PEDESTRIAN / CYCLING BRIDGE OVER THE L3008

Bad Vilbel, Germany

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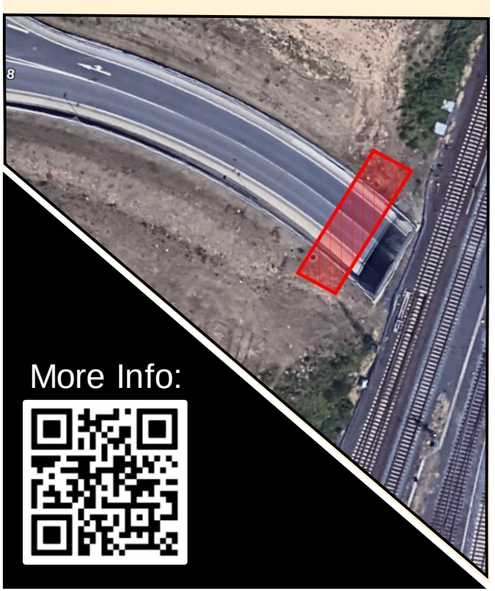
PROJECT BACKGROUND

- Proposed pedestrian bridge between two developing communities in Germany
- To develop three preliminary and two detailed structural designs

CONSTRAINTS

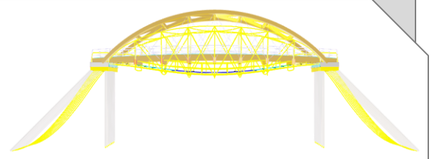
- At least one timber design
- Clear span of 24m
- Must not impact highway or existing infrastructure/utilities
- 6-ton service vehicle load
- Canadian (CSA) and German (DIN EN) design standards



More Info:

DESIGN 1: TIMBER ARCH BRIDGE

OVERVIEW



Deformations/Stresses from RFEM (300x Exaggeration)

Estimated Duration: 14 Weeks Onsite

Estimated Cost: $ 1.42M € 967K

STRUCTURAL ANALYSIS (ARCH)	
MAX. DEFL. @ MIDSPAN	20.7mm
MAX. AXIAL LOAD (Tf)	498 kN
MAX. MOMENT (Mf)	190 kNm

Bridge Deck

- Concrete deck slab with mesh reinforcement
- Corrugated steel deck

Primary Members

- Glulam Timber Arches: GL28h (DIN 1052:2008-12)

Secondary Members

- Longitudinal Timber Stringers: DF-L SS (CSA O86-19:2019-09)
- Transverse Timber Beams: DF-L SS (CSA O86-19:2019-09)
- High-Strength Steel Cables: RB ¾ AISC

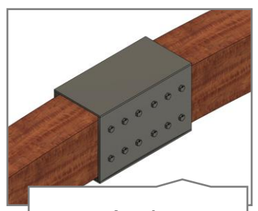
Advantages

- Lightweight Structure
- Few Simple Connections
- Aesthetic Design

Disadvantages

- Reduced Constructability
- Complex Foundation Design
- Many Redundant Cables Required

CONNECTIONS

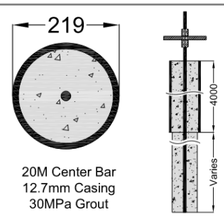


Arch

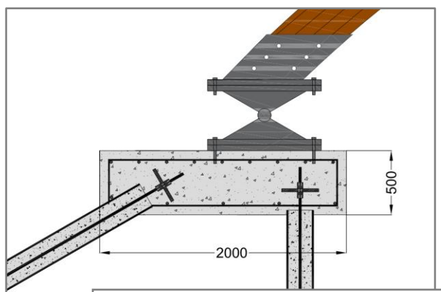
Cables

Bridge Bearings

FOUNDATIONS



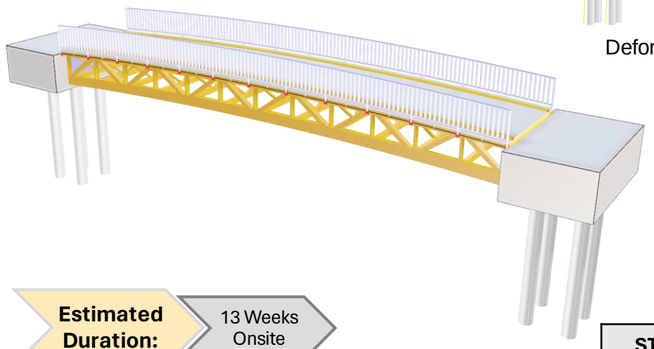
Micropiles

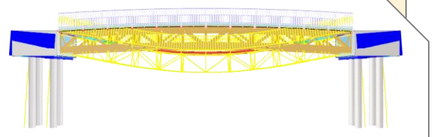


Abutments

DESIGN 2: TIMBER TRUSS BRIDGE

OVERVIEW





Deformations/Stresses from RFEM (300x Exaggeration)

Estimated Duration: 13 Weeks Onsite

Estimated Cost: $ 1.34M € 909K

STRUCTURAL ANALYSIS (TRUSS)	
MAX. DEFL. @ MIDSPAN	33.6 mm
MAX. AXIAL LOAD (Tf)	1317 kN
MAX. MOMENT (Mf)	36.8 kNm

Bridge Deck

- Concrete Deck Slab with Mesh Reinforcement
- Corrugated Fiber Reinforced Polymer (FRP) Deck

Primary Members

- Longitudinal Glulam Timber Chords: GL28h (DIN 1052:2008-12)
- Vertical & Diagonal Truss Members: GL24h (DIN 1052:2008-12)

Secondary Members

- Transverse Glulam Timber Beams: GL24h (DIN 1052:2008-12)
- Transverse Glulam Timber Bracing: GL24h (DIN 1052:2008-12)

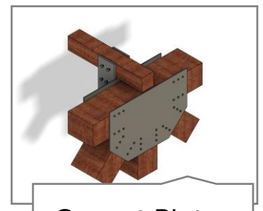
Advantages

- Modular Construction
- High Rigidity/Stiffness
- Simple & Practical Design

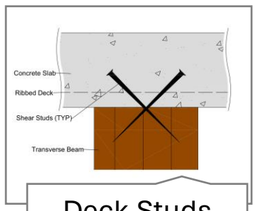
Disadvantages

- Many Connections
- Complex Member Serviceability
- Higher Approach to Deck

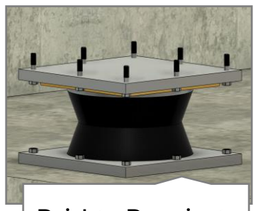
CONNECTIONS



Gusset Plates

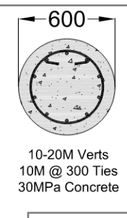


Deck Studs
(Patrice Godonou, 2022)

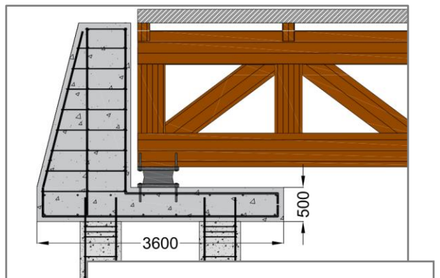


Bridge Bearings

FOUNDATIONS



Concrete Piles



Abutments