03.2024

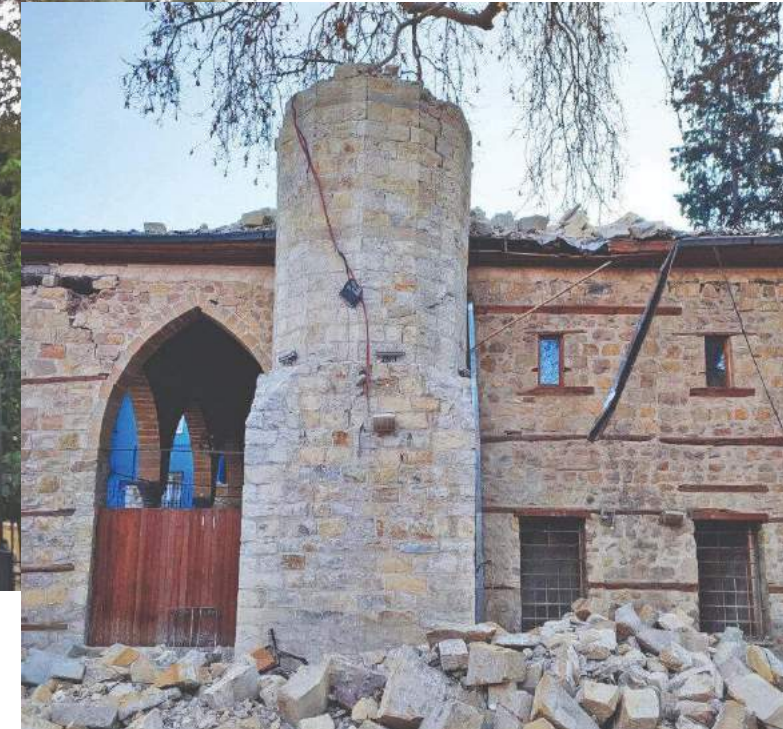
Earthquake in Türkiye

15

# *Performance of Stone Masonry Buildings*



Kahramanmaraş



The height and rigidity of the buildings played an important role.

# *Performance of Stone Masonry Buildings*



Kahramanmaraş

25.03.2024

Earthquake in Türkiye

# *Performance of Adobe Buildings*

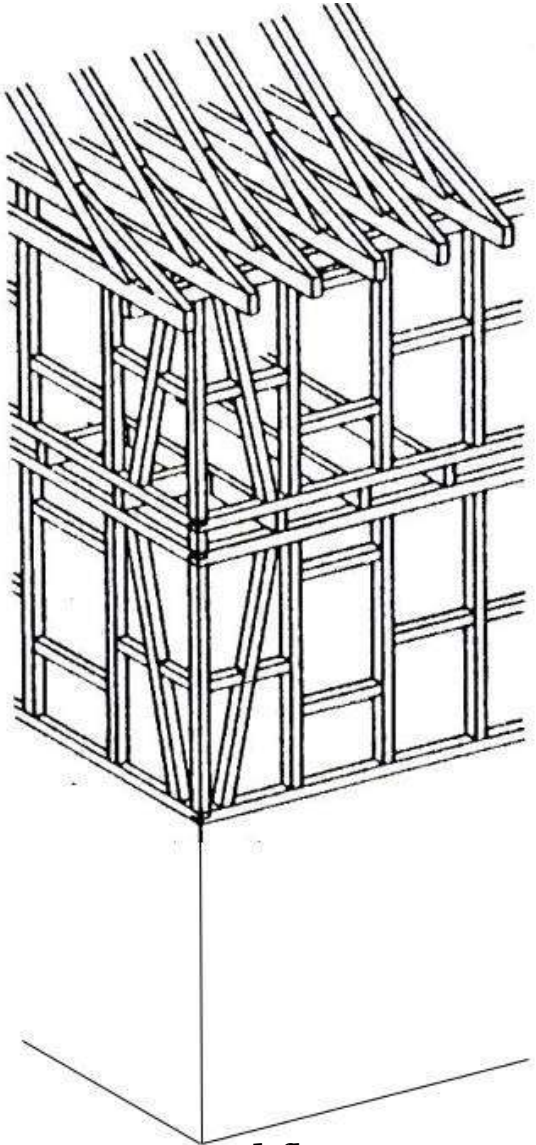


Adobe buildings generally had repairable damages.

Only reported heavy damaged Adobe building in Pazarcık.



# Timber Buildings

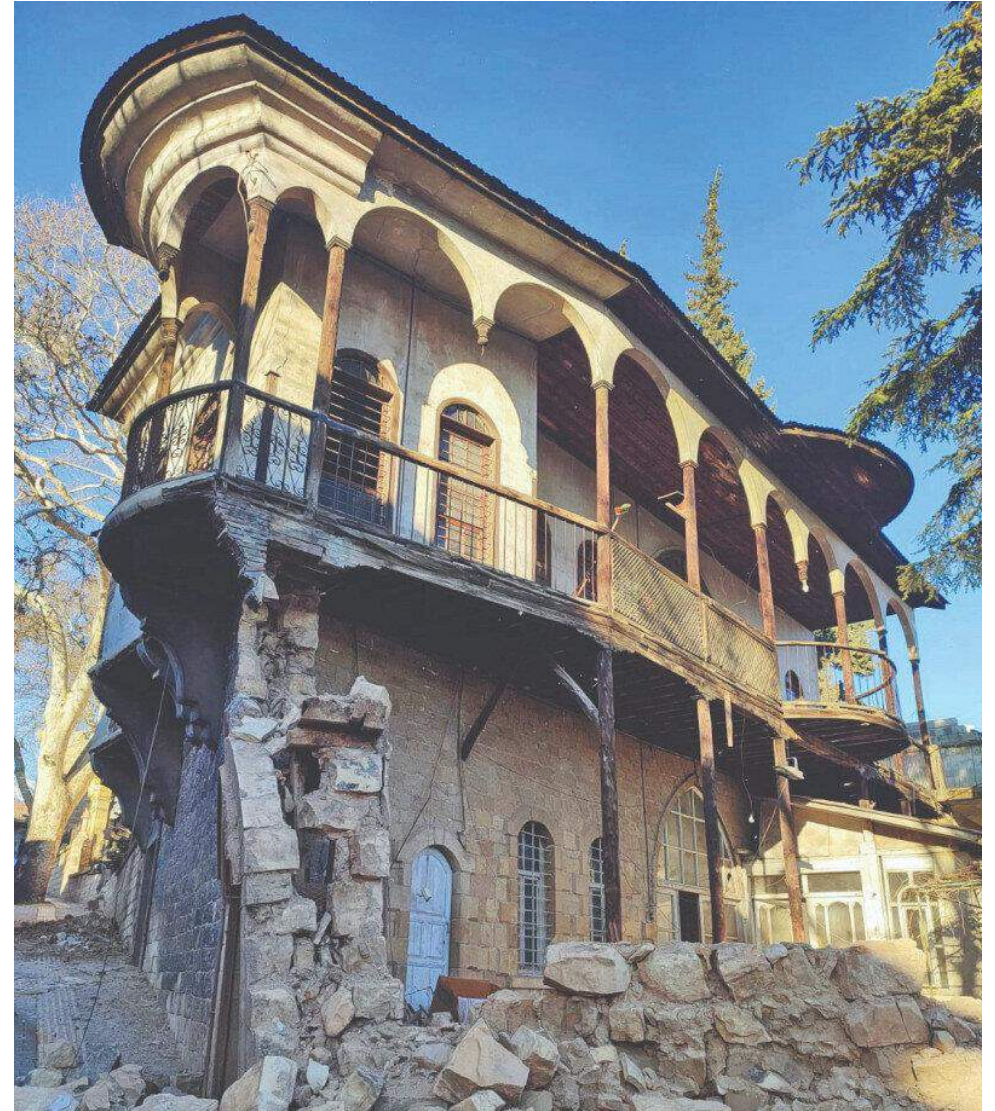


Ground floor; Stone masonry  
1st + 2nd floor: 40-60 cm spaced columns and studs- braced frame  
Infill; rubble stone, adobe or brick blocks set in mud or lime mortar

## *Performance of Timber Buildings*



25.03.2024



Earthquake in Türkiye

20



## *Performance of Timber Buildings*



Several timber roofs fell down when the walls they rested collapsed.

## *Rock Carved Structures*

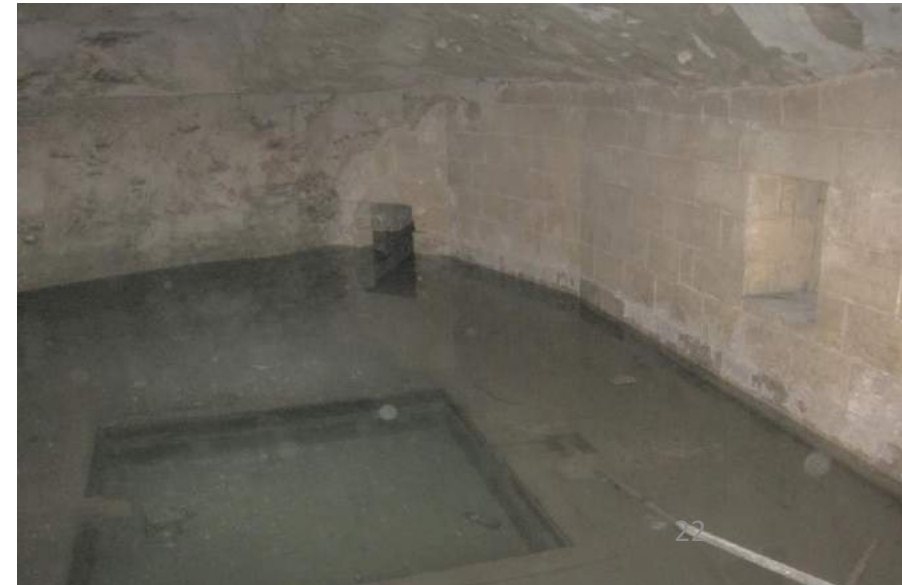


25.03.2024



No failure is reported in  
rock carved structures.

Earthquake in Türkiye



22

## *Erzin, Hatay*



Erzin survived 7.8-magnitude quake with no casualties and little damage.

The mayor did not allow any illegal structures and enforced the implementation of the building standards.

Geologists say that the reason why Erzin was not destroyed is that it was settled on basalt stone and there is a large mountain mass called Amanos between the faults 30-40 km from Erzin

# *Performance of Steel Buildings*



Three Steel Residences built after 2000

- No steel building collapsed
- Three steel residences heavily damaged but people inside were in safe
- Industrial building activated very soon. It was important not only for economy but also returning to social life quickly



After the earthquake on 6 February



After the earthquake on 20 February

# Developments after the Earthquake in Türkiye

- **Corrective activities** such as rescue, shelter and meals & beverage, health and hygiene, transportation and logistics, security, burial and similar operations have been carried out. Building constructions are continuing.
- It is obvious that **Preventive activities** is extremely important in order not to lose the lives of tens of thousands of people, to prevent the collapse of hundred thousands of buildings, and to avoid economic losses of hundred billions of dollars, as experienced before. For the following earthquakes, we believe that governmental bodies and universities will continue to work on this topic by producing strategic solutions and measures based on earthquake resistant construction with the participation of all relevant parties.
- Ministry of Environment, Urbanization and Climate Change requested TUCSA, first time, to inspect and classify the damages for steel structures in earthquake region, on the 29th March 2023.
- TUCSA established teams for inspection and classification of damages for steel structures.

# Developments after the Earthquake in Türkiye

- It was clearly observed that steel buildings were safer than other types of buildings. Therefore, to increase the use of steel structures in Türkiye,
  - ✓ TUCSA achieved an online summer school of 60 hours for steel construction between 18 September and 6 October 2023, with the participation of 1.031 students, architects and engineers.
  - ✓ TUCSA is trying to convince the governmental bodies to make some official regulation such as to make mandatory to construct industrial buildings in steel in seismic zones, all buildings within the certain distance from fault lines must be steel etc.
  - ✓ TUCSA is planning to hold Earthquake Resistant Constructions Summit in Ankara in the second half of September.
- WSA constructsteel will meet in Istanbul on the 29th and 30th of April 2024 for plenary meeting and to discuss the role of steel solutions in disaster prevention & restoration, with the participation of high level governmental officers.

# Lessons Learned

- Inspection and classification of damages for steel structures in earthquake region;
  - ✓ The existing Turkish rules to inspect and classify the damages had been prepared for reinforced concrete, precast concrete and masonry buildings but not for steel structures.
  - ✓ It was reported to the ministry, and TUCSA was requested to draft a regulation for inspection and classification of damages of steel structures, and repair of them. It has been being prepared by using FEMA 352. we may work on similar regulation for Europe.
  - ✓ It can be considered by the ECCS Seismic Design Technical Committee (TC13).
- It is important to be ready to establish earthquake damage inspection and classification teams in advance.
- One of the most important features of steel structures is that their load-bearing elements can be replaced and reinforced fast.

# Proposals

## 1. Steel Temporary Bridges for the damaged roads.



After catastrophic events on the 6<sup>th</sup> of February 2024, some roads have been destroyed as you see on the left. It is better to consider the use of Steel Temporary Bridges not only for the damaged / collapsed bridges but also for some other infrastructure repair such as the damaged roads.



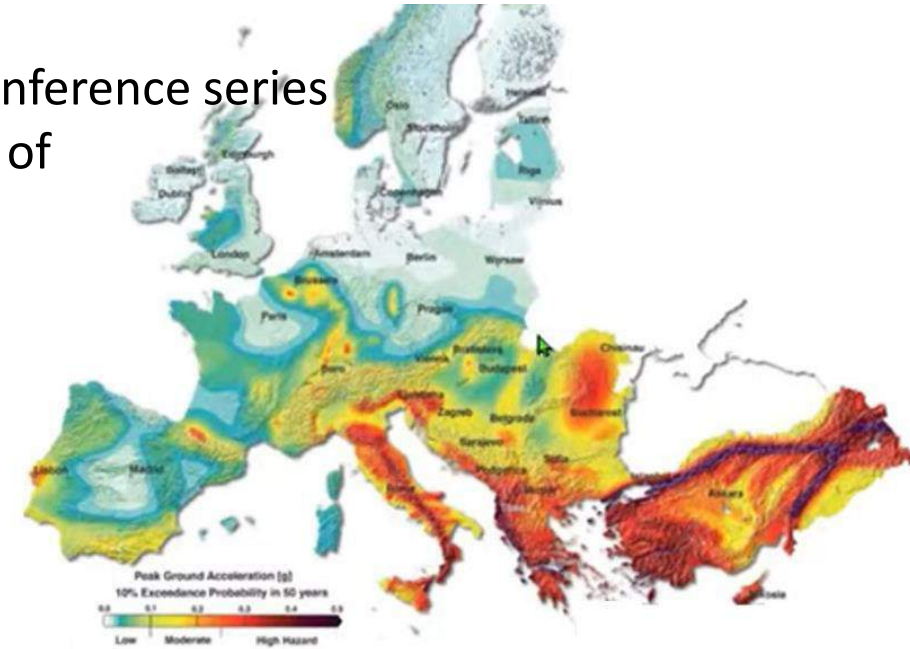
# Proposals

## 2. Regulation for inspection and classification of damages of steel structures.

TUCSA recommends ECCS Seismic Design Technical Committee (TC13) to consider to prepare a regulation / guidance document on inspection and classification of damages of steel structures for Europe which can be discussed also in below mentioned conference.

## 3. Proposal for Earthquake Conferences in turn

- ✓ TUCSA has reiterated the proposal for organising Earthquake Conference series for Europe which can be achieved by high seismic risk countries of Europe such as Portugal, Italy, Greece, Türkiye, Romania.
- ✓ These countries may organise these conferences in turn every two years under the coordination of TC13 Seismic Design Committee should it be accepted by ECCS.
- ✓ If this proposal is accepted, TUCSA is ready to organise the mentioned conference in 2025 autumn or 2026 spring in coordination with Yeditepe University.





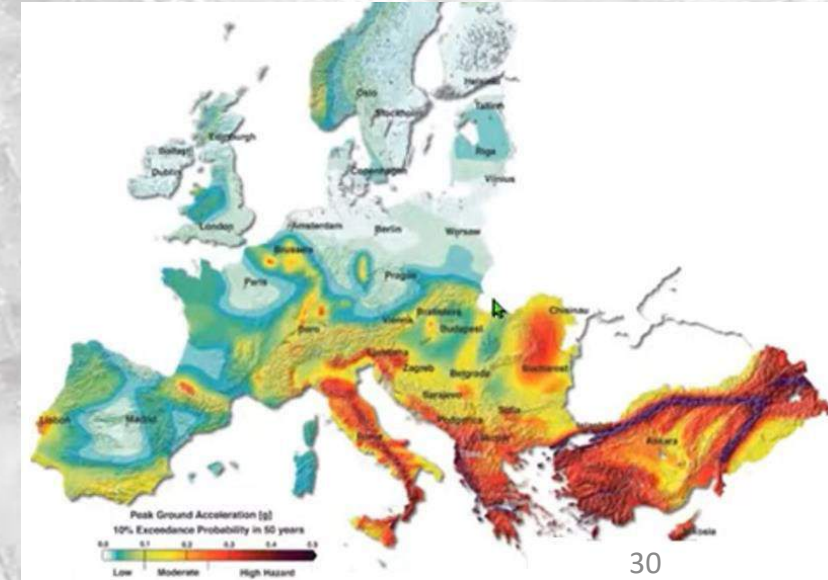
**ECCS  
CECM  
EKS**

## **ECCS ACADEMY**

# Steel Temporary Bridges for quick infrastructure repair after catastrophic events

*I hope this becomes the END of ruins*

*H. Yener Gür'eş, President of TUCSA  
yenergures@gmail.com*





### **3. EXPERIENCES WITH TEMPORARY BRIDGES CONSTRUCTION AFTER FLOODS IN SLOVENIA AND CZECHIA**

*MARTIN BENDA*



# Experiences with temporary bridges construction after floods in Slovenia

Reconnaissance of the possibility of building temporary bridges

15.-19.8.2023

Building of temporary bridge set TMS

4.-21.9.2023



mjr. Ing. Martin BENDA, Ph.D.

University of Defence, FMT

Department of Engineer Technology

E-mail: martin.benda@unob.cz





## TEMPORARY BRIDGES OF ADMINISTRATION OF STATE MATERIAL RESERVES

ASMR has in storage, especially older types of bridges. The most of them no longer meets the requirements for current traffic. Because of load capacity and also because of structural arrangement. The Czech Republic offered three bridges with a total length of 108m.

### Heavy Bridge Set – TMS

Time of origin: 1950

Ona span bridge: 36m according TP (manual) max. 69m

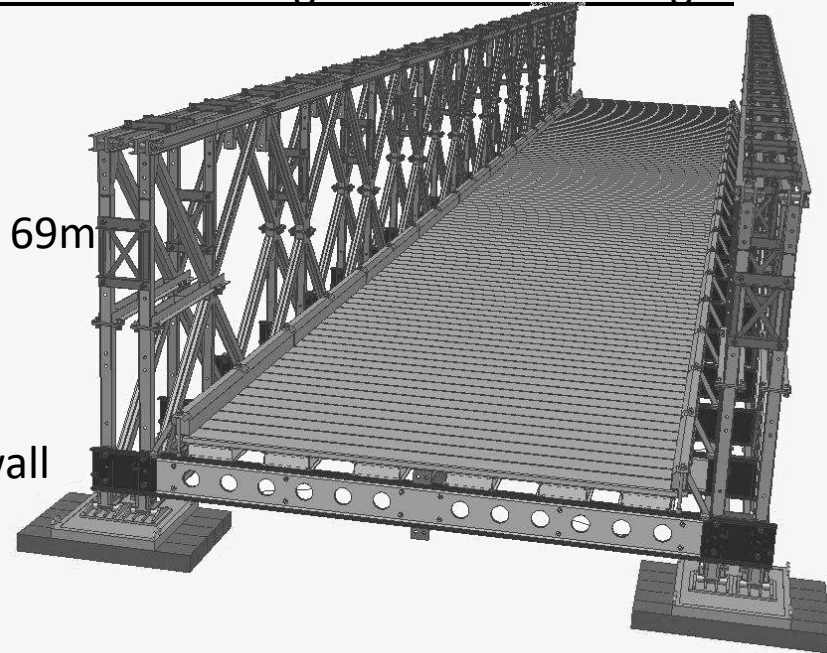
Load capacity: Vn 13t, Vr 44 t (36m)

Deck: width 4m – wooden chess

Time of building: 1 span – aprox. 3-5 days

Variability of construction: 1 – 2 storey and 1 – 2 wall

Quantity: ASMR 3500 bm HD 220 bm





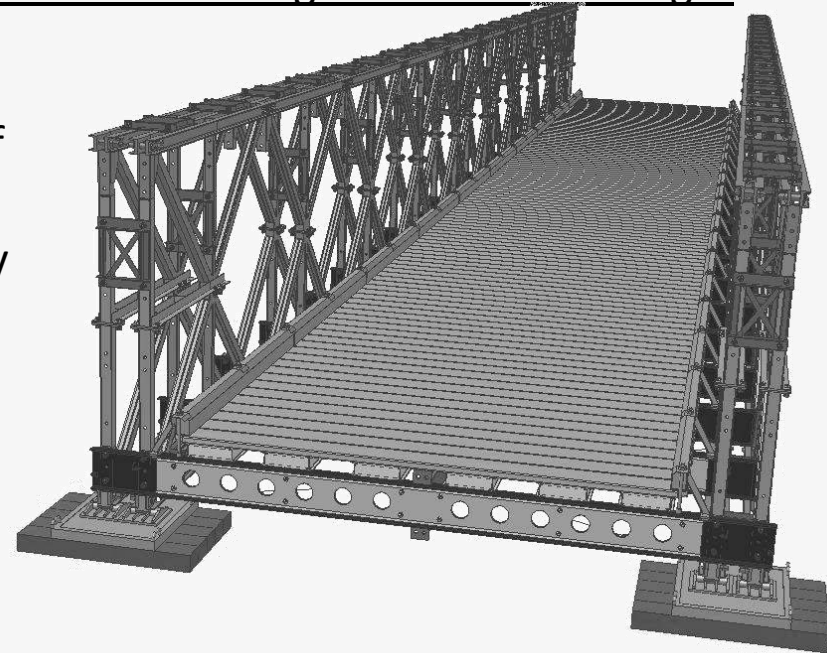
## TEMPORARY BRIDGES OF ADMINISTRATION OF STATE MATERIAL RESERVES

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### Heavy Bridge Set – TMS

The main advantage of TMS set is the possibility of building a bridge without use of mechanization and high variability in design. Construction is easily transportable and storable. It also allows the construction of the multi span bridge and bridging relatively wide obstacles.

The disadvantages are the high noise deck with wooden chess, relatively long period of construction of the bridge and the possibility of building only one lane bridge.



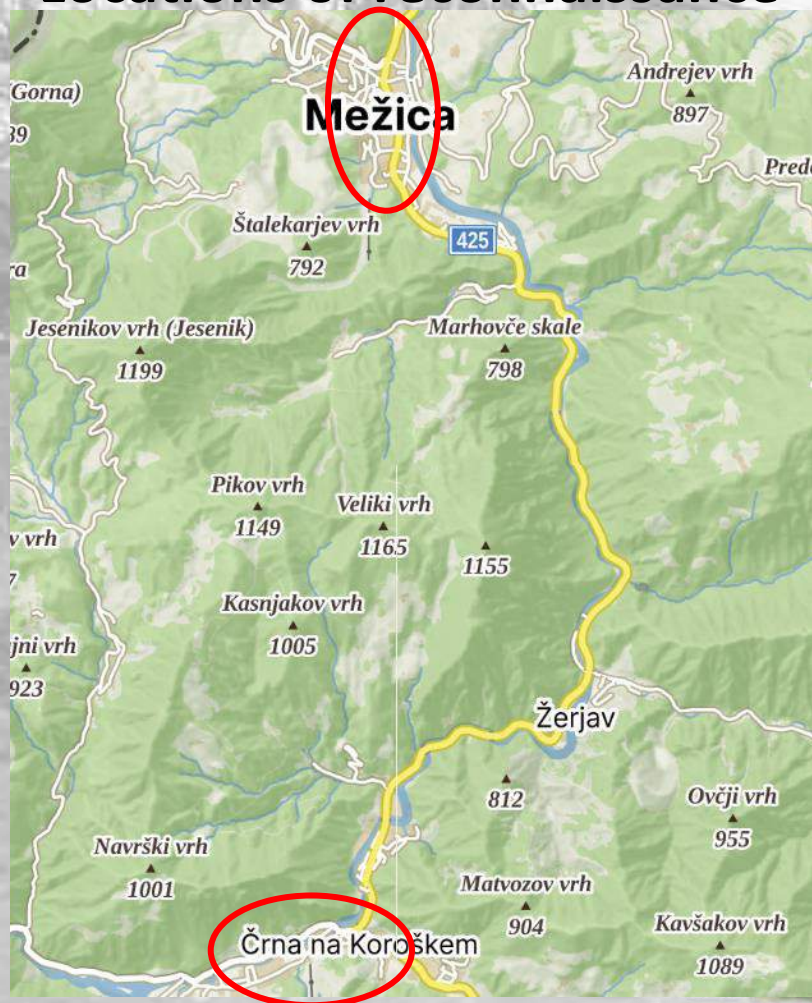


## Locations of reconnaissance





## Locations of reconnaissance







## Location No. 1 – Črna na Koroškem





## Location No. 1 – Črna na Koroškem





## Location No. 1 – Črna na Koroškem





## Location No. 1 – Črna na Koroškem



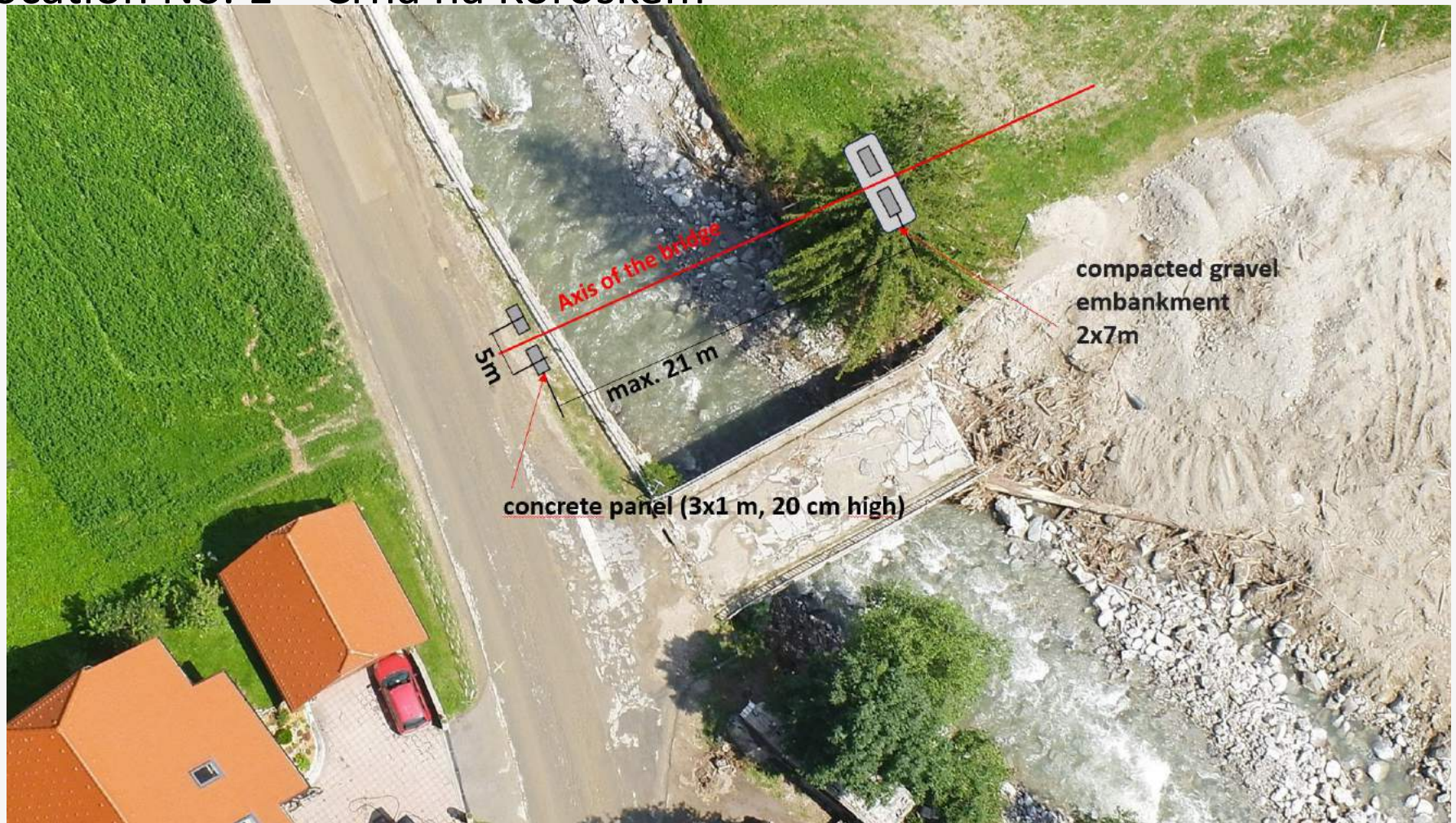


## Location No. 1 – Črna na Koroškem





## Location No. 1 – Črna na Koroškem





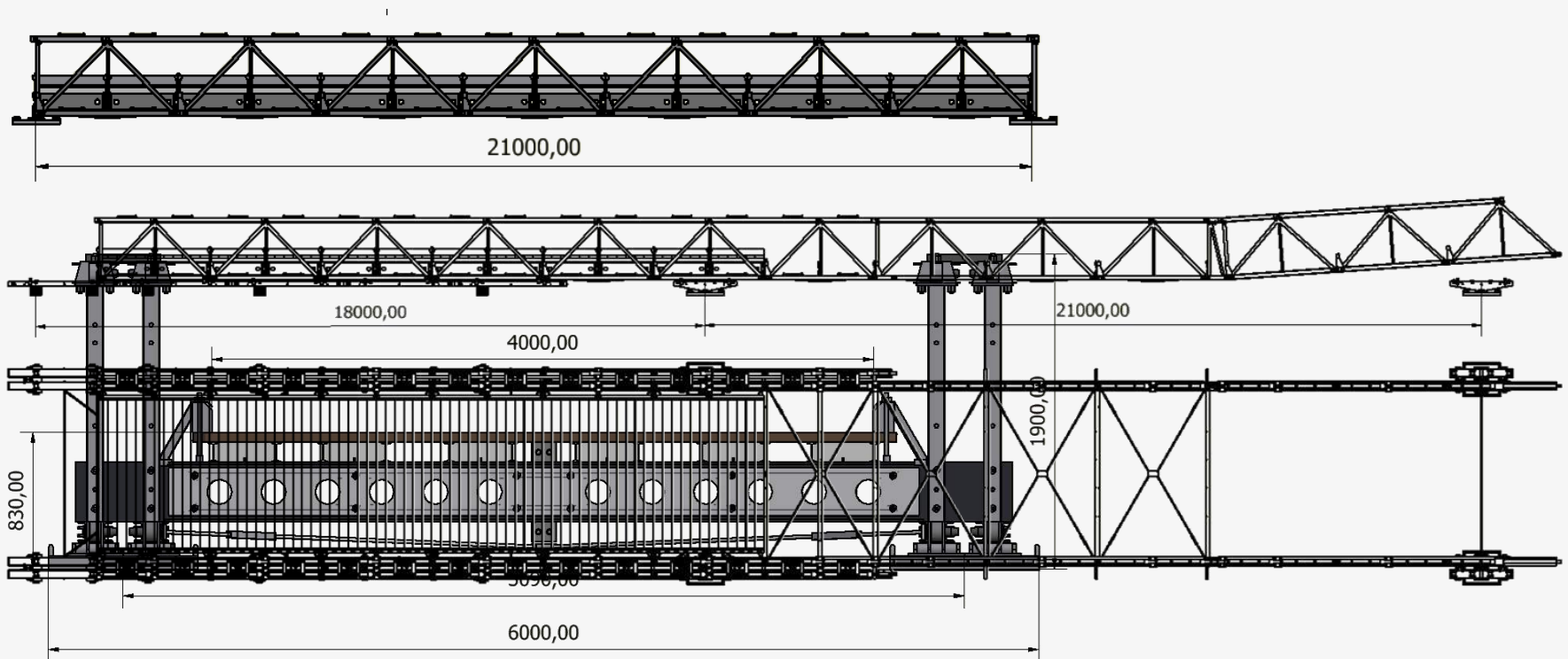
## Location No. 1 – Črna na Koroškem





# Location No. 1 – Črna na Koroškem

## TMS Z1p2s – 21m – Assembly design







## Location No. 2 – Mežica



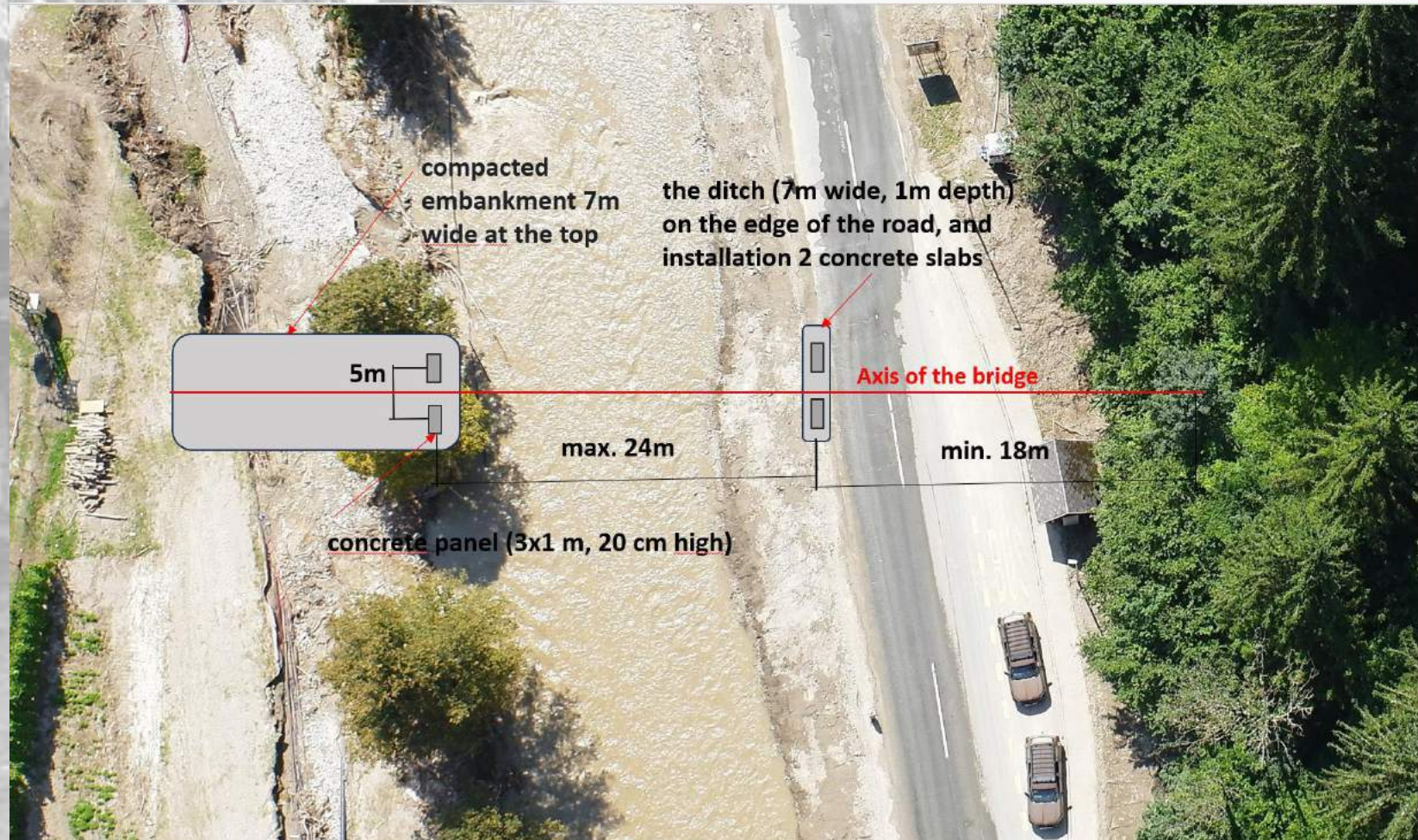


## Location No. 2 – Mežica





## Location No. 2 – Mežica





## Location No.2 – Mežica





## Location No.2 – Mežica





## Location No.2 – Mežica

### Stability calculation for atypical construction

5) fáze



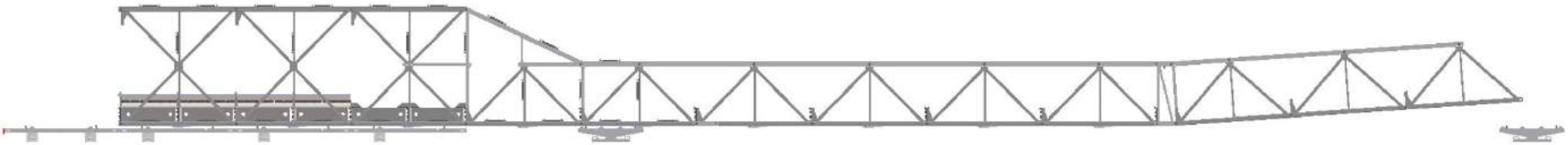
Suma	36	18	6	3	Suma	30	3	6	9	12
	63									

6) fáze



Suma	48	27	12	3	Suma	45	3	6	9	12	15
	90										

8) fáze



Suma	48	36	24	9	Suma	84	3	6	9	12	15	18	21
	117					105							



## Building of temporary bridge set TMS

4.-7.9. Črna na Koroškem TMS Z1ps2 21m

9.-11.9. Mežica TMS Z2p2s 24m

16.-19.9. Ljubno ob Savinji Z2p2s 27m  
(reconnaissance was made 6.9.2023)





## Location No. 1 – Črna na Koroškem (4.9.-7.9.2023)

TMS Z1p2s – 21m







## Location No. 1 – Črna na Koroškem (4.9.-7.9.2023)

### TMS Z1p2s – 21m





Location No. 1 – Črna na Koroškem (4.9.-7.9.2023)

TMS Z1p2s – 21m





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TMS Z1p2s – 21m





## Location No. 1 – Črna na Koroškem (4.9.-7.9.2023)

TMS Z1p2s – 21m





## Location No. 1 – Črna na Koroškem (4.9.-7.9.2023)

TMS Z1p2s – 21m





## Location No. 2 – Mežica (9.9.-11.9.2023)

### TMS Z2p2s – 24m





## Location No. 2 – Mežica (9.9.-11.9.2023)

TMS Z2p2s – 24m





## Location No. 2 – Mežica (9.9.-11.9.2023)

TMS Z2p2s – 24m







Location No. 2 – Mežica (9.9.-11.9.2023)

TMS Z2p2s – 24m





## Location No. 2 – Mežica (9.9.-11.9.2023)

TMS Z2p2s – 24m





Location No. 2 – Mežica (9.9.-11.9.2023)

TMS Z2p2s – 24m





## Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m





## Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m





## Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m





## Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m





Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m







Location No. 3 – Ljubno ob Savinji (16.9.-19.9.2023)

TMS Z2p2s – 27m





# QUESTIONS ?





#### **4. THE TEMPORARY BRIDGES IN TURKEY – FABRICATION AND APPLICATION**

*KERIM DEDEOGLU*

## Temporary Bridges in Turkey

### Fabrication and Application

Kerim Dedeoglu

# Temporary Bridges in Turkey Fabrication and Application

ENKA / Çimtaş Group



**ENKA**

More than **570** Projects in **53** Countries  
More than **60 Billion USD** Historical Contract Value

**53<sup>rd</sup>** @ ENR Top 250 International Contractors List - 2023  
More than **20,000** Employees



OIL, GAS & PETROCHEMICALS



POWER PLANTS



INFRASTRUCTURE



BUILDING WORKS

# Temporary Bridges in Turkey Fabrication and Application

## ENKA / Çimtaş Group



### WHO WE ARE



Fenced Area : 160,000 m<sup>2</sup>



Fenced Area : 120,000 m<sup>2</sup>



Fenced Area : 270,000 m<sup>2</sup>



Fenced Area : 56,000 m<sup>2</sup>



Fenced Area : 13,000 m<sup>2</sup>

ÇİMTAŞ GROUP, a subsidiary of ENKA, having 50 years of experience and 5 subsidiaries with an aggregated annual capacity of 380,000 tons, provides engineering, procurement, fabrication, machining, modularization, erection and installation services to the leading customers of construction, power (including nuclear), oil, gas and chemicals industries.

A subsidiary of **ENKA**

### cimtas | group



**380,000 t**  
Fabrication Capacity



**2 M t**  
Fabrication in Total



**5,000**  
Employees



**55+**  
Countries



**100+**  
Customers



**100+**  
Mega Projects



**Zero**  
Accident Policy



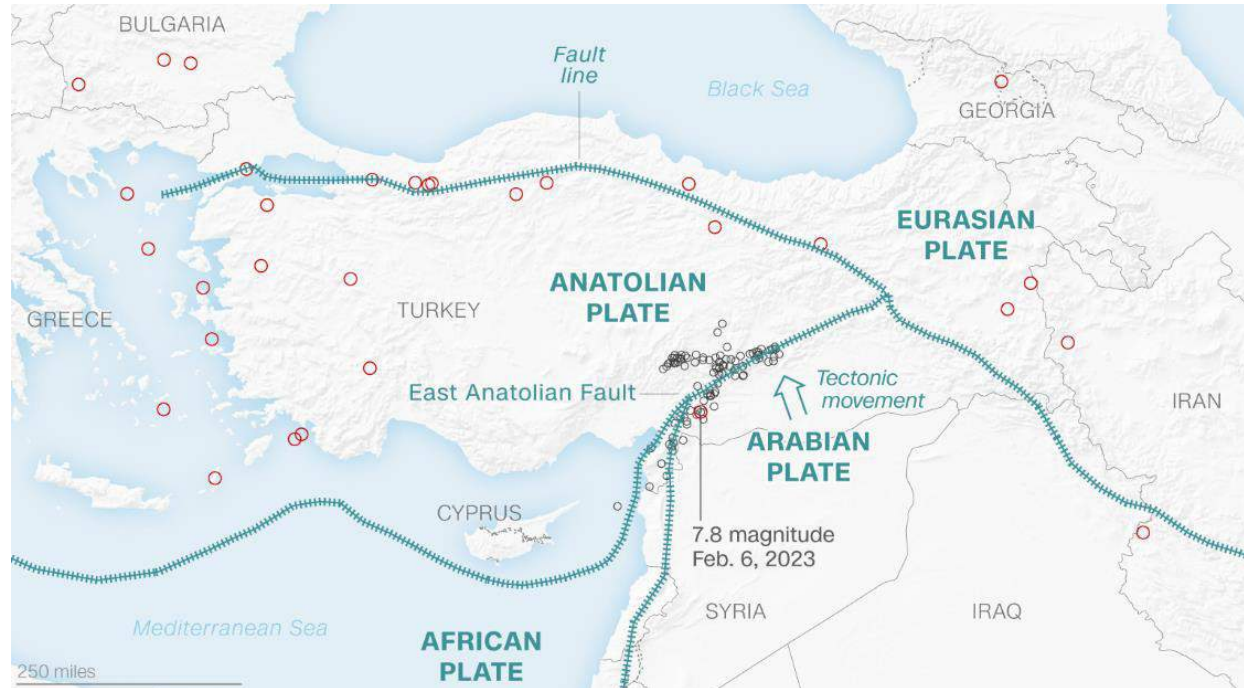
**50**  
Years of Experience



- On February 6, 2023, two consecutive earthquakes of magnitude 7.7 and 7.6 occurred in Kahramanmaraş, Turkey. These largest earthquakes in recent history caused varying levels of destruction in 11 cities in southeastern Turkey. These earthquakes, which occurred in severe winter conditions and the first of which occurred at night, reminded again the importance of roads and bridges, which are of great importance especially for the first aid and logistic support in the following days after the catastrophic events.
- Floods that are becoming more frequent every day due to changing climate conditions, cause great loss of life and property, as well as earthquakes, and cause heavy damage to infrastructure and superstructure systems. Bridges built over waterways are the first structures affected by these floods and often become unusable.
- In this presentation, the major earthquakes and floods that have historically occurred in Turkey, the bridges that became unusable during these catastrophic events, what needs to be done and suggestions for the provision of bridges that can be fabricated and built quickly to replace the damaged bridges will be discussed.

# Temporary Bridges in Turkey Fabrication and Application

## Geological Location of Turkey



- Turkey is located on a seismically active area within the complex zone of collision between the Eurasian Plate and both the African and Arabian Plates.
- Much of the country lies on the Anatolian Plate, bounded by two major strike-slip fault zones, the North Anatolian Fault and East Anatolian Fault.
- The western part of the country is also affected by the zone of extensional tectonics in the Aegean Sea caused by the southward migration of the Hellenic arc.



# Temporary Bridges in Turkey Fabrication and Application

## Earthquakes and Floods in the Last 50 Years and Damage



Date	Place	Magnitude	Damage
November 1976	Muradiye	7.5	
August 1999	İzmit	7.6	There was extensive damage to several bridges and other structures on the Trans-European Motorway, including 20 viaducts, 5 tunnels, and several overpasses. Damage ranged from spalling concrete to total deck collapse.
November 1999	Düzce	7.2	
September 2009	Floods in Marmara Region	-	2 bridges on the Bahçeköy–Saray highway were destroyed
October 2011	Van	7.2	
October 2020	Aegean Sea	7.2	
August 2021	Floods in Bartın, Kastamonu, Sinop Region	-	6 Bridges were destroyed
February 2023	Kahramanmaraş	7.8	75% of the infrastructure was damaged in 11 cities, including bridges

## Temporary Bridges in Turkey Fabrication and Application



Bridge collapsed after the Kahramanmaraş earthquake located on one of the branches of Asi River

# Temporary Bridges in Turkey Fabrication and Application

## First Response after the Catastrophic Event



In most of the cases, military response is the first response after catastrophic events.

Right after military response, a civil initiative should take place, in cooperation with army or official authorities , as required, in order to establish mid-term temporary bridges instead of short-term solutions



# Temporary Bridges in Turkey Fabrication and Application

## Advanced Planning



Especially earthquakes can be predictable as historical data and seismological researches help us to predict at least a time period and estimated magnitude for an approaching earthquake.

There are several fault lines that are predicted to create large magnitude earthquakes in Turkey, especially the Northern Anatolian fault line which is passing through multiple populated cities in Marmara region, including Istanbul.

Northern Anatolian fault line has created 2 massive earthquakes in 1999 causing dozens of thousands of deaths and severe infrastructure damage.

Another massive earthquake in the same region is expected soon as the stress level is increased in the last 25 years.

# Temporary Bridges in Turkey Fabrication and Application

## Advanced Planning



Advanced planning and preparation prior to catastrophic events can minimize the impact of the emergency. As related to the emergency response to damaged or collapsed bridges and their repair or replacement, advanced preparation can minimize additional injury and damage immediately following the initial event by providing more organized and timely responses of the various responsible individuals and organizations.

In addition, advanced planning and preparation can also minimize longer-term issues associated with damaged areas and construction zones, such as driving safety, public accessibility, and traffic congestion, as well as minimize potential economic impact on or disruption of services to the local region.

## Temporary Bridges in Turkey Fabrication and Application

### Emergency Response Plans



Once the critical bridges have been identified and a ranked order established, an Emergency Response Plan (ERP) should be developed for each critical bridge. By developing an ERP for each critical bridge prior to an extreme event, initial response times can be shortened by identifying key personnel and organizations, along with their contact information, for the specific geographic region of the selected asset.

In addition, pre-coordination between these key players will yield very positive benefits in a postevent environment. The development of a variety of response plans, the acquisition of key personal information, and the acquisition of or identification of selected materials, equipment, information, and organizations associated with the selected asset prior to an extreme event will also yield very positive benefits in a post-event environment

# Temporary Bridges in Turkey Fabrication and Application

## Emergency Response Plans



Metropolitan Municipality of İstanbul prepared an Earthquake Master Plan for İstanbul in collaboration with Boğaziçi University, İstanbul Technical University, Middle East Technical University and Yıldız Technical University.

The main guiding principle in this plan has been the self-evident fact that while no natural disaster can be prevented from happening, the incorporation of well-formulated planning and technical counter-measures will mitigate damages and losses significantly.

This well organized and prepared plan is more focused on diagnosing the risk levels of existing infrastructure and identify the structures that needs reinforcement or reconstruction.

# Temporary Bridges in Turkey Fabrication and Application

## Emergency Response Plans



As we have experienced in Kahramanmaraş earthquake last year, even the structures are strong enough, an earthquake with a high peak ground acceleration can damage them.

If structures, especially bridges, collapse in a sufficiently powerful natural disaster, even after the risk level has been determined and the necessary reinforcement has been made, they must be repaired or rebuilt very quickly in order for emergency response and rescue teams to reach the damaged area.

Fastest way to replace the critical bridges that may be damaged after the disaster is to prefabricate the bridge sections and make them available for installation prior to potential damage.



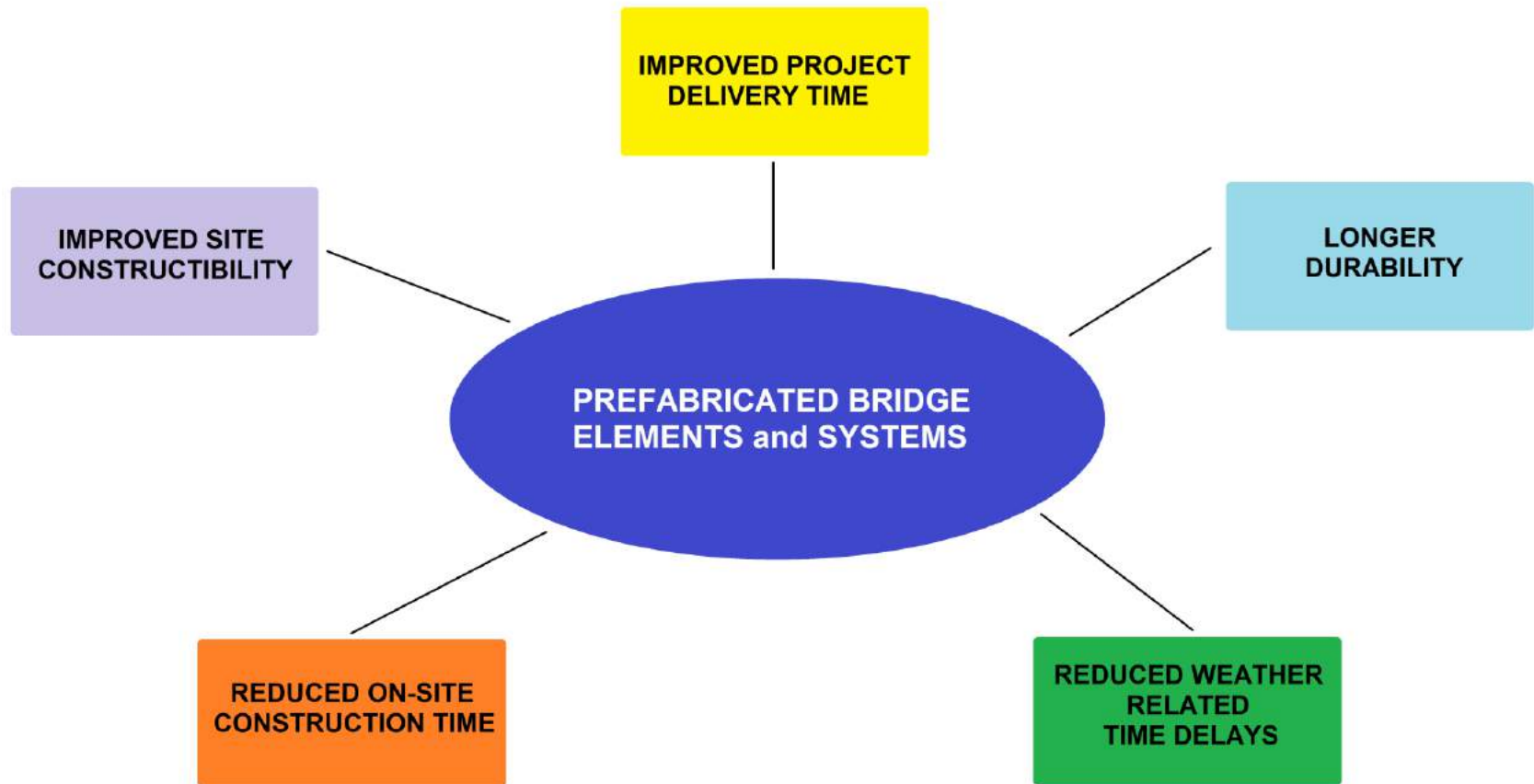
# Temporary Bridges in Turkey Fabrication and Application

## Prefabricated Bridge Elements and Systems



There are several types of prefabricated bridge types that have been used to serve as temporary bridges during construction, as emergency bridges, and (in some cases) permanent structures after the catastrophic events.

In all cases, the prefabricated bridge or bridge components are intended to be quickly and easily assembled on site, minimizing the time required on site to construct or restore the bridge.



# Temporary Bridges in Turkey Fabrication and Application

## Panelized Truss Systems



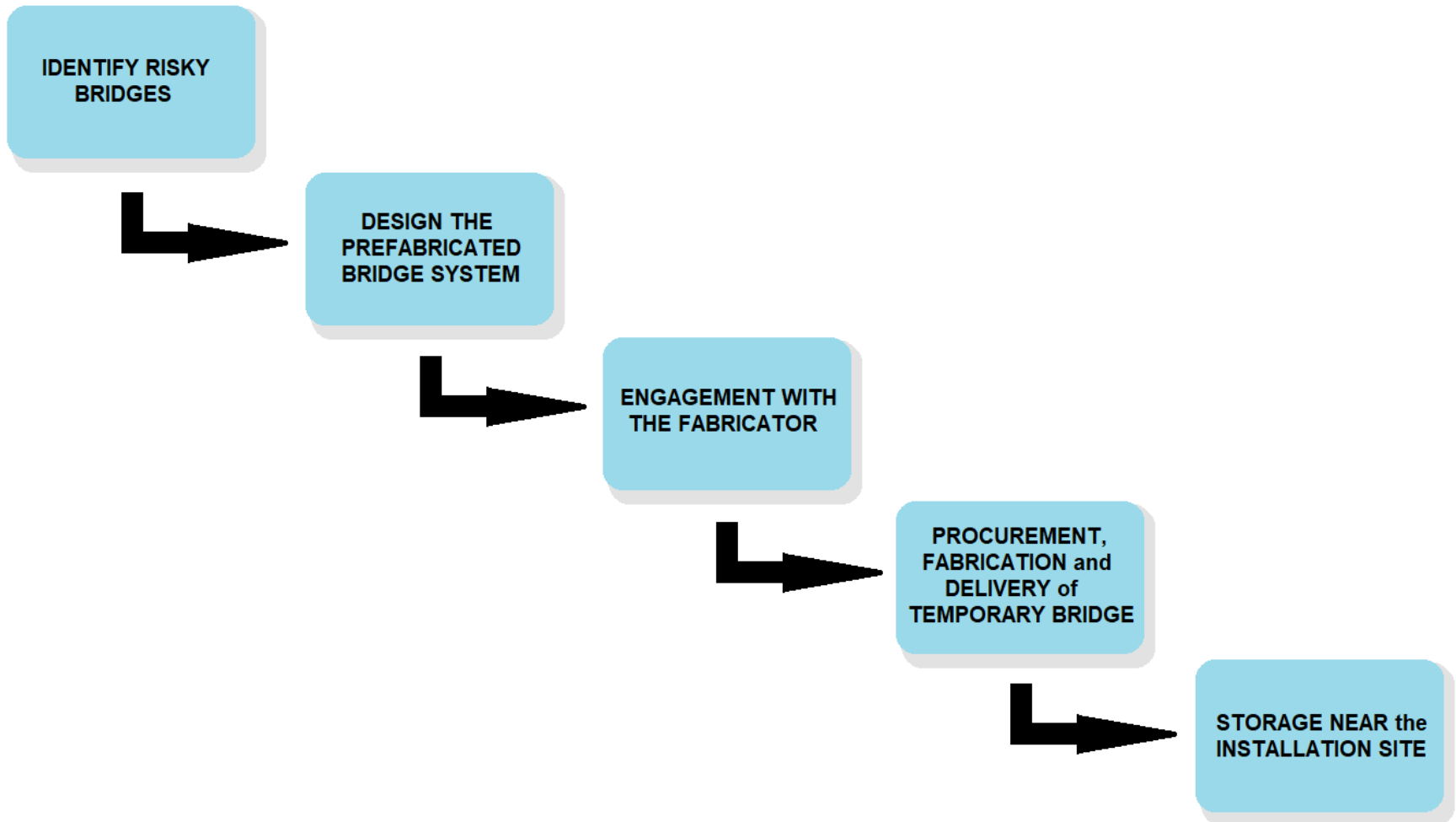
After identifying the risky bridges and viaducts in the Emergency Response Plan studies, a panelized truss system bridge can be designed for each specific crossing.

Panelized truss systems are composed of prefabricated truss panels that are bolted/pinned together and floor beams that span between the trusses.



# Temporary Bridges in Turkey Fabrication and Application

## Supply Flow of the Temporary Bridge



# Temporary Bridges in Turkey Fabrication and Application

## Fabrication of Prefabricated Bridge Truss



# Temporary Bridges in Turkey Fabrication and Application

## Fabrication of Prefabricated Bridge Truss





- Prefabricated temporary bridges, especially panelized truss systems may help quick replacement of damaged bridges after catastrophic events.
- Prior to predicted disasters, bridges with high risk factor should be identified and reinforced or replaced as soon as possible.
- Bridges with higher importance for the post-disaster recovery should be spared with a temporary bridge.
- Specific design for each critically important bridge can be made and a specific panelized truss system can be fabricated prior to catastrophic event.
- Emergency Response Plans and Execution Plans for the application of temporary bridges shall be prepared in collaboration with governmental organizations, municipalities, universities and public and private companies which can design, fabricate and install temporary bridges.

## Temporary Bridges in Turkey Fabrication and Application



*Thank You...*





**5. RE-ESTABLISHING MOBILITY DURING A CIVIL- AND  
MILITARY CRISIS USING MODERN TEMPORARY BRIDGES  
VIA INNOVATIVE PUBLIC-PRIVATE COLLABORATION  
MODELS**

*JOHN KERKHOFF*



**Re-establishing mobility during a civil- and military crisis using modern temporary bridges via innovative public-private collaboration models**

1 Introduction of company

2 Emergency bridging - environmental

3 Emergency bridging - flooding

4 Emergency bridging - reconstruction

5 Emergency bridging - repair

6 Emergency bridging - army

7 Q&A

JANSON BRIDGING

# GET TO KNOW JANSON BRIDGING



## Established in 1972

- Family owned
- Huge experience
- Market knowledge
- Established name



## Worlds largest bridge rental company

- Stock of ~ 30.000 tons
- Decentralised stocks
- Sales and rental projects
- European rental market leader



## Top 3 in sales of modular bridges









- Global presence
- Export Finance
- Education and training
- Prime- or subcontractor
- Turn key

# OVERVIEW RENTAL BRIDGES

Janson Bridging has a suitable modular bridge solution for every situation. The overview shows how our bridge solutions can adapt to different requirements. It would

be great to have the opportunity to demonstrate how our optimal solution could add value to your project.



BRIDGE TYPE	FREE SPAN <small>BASED ON EUROCODE LOAD</small>	APPLICATIONS*	PAGE
JMB	UP TO MAXIMUM 20 METRES		22
JSK-JBB	UP TO MAXIMUM 24 METRES		14
JFB	UP TO MAXIMUM 40 METRES		28
JSB	UP TO MAXIMUM 54 METRES		16
JGB	UP TO MAXIMUM 60 METRES		26
JPB-P	UP TO MAXIMUM 61 METRES		20
JPB-T	UP TO MAXIMUM 70 METRES		20
JTB	UP TO MAXIMUM 100 METRES		24

\*  Pedestrians and cyclists  Motorised (freight) traffic  Construction traffic (heavy equipment)  Movable

# We are close

Local presence

 Office locations

 Prepositioned stocks





# THINKING MODULAR



# Emergency bridging - environmental

A20 TRIBSEES - GERMANY MECKLENBURG - VORPOMMERN



Collapse  
motorway

Installation  
bridge

Dismantling  
bridge

Motorway  
open



2017



2018



2021



2023



### JSB-2

Installation of 800 x 7½ m temporary bridge from stock  
Motorway traffic



### JSB-2

Open for traffic



# Emergency bridging - flooding

FLOODING IN EUROPE DUE TO CLIMATE CHANGE

# Storelva Norway



## Flooding

Damage after the flood of the Storelva river in Utvik (Norway)



## JSK

Standard solution 21 x 4,2m  
Emergency solution SVV within 3 days

# Pepinster Belgium



## Flooding

Bridge damaged after flooding in 2021



## JSB-2

Solution from stock 30 x 10 meter



# Emergency bridging - repair

PREVENT DAMAGED INFRASTRUCTURE FROM COLLAPSING

# Maastricht, Netherlands



## Damaged intermediate support

Intermediate support was damaged due to flooding and collision, January 2024



## JSB-2

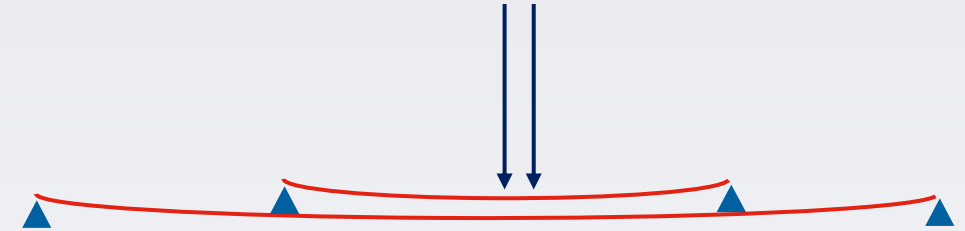
Supporting structure with bridge to relieve the center support point

# Maastricht, Netherlands



## Damaged intermediate support

Intermediate support was damaged due to flooding and collision, January 2024



## JSB-2

Supporting structure with bridge to relieve the center support point

# Maastricht, Netherlands



## Damaged intermediate support

Intermediate support was damaged due to flooding and collision, January 2024



## JSB-2

Supporting structure with bridge to relieve the center support point





# Emergency bridging - reconstruction

REBUILD

# Rebuild of infrastructure Sri-Lanka



## Existing infrastructure

Damaged infrastructure after conflict



## JGB

Standard modular steel solutions from 6 to 30 meter free span.  
1000+ bridges delivered



# Emergency bridging - adaptive armed forces

TRAIN AND SHARE TO BE READY

# BELGIAN ARMY

- Training together to be ready for future crisis
- Guaranteed availability
- Various bridge types



# DUTCH ARMY

- Training together to be ready for future crisis
- Share knowledge and personnel
- Various bridge types



# What would you need to re-establish mobility

## Statement

*Re-establishing mobility during a civil- and military crisis using modern temporary bridges via innovative public-private collaboration models*

- › What solutions are available and where
- › To react quickly, you need Off-The-Shelf solutions
- › Accept standard solutions
- › Understand each other; what are the possibilities and obstacles
- › Work out cooperation agreements in advance
- › Predict a crisis by prediction models and inspections
- › Guarantee availability in case of emergencies
- › Include suppliers in decision making process

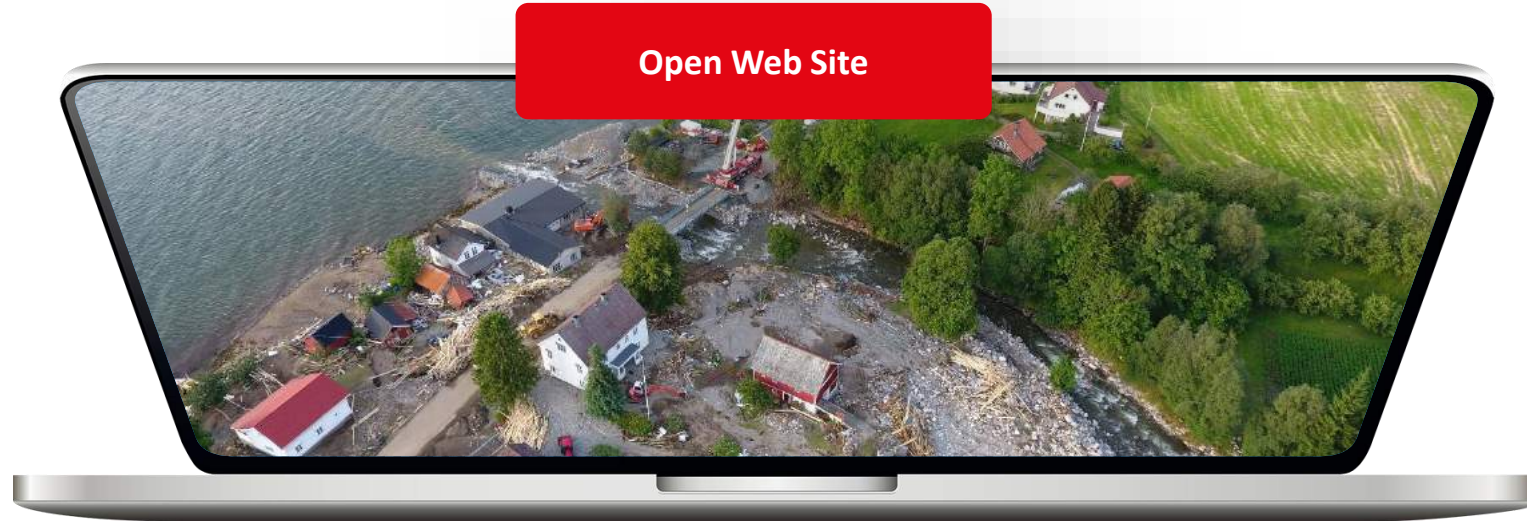


# QUESTIONS

AT 15:55 HRS



Open Web Site



**JANSONBRIDGING**

COME ACROSS





**6. PREPARING FOR THE IMPACTS OF CLIMATE CHANGE &  
OTHER NATURAL EMERGENCIES: THE MODULAR BRIDGE  
CASE**

*CARLOS ARIAS*



**waagner biro**  
bridge systems

TEMPORARY

PERMANENT

BRIDGING



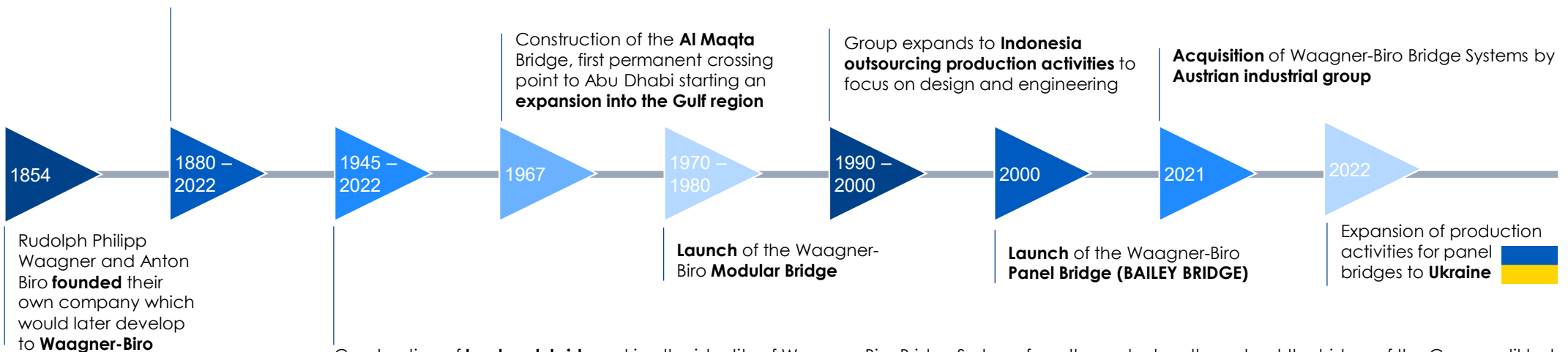
PREPARING FOR CLIMATE CHANGE & OTHER EMERGENCIES:  
THE MODULAR BRIDGE CASE

# — HISTORY

Bridge engineering is at the core of the brand's 170 year history with over 5,000 bridges built



The Group expands into other steel, glass and stage construction activities, which contribute to global landmark projects and today's **brand heritage**



Construction of **landmark bridges** drive the identity of Waagner-Biro Bridge Systems from the early days throughout the history of the Group until today



# — WBBS AT A GLANCE

Worldwide operations in Austria and Indonesia

**waagner biro**  
bridge systems

Waagner Biro Bridge Systems Austria



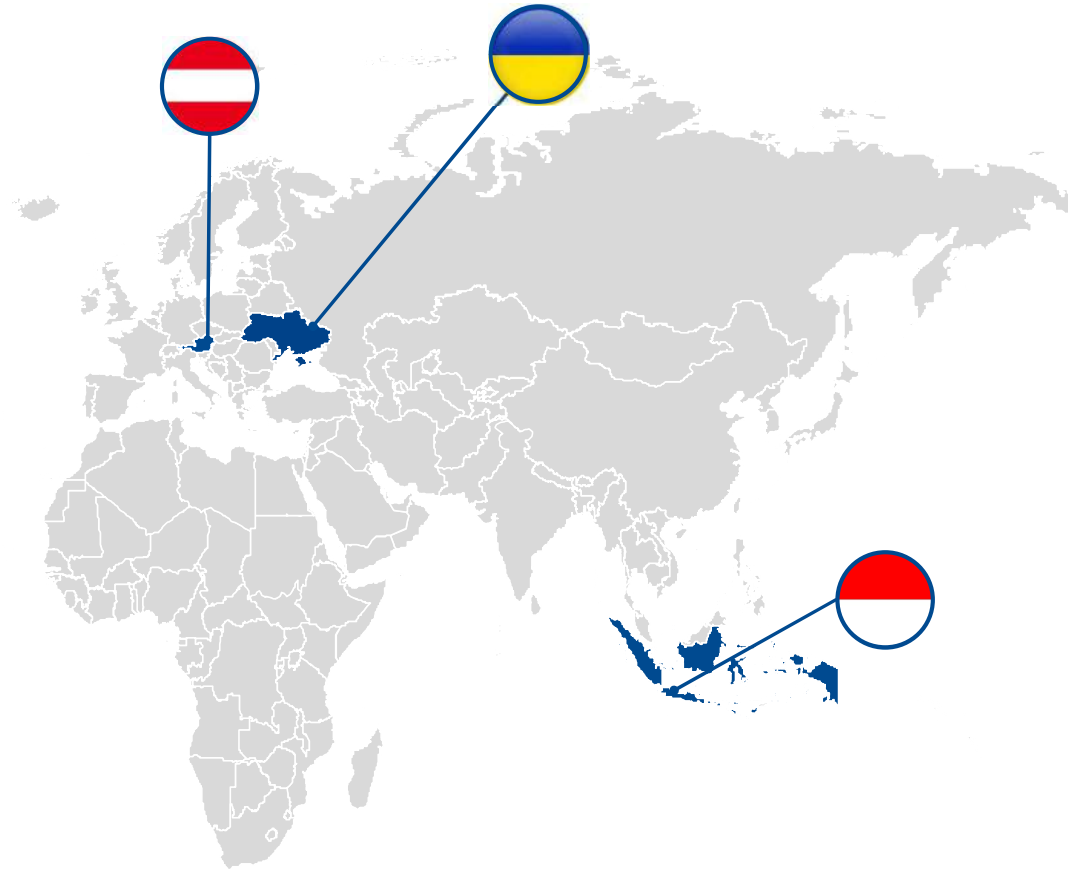
Panel Bridges for Chilean Armed Forces



Calaba Bridge in the Philippines



Installation services in Central Europe



Waagner Biro Indonesia



Youtefa Box Arch Bridge



Long-Span Truss Bridges



Emas Lifting Bridge

# — WBBS AT A GLANCE

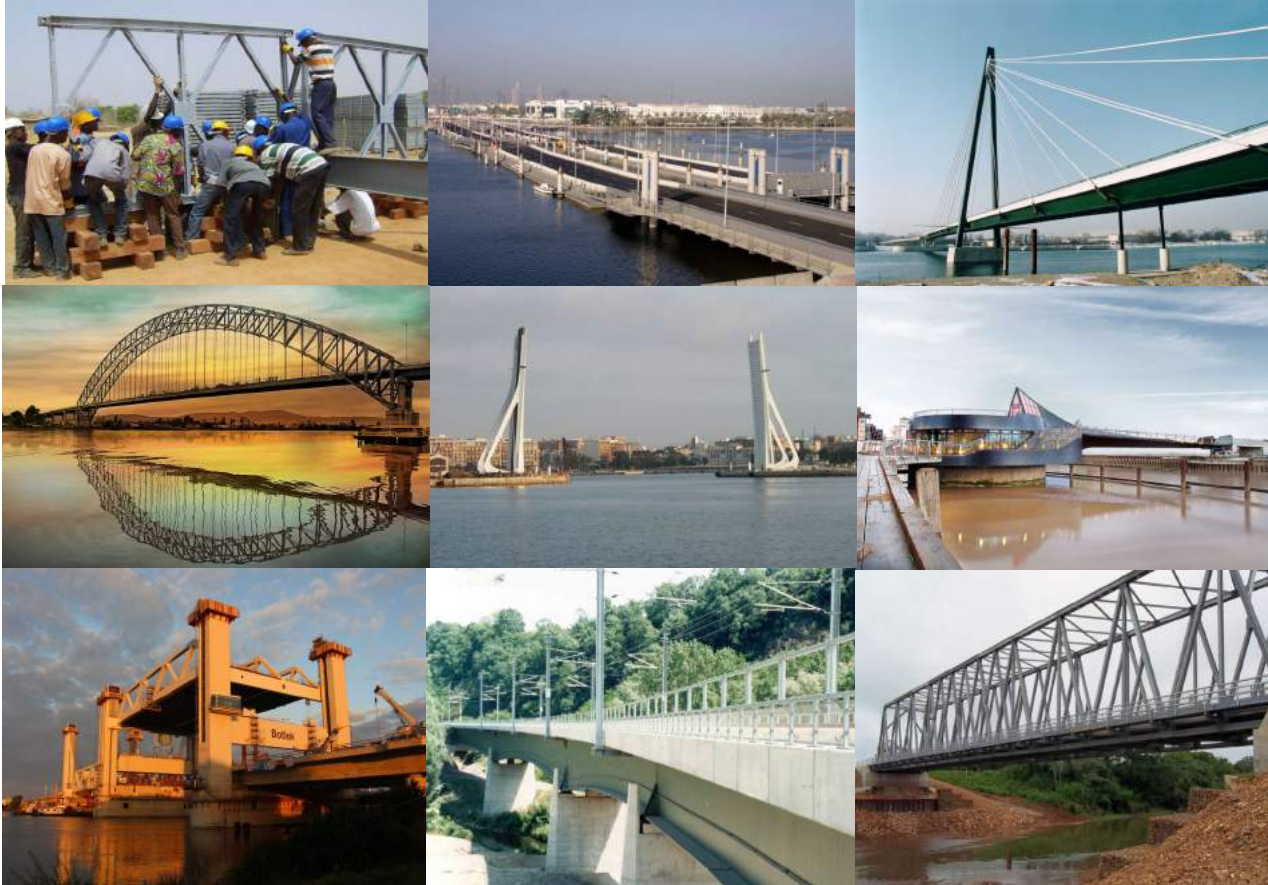
WBBS proven track record around the world

- 1 5,000+ bridges in more than 170 years of corporate history, including circa 25km of modular bridges
- 2 Strong brand recognition, and positioned as a market leader in steel bridges
- 3 Extensive experience and knowledge in bridge exports, transport and project management
- 4 A Worldwide leading player in engineering, design and installation of steel bridges
- 5 Waagner-Biro also offers complementary services for steel infrastructure in Central Europe
- 6 Waagner-Biro is positioned as the regional market leader in SE Asia, with its own manufacturing unit
- 7 Experienced management with technical know-how on bridge design standards and specifications
- 8 Positive sector outlook following increasing infrastructure spending and other government initiatives



# — SCOPE OF SUPPLIES

## PRODUCT PORTFOLIO



### STANDARDIZED BRIDGES

- 'Bailey' type panel bridges
- Modular truss bridges

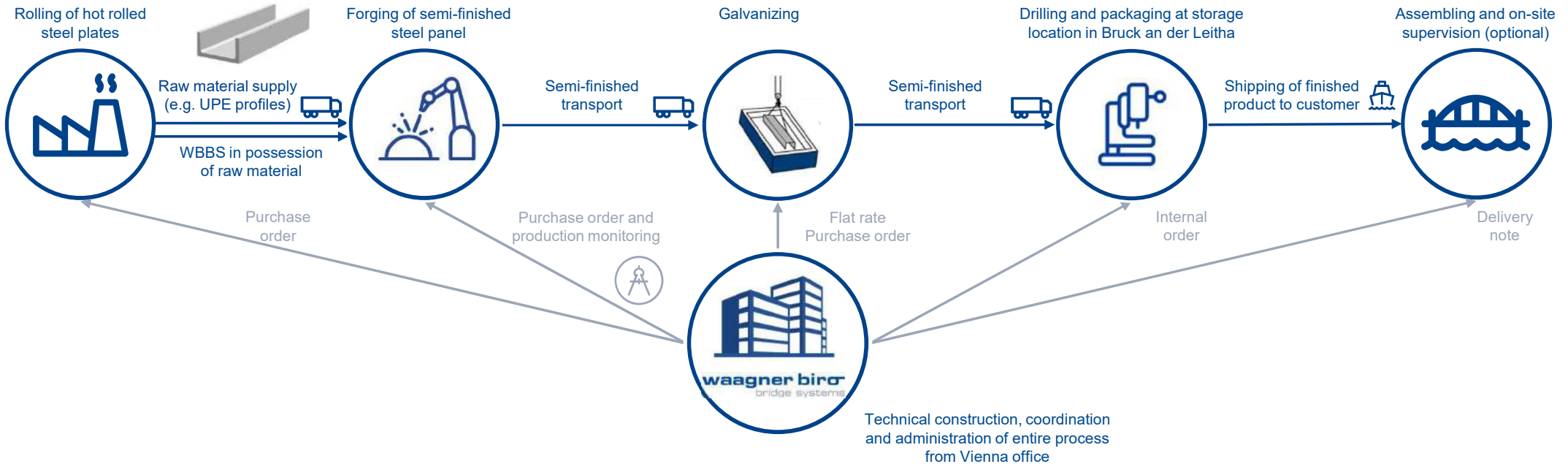
### BESPOKE BRIDGES

- Movable Structures
  - *Bascule bridges*
  - *Swing bridges*
  - *Lift bridges*
- Special Structures
  - *Plate girder bridges*
  - *Arch/Truss bridges*
  - *Suspension/Cable-stayed bridges*
  - *Pipe bridges*
  - *Pontoon bridges*

### RELATED SERVICES

# — BRIDGE PRODUCTION

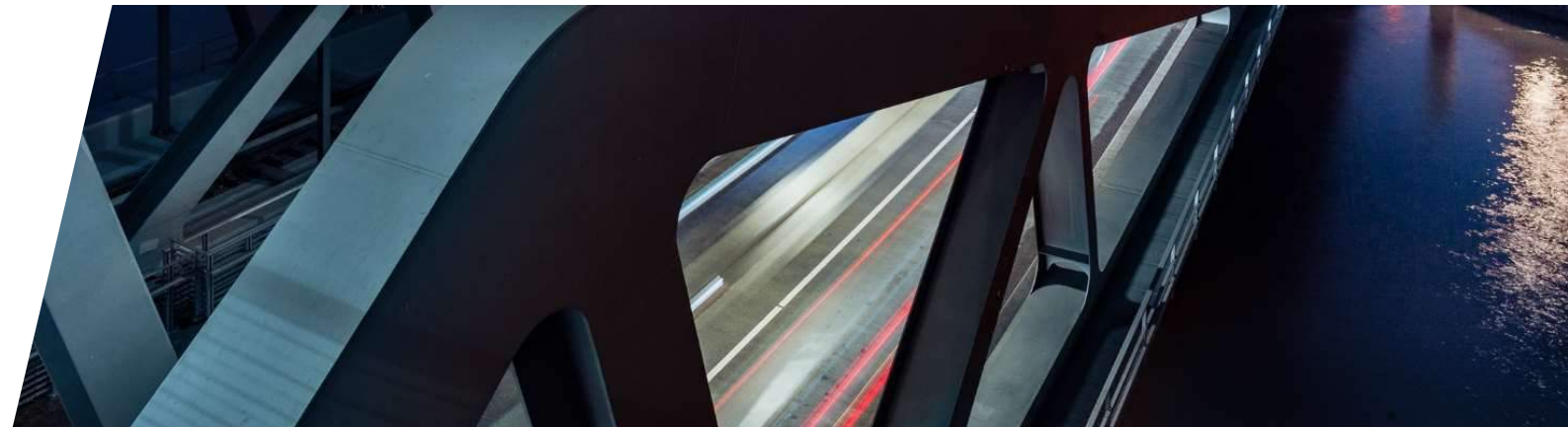
## SUPPLY CHAIN MANAGEMENT



TEMPORARY

PERMANENT

BRIDGING

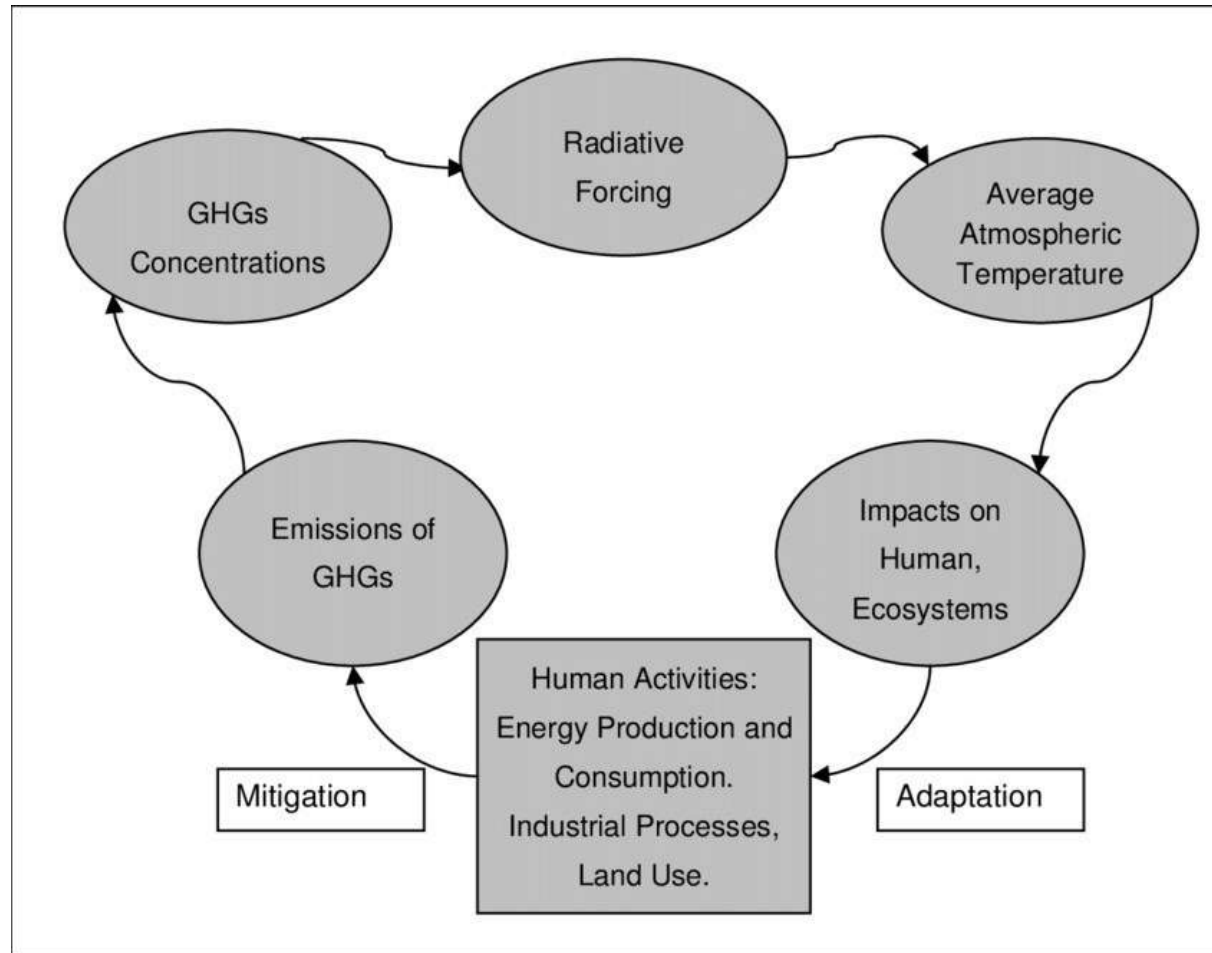


THE CLIMATE CHALLENGE



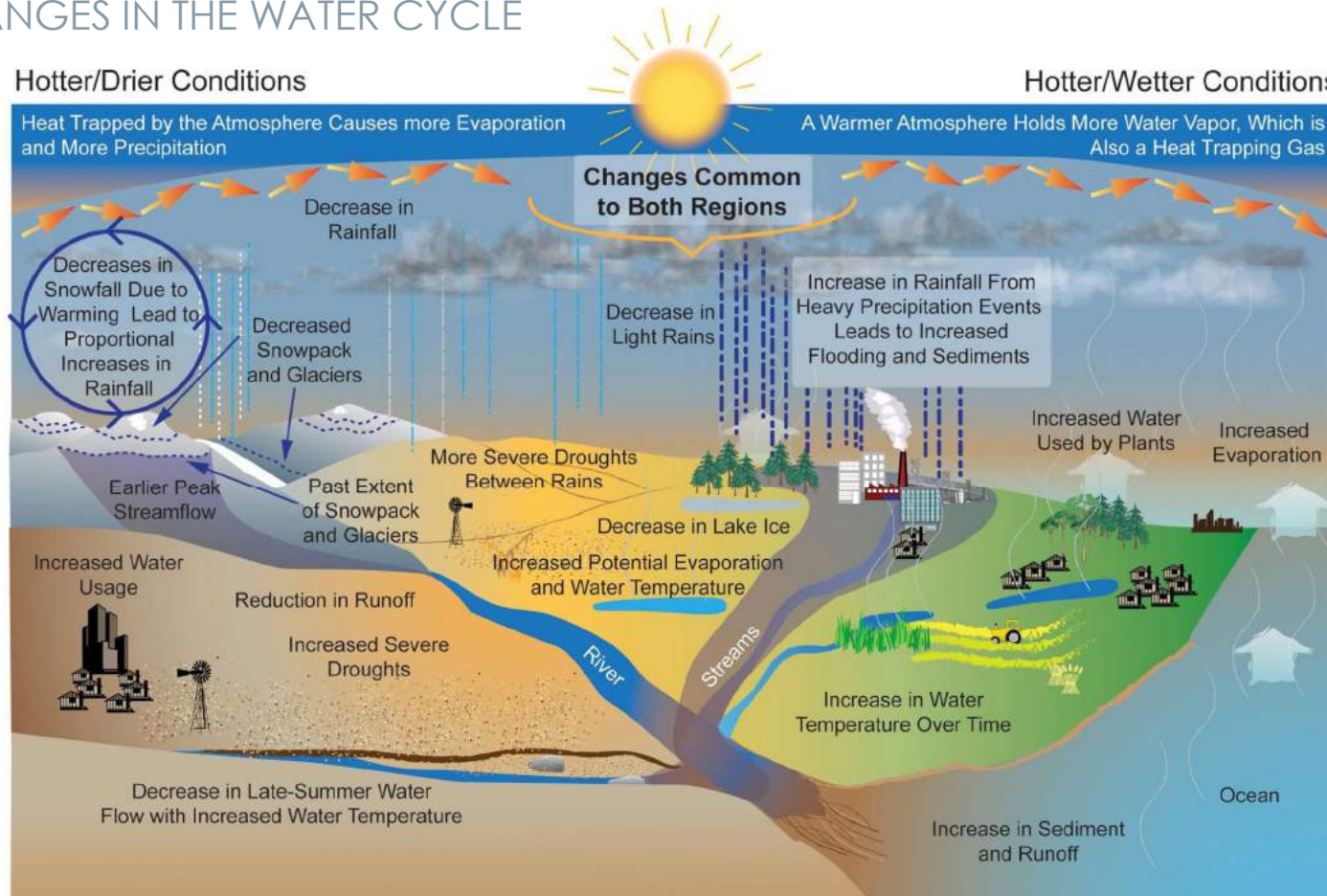
# — CLIMATE CHANGE

## CLIMATE CHANGE CYCLE



# — CLIMATE CHANGE

## PROJECTED CHANGES IN THE WATER CYCLE



NOAA/NCDC

The water cycle exhibits many changes as the earth warms. Wet and dry areas respond differently.

# — CLIMATE CHANGE

## BRIDGE INFRASTRUCTURE CONSEQUENCES



# — CLIMATE CHANGE

## BRIDGE INFRASTRUCTURE CONSEQUENCES



# — CLIMATE CHANGE

## BRIDGE INFRASTRUCTURE CONSEQUENCES



# — CLIMATE CHANGE

## BRIDGE INFRASTRUCTURE CONSEQUENCES



TEMPORARY  
PERMANENT  
BRIDGING



PANEL BRIDGES

# — PANEL BRIDGES

## FIELDS OF APPLICATION



- Provisional bridges for disaster relief
- Emergency response bridges
- Military bridges
- Temporary railway and road bridges
- Floating bridges





# — PANEL BRIDGES

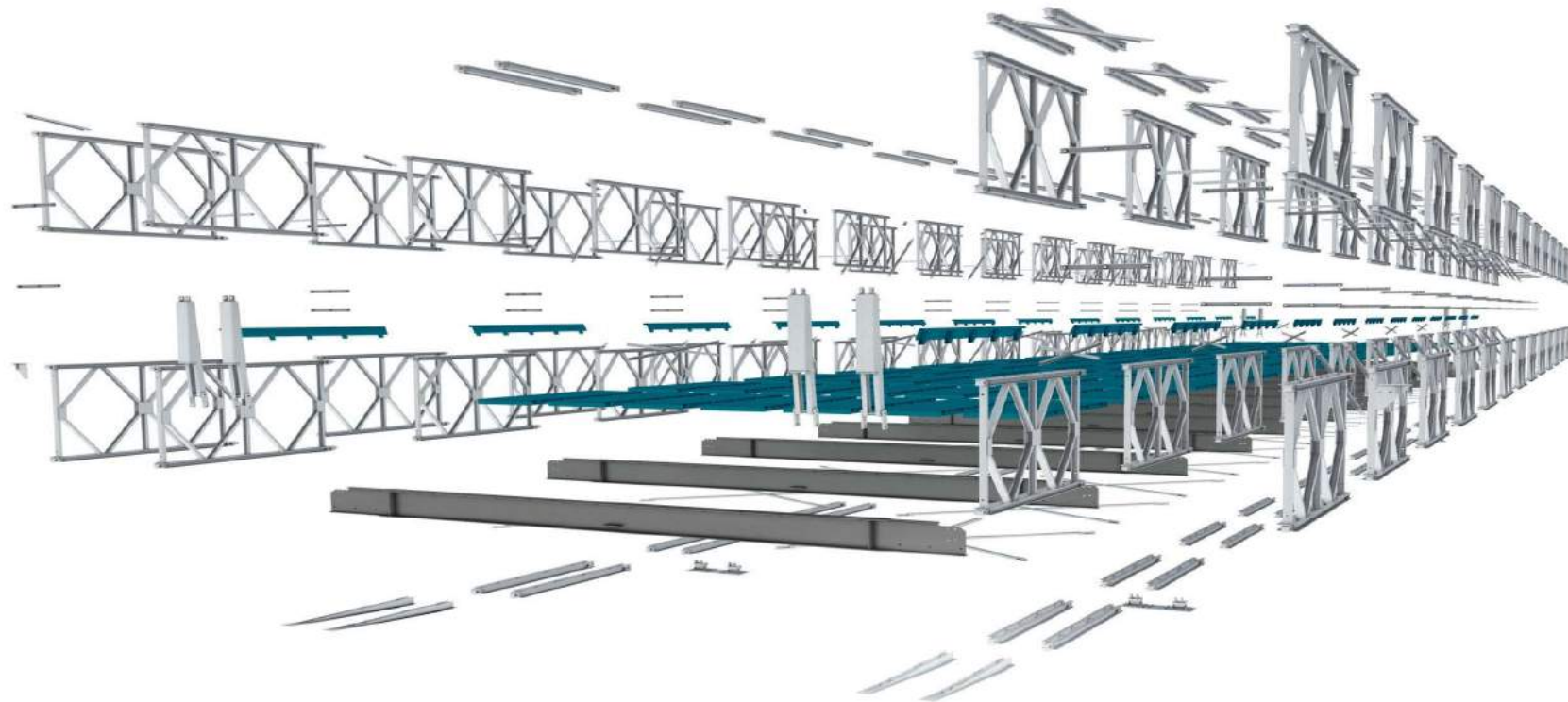
## MAIN COMPONENTS AND DESCRIPTION



- The Waagner Biro panel bridge system is an engineering development based on the Bailey Bridge.
- Panel bridges are versatile solutions, offering short assembly times, simple installations and maximum flexibility for emergency response.
- The system consists of pre-designed elements that are prefabricated with standardised modular components.
- WB panel bridges can be easily adapted to different spans, roadway widths and load capacity.
- The system is suitable for temporary use, as an emergency and disaster relief bridge.

# — PANEL BRIDGES

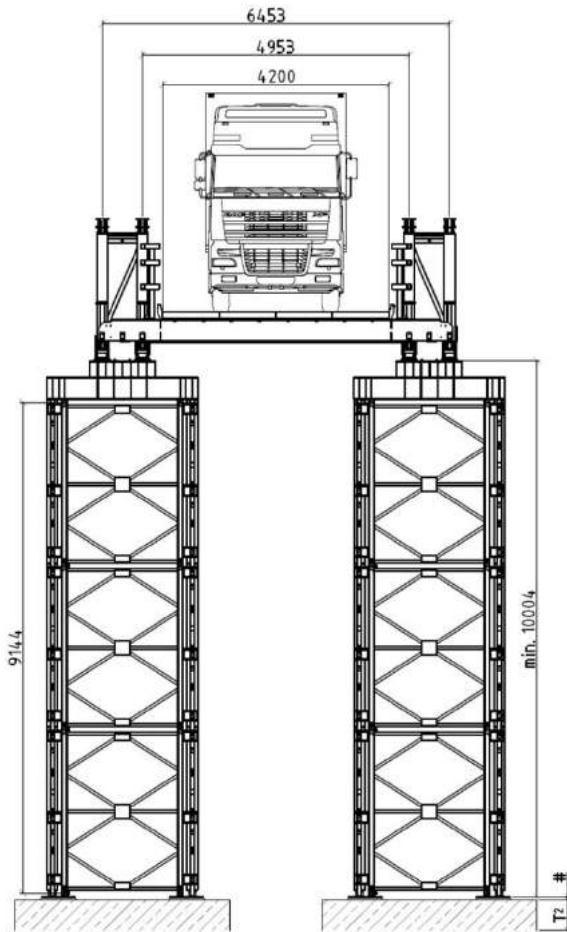
TRUSS CONFIGURATIONS – SINGLE AND DOUBLE STOREY



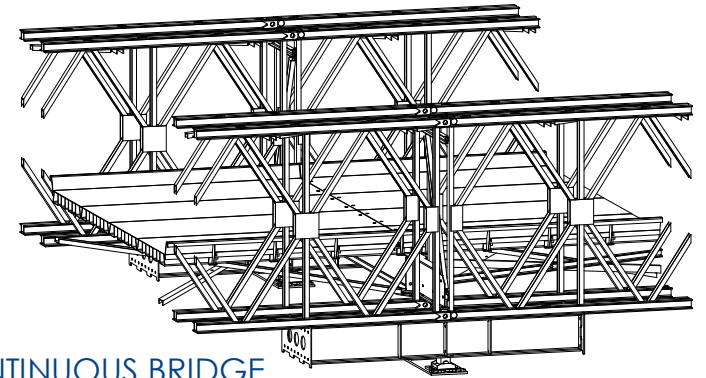
# — PANEL BRIDGES

ACCESSORIES FOR MULTIPLE SPANS

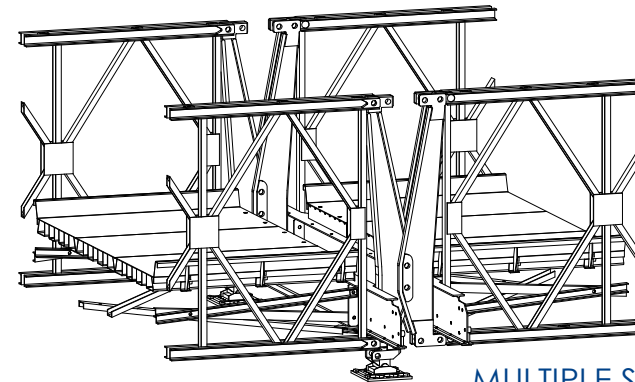
**waagner biro**  
bridge systems



SQUARE TOWER DESIGN



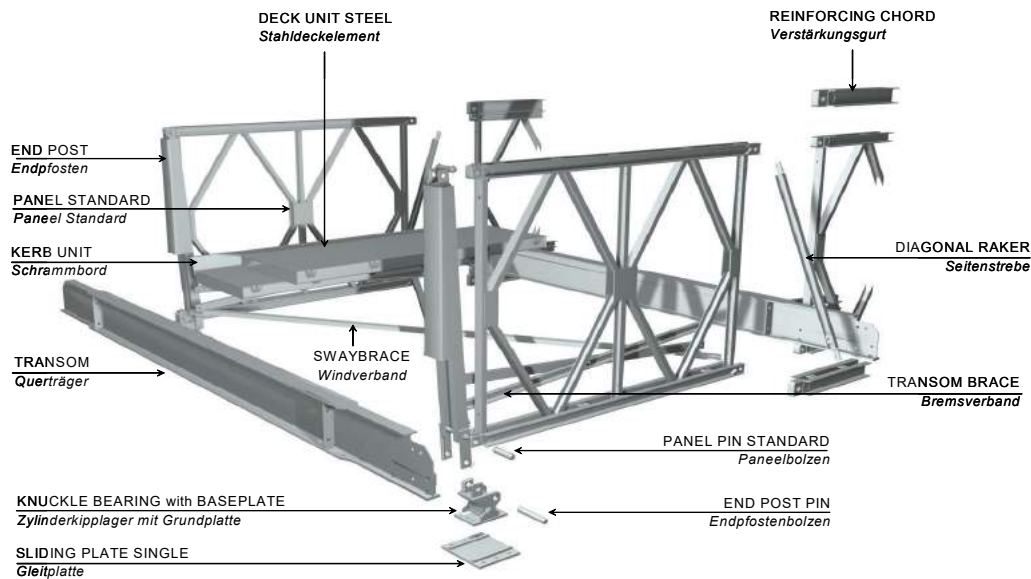
CONTINUOUS BRIDGE  
(DISTRIBUTION BEAM)



MULTIPLE SINGLE SPAN  
(SPAN JUNCTION)

# — PANEL BRIDGES

## ADVANTAGES



- Combines the benefits of prefabricated bridge components – buildability, handling, interchangeability – with modern materials, simple connections and better welding details.
- Identical modular components.
- High load capacity and durability.
- Easy adaptation to different side conditions.
- logistical versatility – Small & light components.
- Extensive stock for immediate delivery in emergency situations.
- Speedy assembly and erection with semi-skilled staff.

# — PANEL BRIDGES

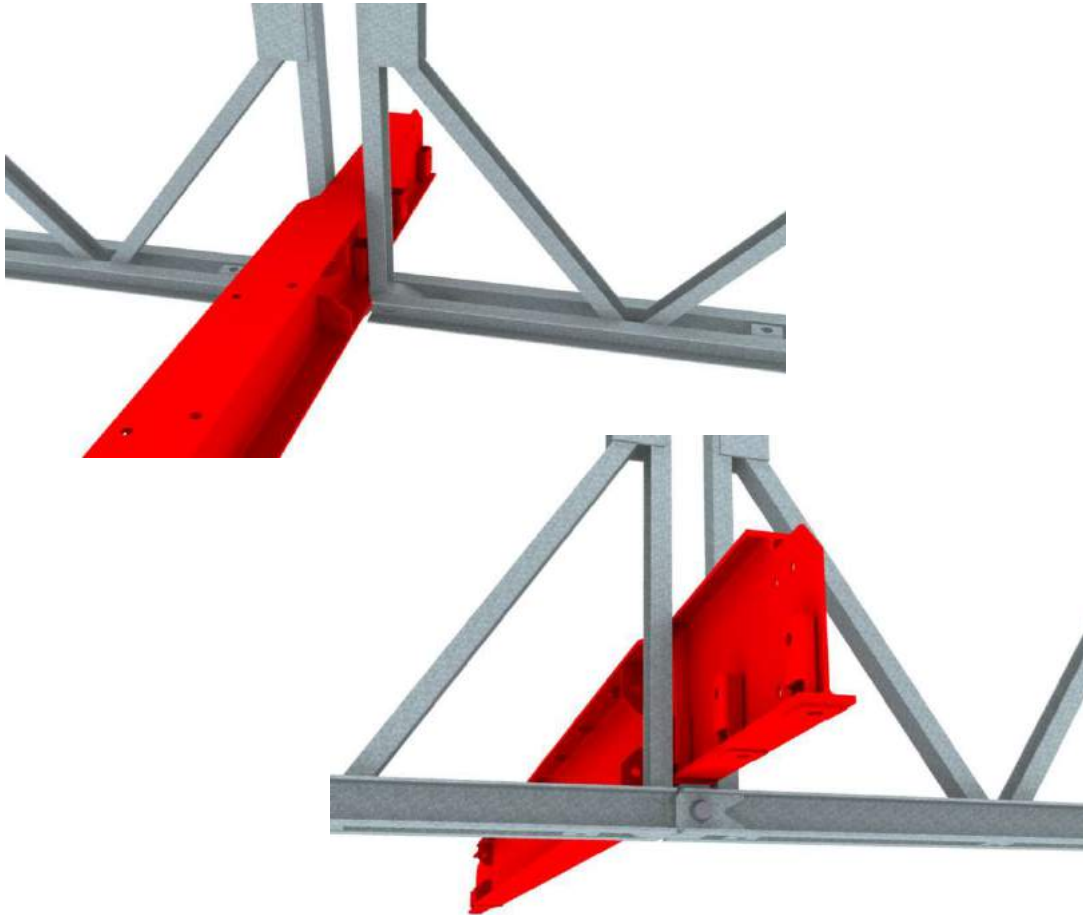
## UNIQUE DESIGN ADVANTAGES (1) – ONE TYPE OF PANEL



- High load-bearing capacity due to high-strength steel (yield strength 460 N/mm<sup>2</sup>) with a system height of 2.15 m and a system length of 3,048m (10ft).
- Only one type of panel is used - it is not possible to mix up any panels.

# — PANEL BRIDGES

## UNIQUE DESIGN ADVANTAGES (2) – TRANSOM

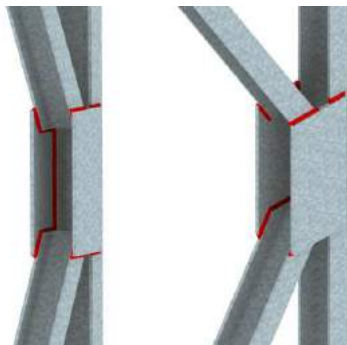
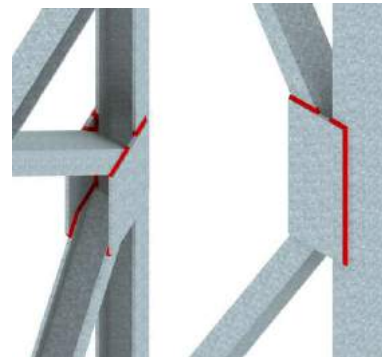
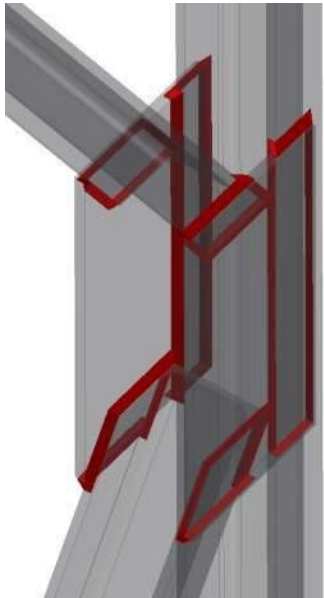


- Waagner-Biro places its transom directly between the panels, facilitating assembly of the bridge.
- No need for complex handling manoeuvres to align the transom in its correct position.
- Transom assembly (using 2 sets of braces) has been designed to allow an even distribution of loads improving the fatigue life of the transom.



# — PANEL BRIDGES

## UNIQUE DESIGN ADVANTAGES (3) – WATERPROOF AND CLOSED WELDS FOR PROTECTION



- Fully closed and waterproof weld design
- Improved fatigue strength and protection against corrosion.

# — PANEL BRIDGES

REFERENCE: EMERGENCY BRIDGES TO COLOMBIA (2 x 60.96M)





# — PANEL BRIDGES

REFERENCE: EMERGENCY RESPONSE BRIDGE FOR ROK (70.10M, BUILT WITHIN 69 HOURS)



## Borquez Bridge

Place: Borquez, Patagonia, Southern Chile

Facts: 92-metre multi-span bridge across the Bravo River

Project type: Panel bridge, road bridge



## 36m Calluqueo Bridge

Place: Patagonia, Southern Chile

Facts: One of many bridges located east and west of the Carretera Austral

Project type: Road bridge, panel bridge



# — PANEL BRIDGES

REFERENCE: PANEL BRIDGES FOR CHILEAN ARMY (10 DIFFERENT SPANS, HARSH CLIMATE)



# — PANEL BRIDGES

REFERENCE: PUENTE MODULAR COCHRANE, 39.6M, EW, CHILE



# — PANEL BRIDGES

REFERENCE: 3 KM OF EMERGENCY RESPONSE BRIDGES FOR THAILAND

**waagner biro**  
bridge systems



# — PANEL BRIDGES

REFERENCE: PANEL BRIDGES FOR BURKINA FASO (4 x 27.43M)

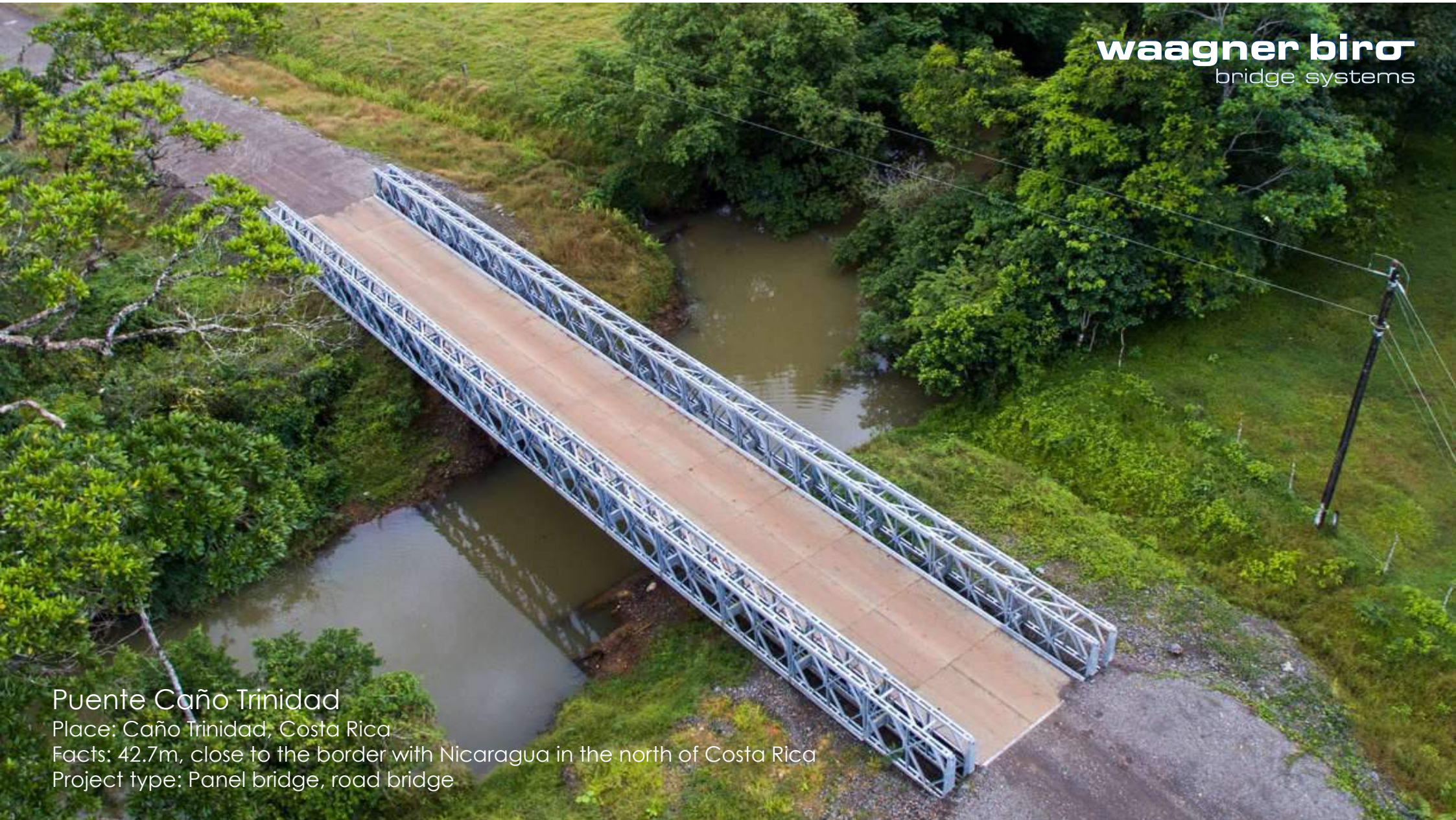


## Puente Caño Trinidad

Place: Caño Trinidad, Costa Rica

Facts: 42.7m, close to the border with Nicaragua in the north of Costa Rica

Project type: Panel bridge, road bridge





## Puente Isla Chica

Place: Isla Chica, Costa Rica

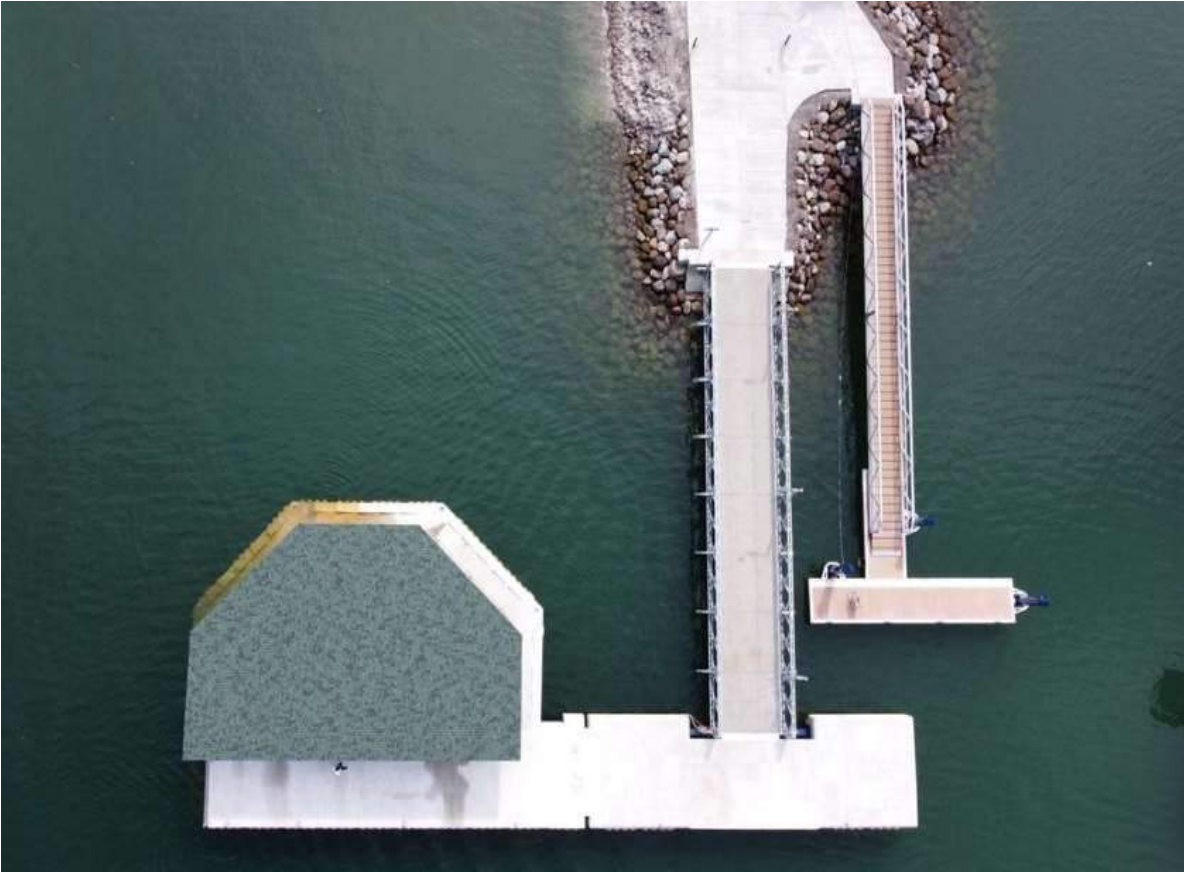
Facts: 42.7m, close to the border with Nicaragua in the north of Costa Rica

Project type: Panel bridge, road bridge



# — PANEL BRIDGES

REFERENCE: PUENTE FERRY (24.4M) GOLFITO MUNICIPAL WHARF, PUNTARENAS, COSTA RICA



# — PANEL BRIDGES

REFERENCE: FOUR-SPAN TSHOPO BRIDGE (163 M) IN KISANGANI, DR CONGO



Emergency response bridge over the Tigris river  
Place: Mosul, Iraq  
Facts: Four-span double lane bridge: 7.35m wide, 172 m long  
Project type: Panel bridge, emergency response bridge, road bridge



# — PANEL BRIDGES

REFERENCE: TEMPORARY BRIDGE (62M) IN BRANDÝS NAD ORLICÍ, CZECH REPUBLIC





## Panel Bridge Seybousse

Place: Seybousse, Algeria

Facts: 67.05m, designed for 512 tons, the most robust panel bridge in the world

Project type: Construction site bridge, panel bridge, road bridge

TEMPORARY

PERMANENT

BRIDGING



MODULAR TRUSS BRIDGES

# — PRODUCT PORTFOLIO —

## MODULAR BRIDGE



Long-span modular steel bridge Puente General Viejo in Costa Rica



- Waagner-Biro is one of the most respected suppliers of (launchable) long-span modular steel bridges with single spans of up to 140 metres to be used for permanent use on high-traffic routes.
- Long-span modular bridges also serve to replace old highway bridges in less accessible areas, as they can be built very quickly compared to other types of permanent bridges.
- Modular bridge constructions designed by Waagner-Biro are based on the proven idea of truss structures which combine the benefits of modern bridge construction and the highest level of flexibility with regards to bridge width, span and traffic load.



# — PRODUCT PORTFOLIO —

## MODULAR BRIDGE



### ADVANTAGES OF THE PANEL BRIDGE:

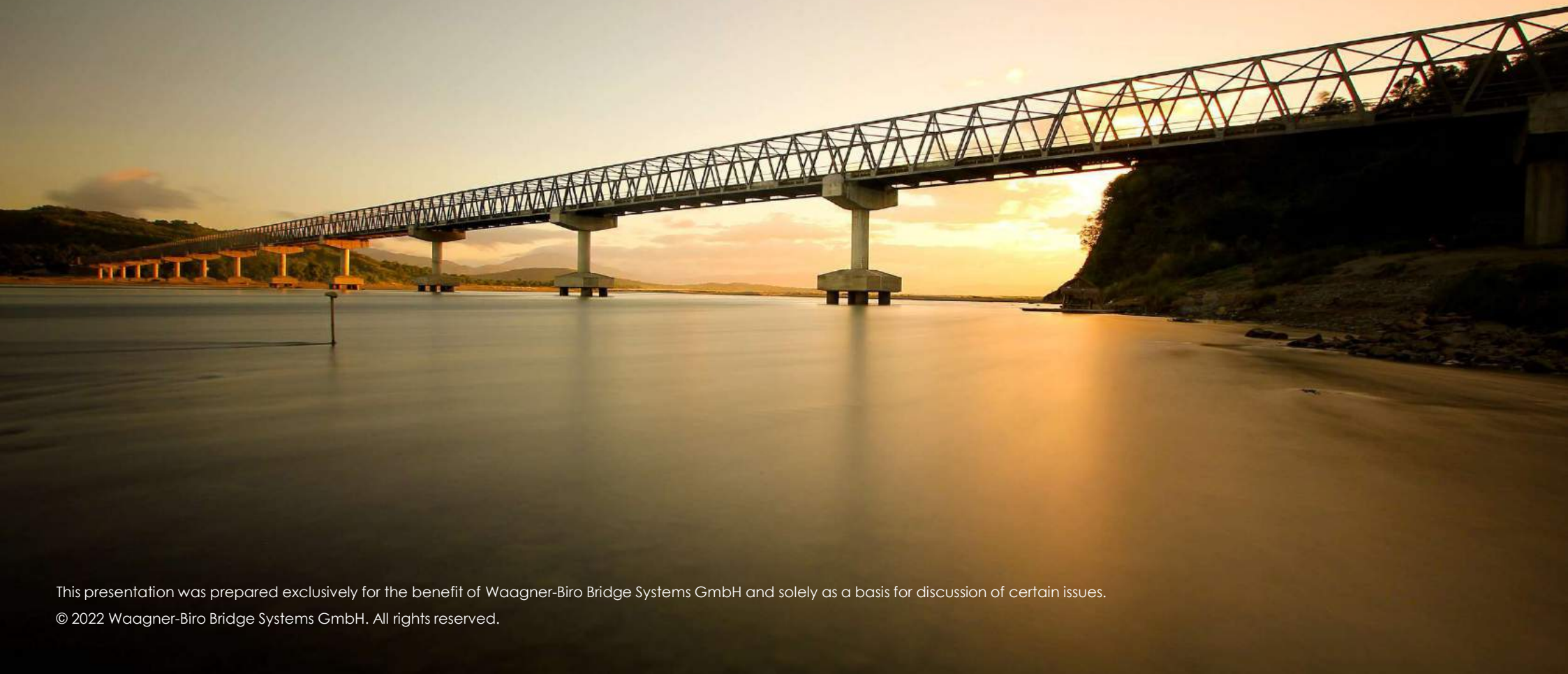
- Cost efficient solution for permanent use
- Rapid availability
- Suitable for all types of traffic (including multi-lane) & railways
- Easy transportation of the modules
- Light inherent weight due to high-strength steel
- Short construction time
- Construction by unskilled workers is possible - no welding on site required
- Long-term durability due to low material fatigue construction
- Standardized, compact and interchangeable components
- Low service and maintenance costs

# — PRODUCT PORTFOLIO —

## MODULAR BRIDGE – SELECTED REFERENCES



# — BRIDGES AS GATES TO THE WORLD —



This presentation was prepared exclusively for the benefit of Waagner-Biro Bridge Systems GmbH and solely as a basis for discussion of certain issues.

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## **7. TEMPORARY SMALL SPAN BRIDGES WITH STANDARD STOCK SECTIONS**

*RICCARDO ZANON*

## Temporary small span bridges with standard stock sections



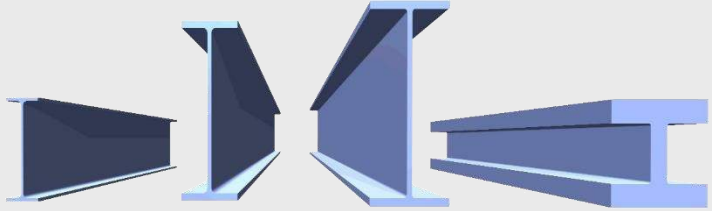
**Riccardo ZANON**

Structural Engineering Cluster Lead  
@ ArcelorMittal Steligence®  
[Riccardo.Zanon@arcelormittal.com](mailto:Riccardo.Zanon@arcelormittal.com)

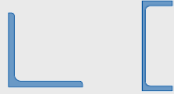


# For complex bridge construction ArcelorMittal is proud to be material supplier of recognized companies

Available full range of H structural shapes up to 1,1m tall beam and up to S500 class



And also angles up to 300mm  
und Channels up to 460mm tall



# Profiles are essence of auxiliary bridges

Modular system deployed by THW in Germany.  
Example reconstruction bridge BAD NEUENAHR-AHRWEILER.  
Bridge deck reconstruction during 1 week after flood event.

Video:  
<https://www.youtube.com/watch?app=desktop&v=whyr1K5D8zo>



# Examples by Technisches Hilfswerk (Germany)



Maulburg @Robert Bergmann

Technisches  
Hilfswerk

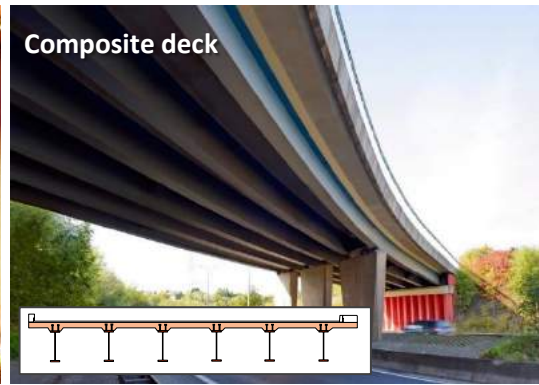




For some simple bridge typologies ArcelorMittal may be supplier of ready-to-install bridge girders or decks

The intelligent construction choice

Stelgence®



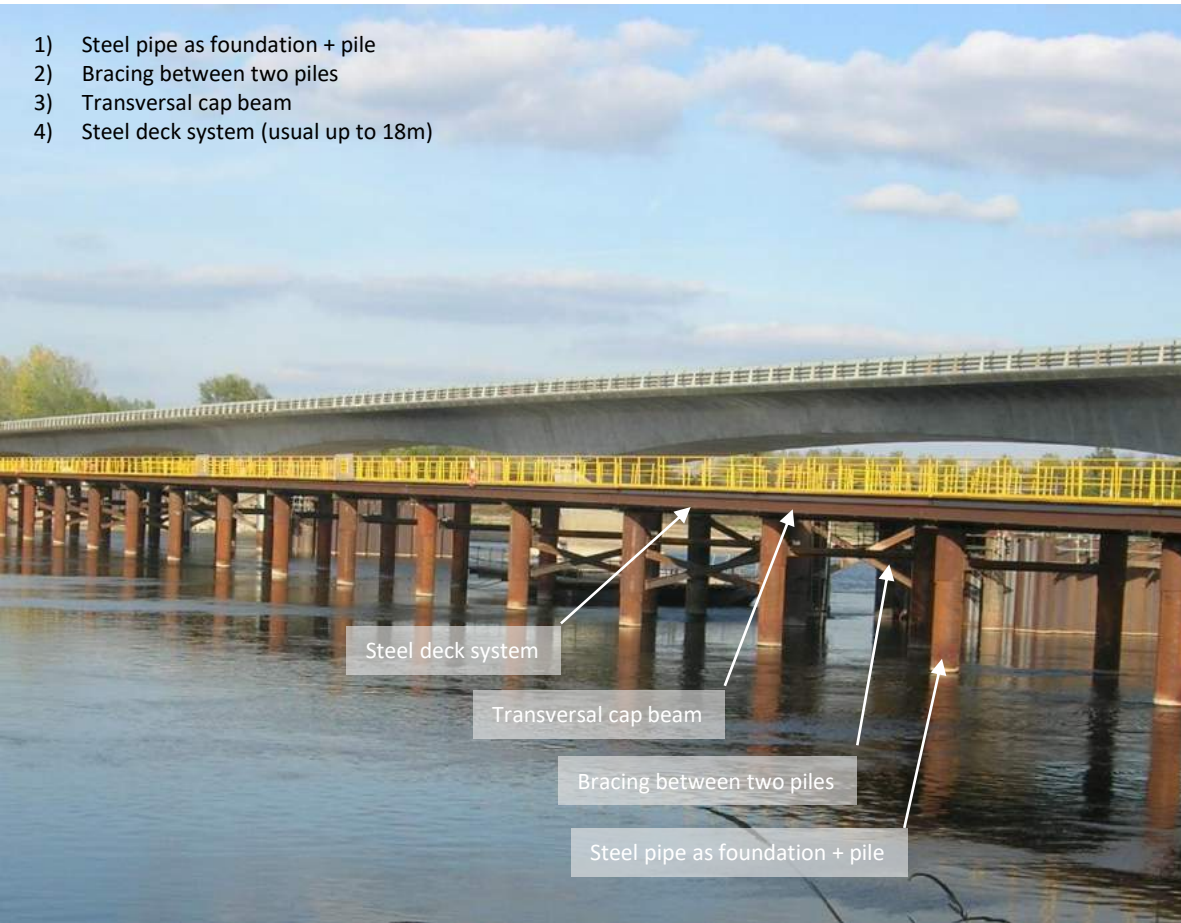
# Temporary bridge deck

- 1) Steel pipe as foundation + pile
- 2) Bracing between two piles
- 3) Transversal cap beam
- 4) Twin-girder longitudinal beams (usual up to 20m)
- 5) Transversal prefabricated concrete slabs (up to 12m)



# Temporary bridge deck - Full steel solution

- 1) Steel pipe as foundation + pile
- 2) Bracing between two piles
- 3) Transversal cap beam
- 4) Steel deck system (usual up to 18m)

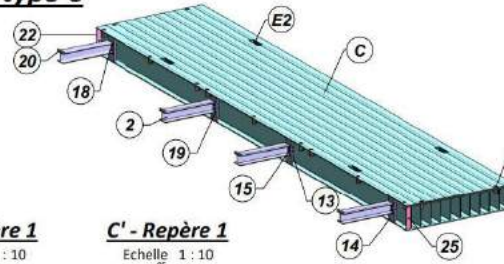


# Temporary bridge deck - Full steel solution

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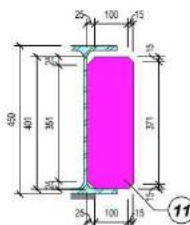
Elements obtained by assembling several sections along the longitudinal flange edge with a weld. The elements form a horizontal surface which serves as deck, with inserts for the supports and devices. The elements carry directly the load longitudinally to the supports.

## Platelage type C



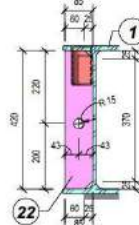
### C - Repère 1

Echelle 1 : 10



### C' - Repère 1

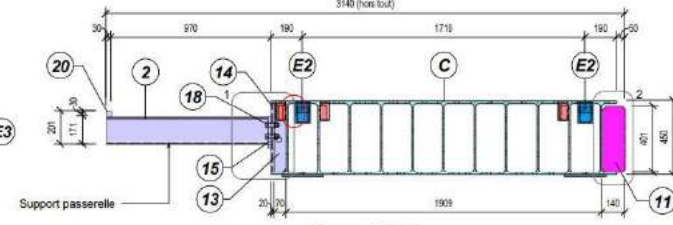
Echelle 1 : 10



## Coupe C-C

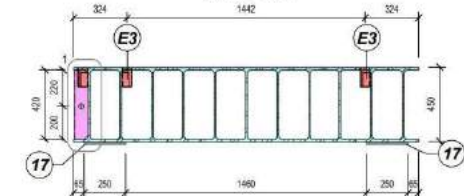
Echelle 1 : 20

Affaire : 11047  
Plan n° : ETP-EXE-PLA-CN-C-3-10170  
Page n° : 7  
Index : A.2



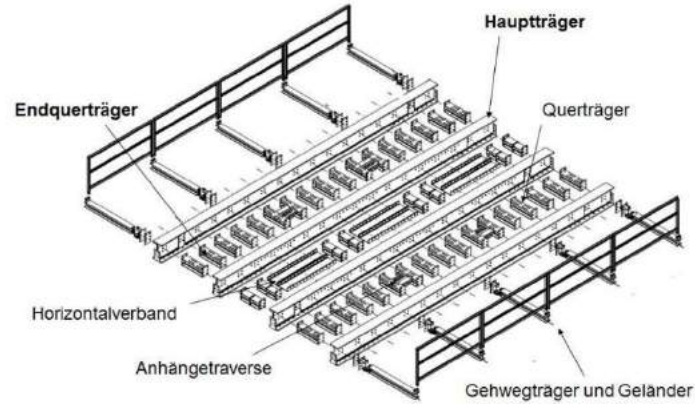
## Coupe C'-C'

Echelle 1 : 20



# Auxiliary bridges for railway

Span range: 7m – 24m



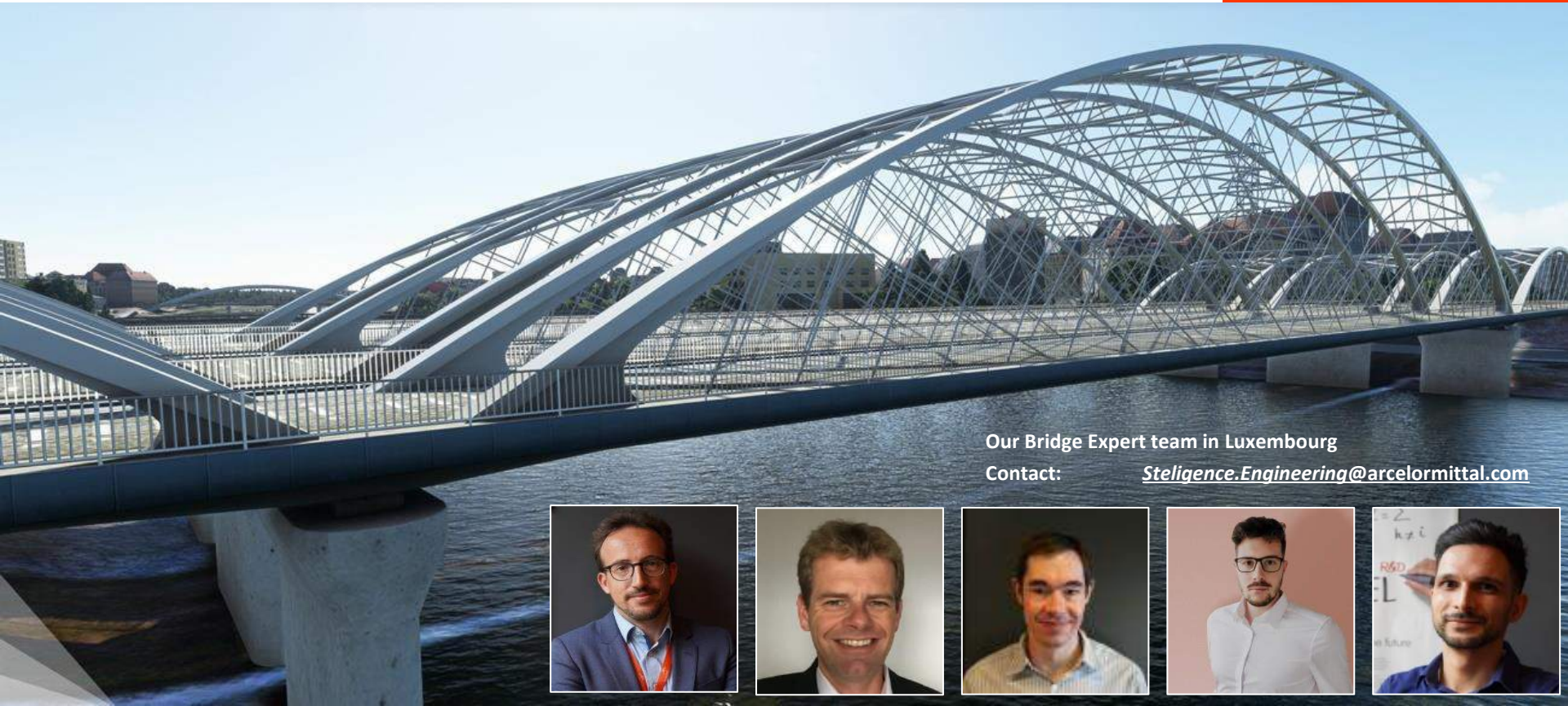
Network operators use temporary bridges with different spans and construction methods during temporary construction work on and alongside railway lines to intercept the tracks. The deck is meant to be prefabricated and inserted by crane during one day. With direct fixation of the rail on the cross beam, the deck can be immediately be opened to the traffic. The decks are standardized so they can be used several times in different locations.



**Let's talk bridges!**

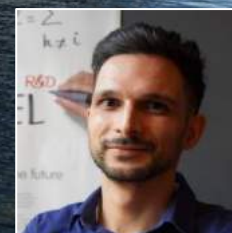
The  
intelligent  
construction  
choice

**Stelgence**



Our Bridge Expert team in Luxembourg

Contact: [Stelgence.Engineering@arcelormittal.com](mailto:Stelgence.Engineering@arcelormittal.com)



*Thank you for your kind attention and good luck for your next challenge!*



*“There is no higher satisfaction for an Engineer than to see the realizations of his work serving the community and the society”.*

*Adaptation from last page Luigi Negrelli’s memories.*

*Temporary bridges to re-establish links after catastrophic events are the highest expression of how Engineers can serve the Society!*



**Luigi Negrelli (1799–1858)**  
*One of main designers of Suez Canal*



## **Steel temporary bridges for quick infrastructure repair after catastrophic events**

**1<sup>st</sup> Edition, 2024**

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