Bridge Design

Introduction

What is a Bridge?

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Some definitions:

“a structure spanning and providing passage over a river, chasm, road, or the like.” [Dictionary.com]

“a structure carrying a pathway or roadway over a depression or obstacle (such as a river)” [Merriam-Webster]

“a structure that is built over a river, road, or railway to allow people and vehicles to cross from one side to the other” [Cambridge Dictionary]

“A bridge is a structure that is built over a railway, river, or road so that people or vehicles can cross from one side to the other.” [Collins Dictionary]

“A structure carrying a road, path, railway, etc. across a river, road, or other obstacle.” [Oxford Dictionary]

“a road, railway, or path that goes over a river, over another road etc, and the structure that supports it” [MacMillan Dictionary]

“A structure spanning and providing passage over a gap or barrier, such as a river or roadway.” [FARLEX]

None of them are complete but they define the basic characteristics of a bridge

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A bridge is a structure

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A bridge provides a passage for vehicles, people, water, materials, utilities, …

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A bridge crosses a natural or manmade obstacle.

Bridge Classification

Based on traffic carried:

- Road traffic
- Rail traffic
  (Heavy rail, Light rail)
- Non-motorised traffic
  (Pedestrians, Cyclists)
- Water
  (aqueducts, canals)
- Utilities
  (water, electricity, tele-communications, natural gas)
- Raw Material
  (conveyor bel
- Wildlife

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  (conveyor belts)
- Wildlife

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab (Plattenbrücke)
- Girder
- Truss
- Frame
- Strut frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder (Balkenbrücke)
- Truss
- Frame
- Strut frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss (Fachwerkbrücke)
- Frame
- Strut frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame (Rahmenbrücke)
- Strut frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Strut frame (Sprengwerk)
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Strut frame
- Arch (Bogenbrücke)
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Strut frame
- Arch
- Suspension (Hängebrücke)
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Strut frame
- Arch
- Suspension
- Cable-Stayed (Schrägseilbrücke)
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clear distinction?
(see notes)

Bridge Classification

Based on typology:

- Slab
- Girder
- Truss
- Frame
- Strut frame
- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung (Unterspannter Träger)
- Stress-ribbon
- Floating
- Movable
- Hybrid systems

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- Slab
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- Truss
- Frame
- Strut frame
- Arch
- Suspension
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- Floating
- Movable
- Hybrid systems

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- Girder
- Truss
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- Arch
- Suspension
- Cable-Stayed
- Extradosed
- Underslung
- Stress-ribbon
- Floating (Schwimmbrücke)
- Movable
- Hybrid systems

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- Girder
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- Arch
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- Extradosed
- Underslung
- Stress-ribbon
- Floating
- Movable (Klappbrücke, …)
- Hybrid systems

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Bridge Classification

Based on material:

- Masonry
- Timber
- Iron
- Steel
- Concrete
- Composite
  (steel-concrete)

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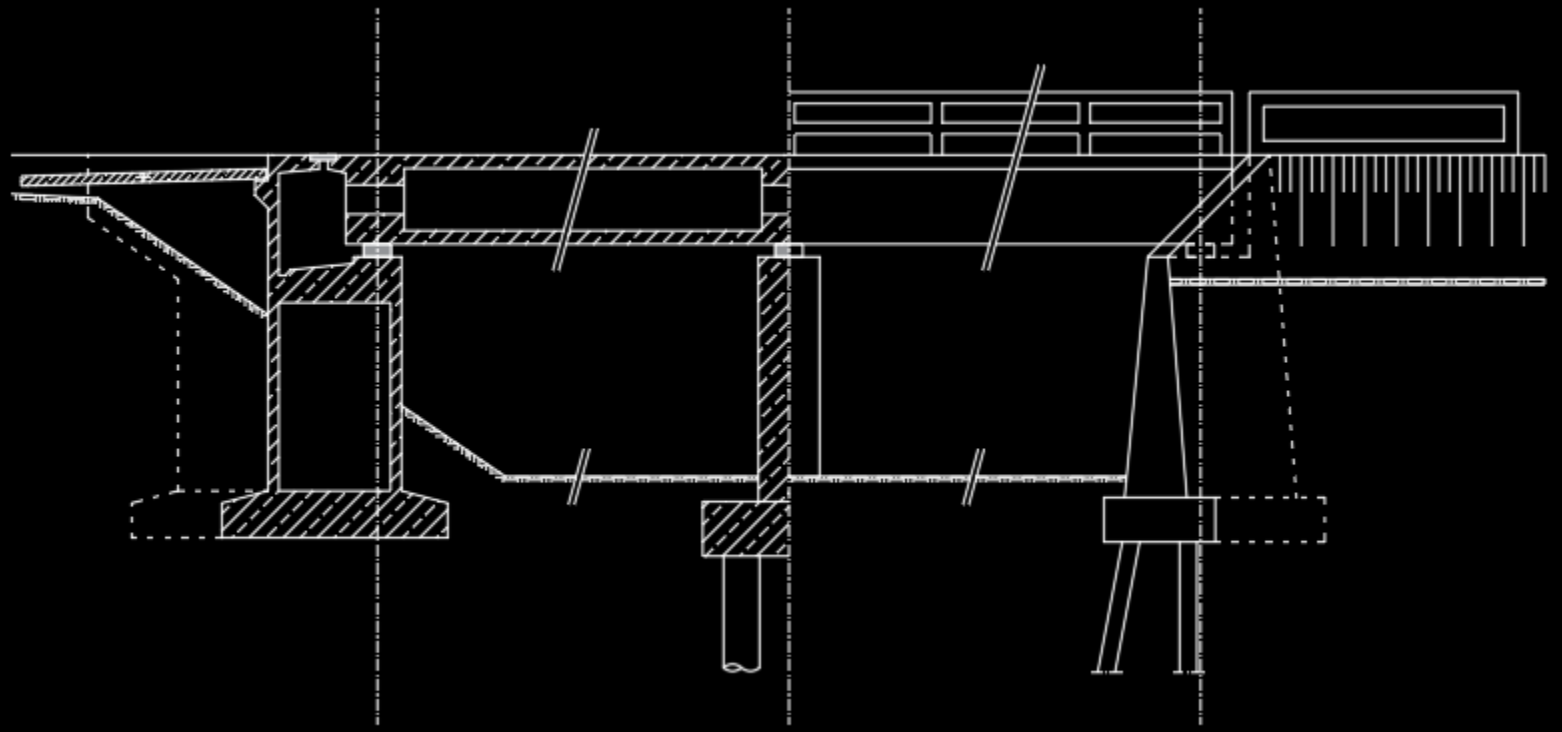
Bridge Classification

Based on material:

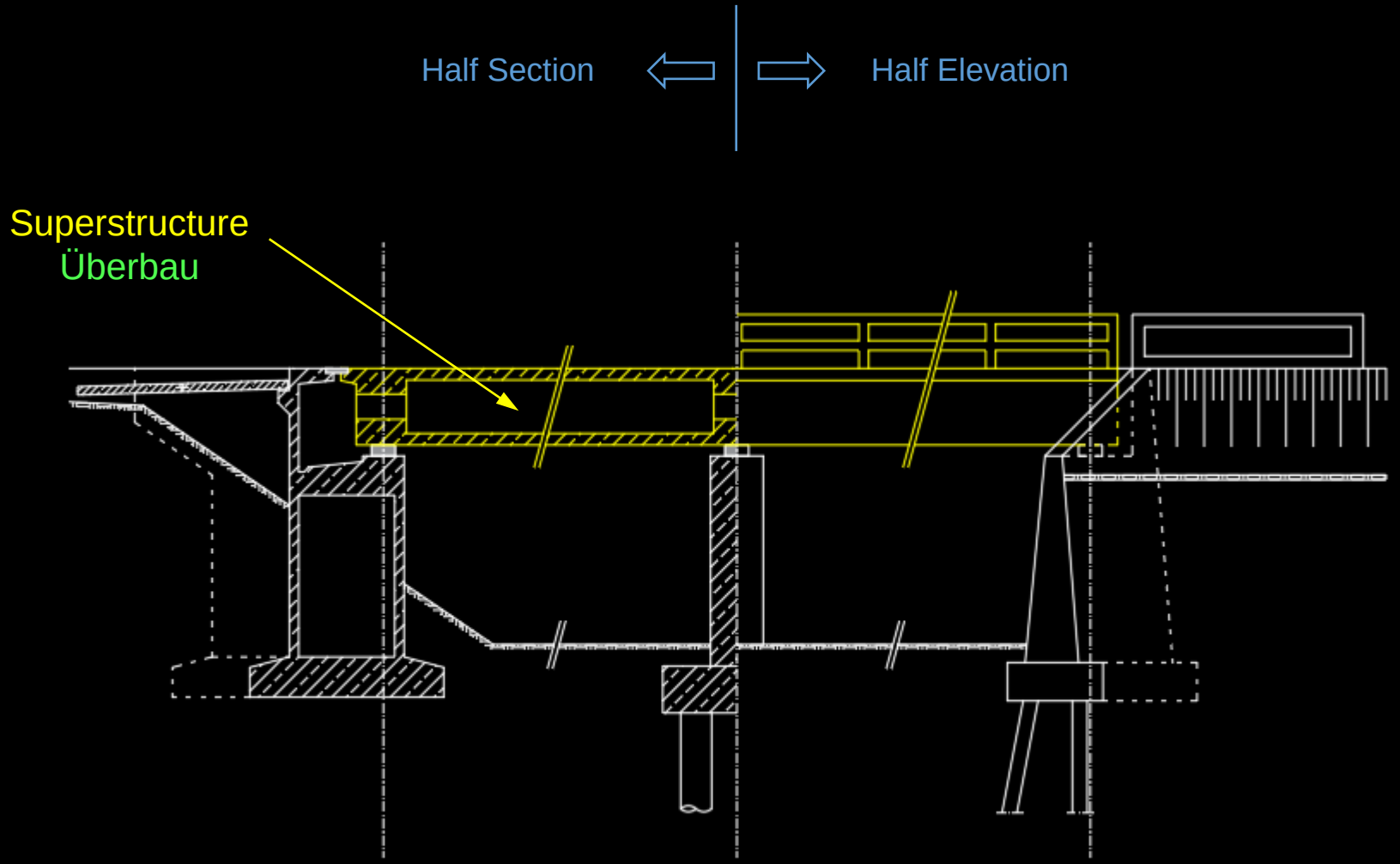
- Masonry
- Timber
- Iron
- Steel
- Concrete
- Composite
  (usually steel-concrete)

General Characteristics - Nomenclature

Half Section ⇦ | ⇨ Half Elevation



General Characteristics - Nomenclature



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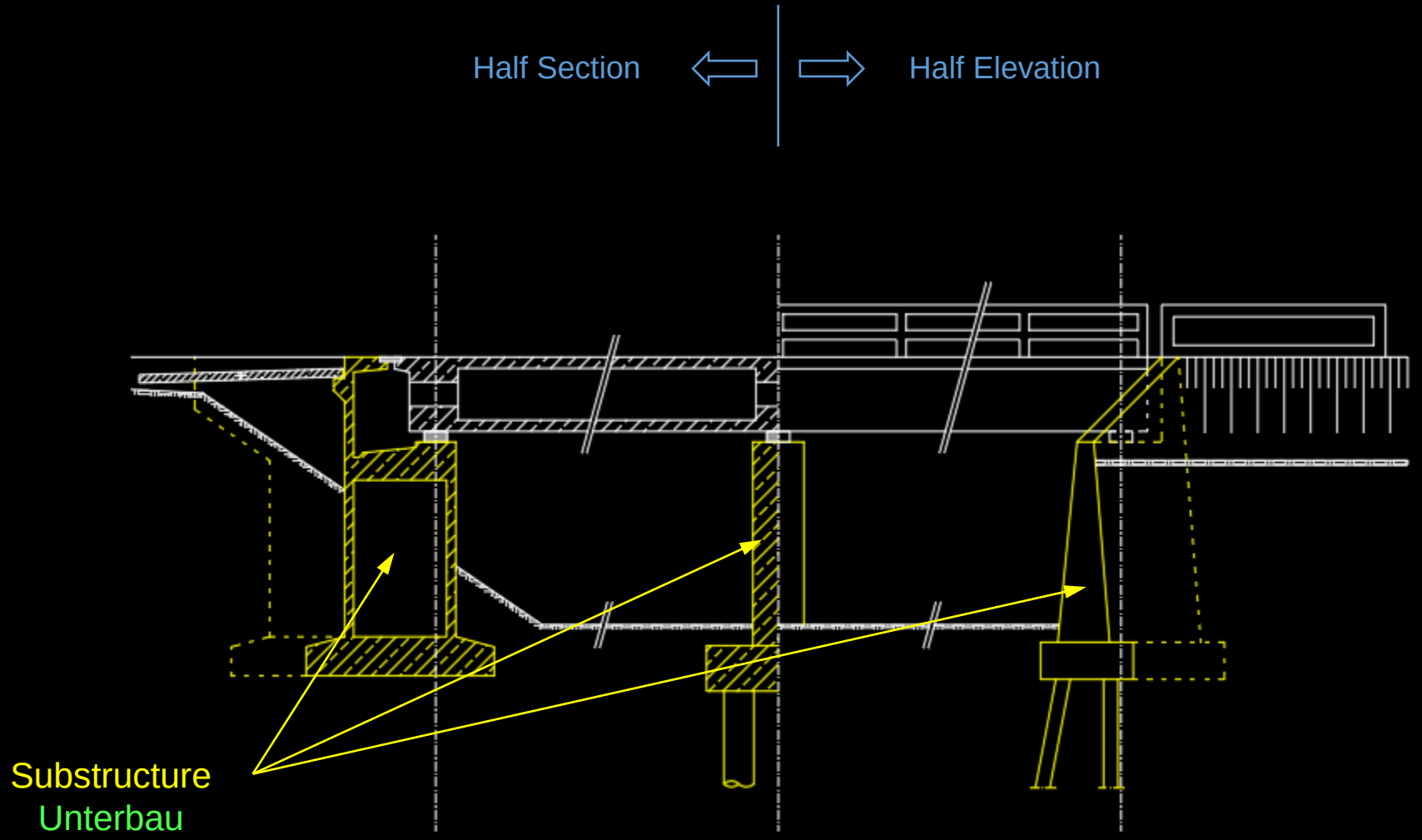

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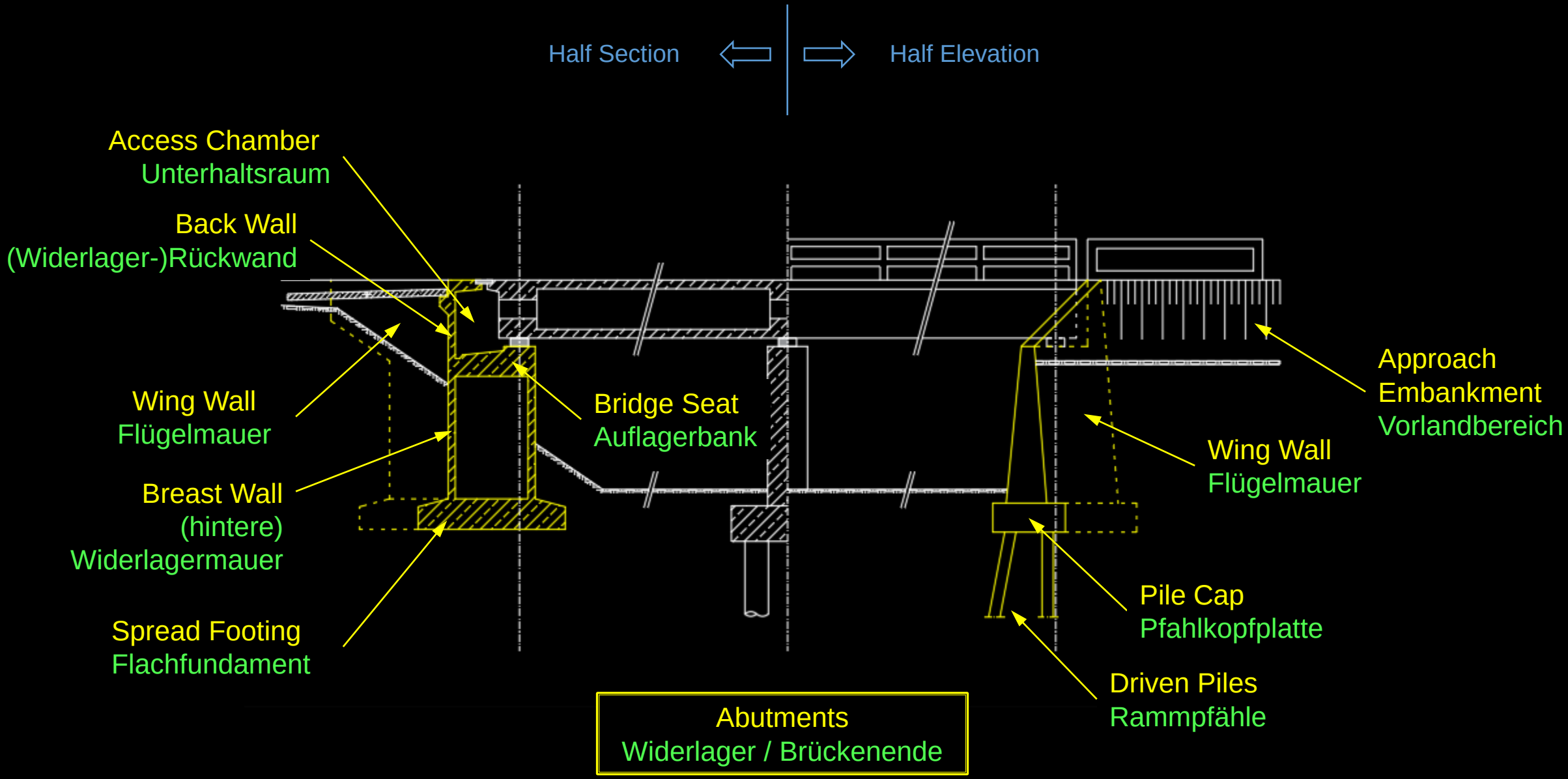

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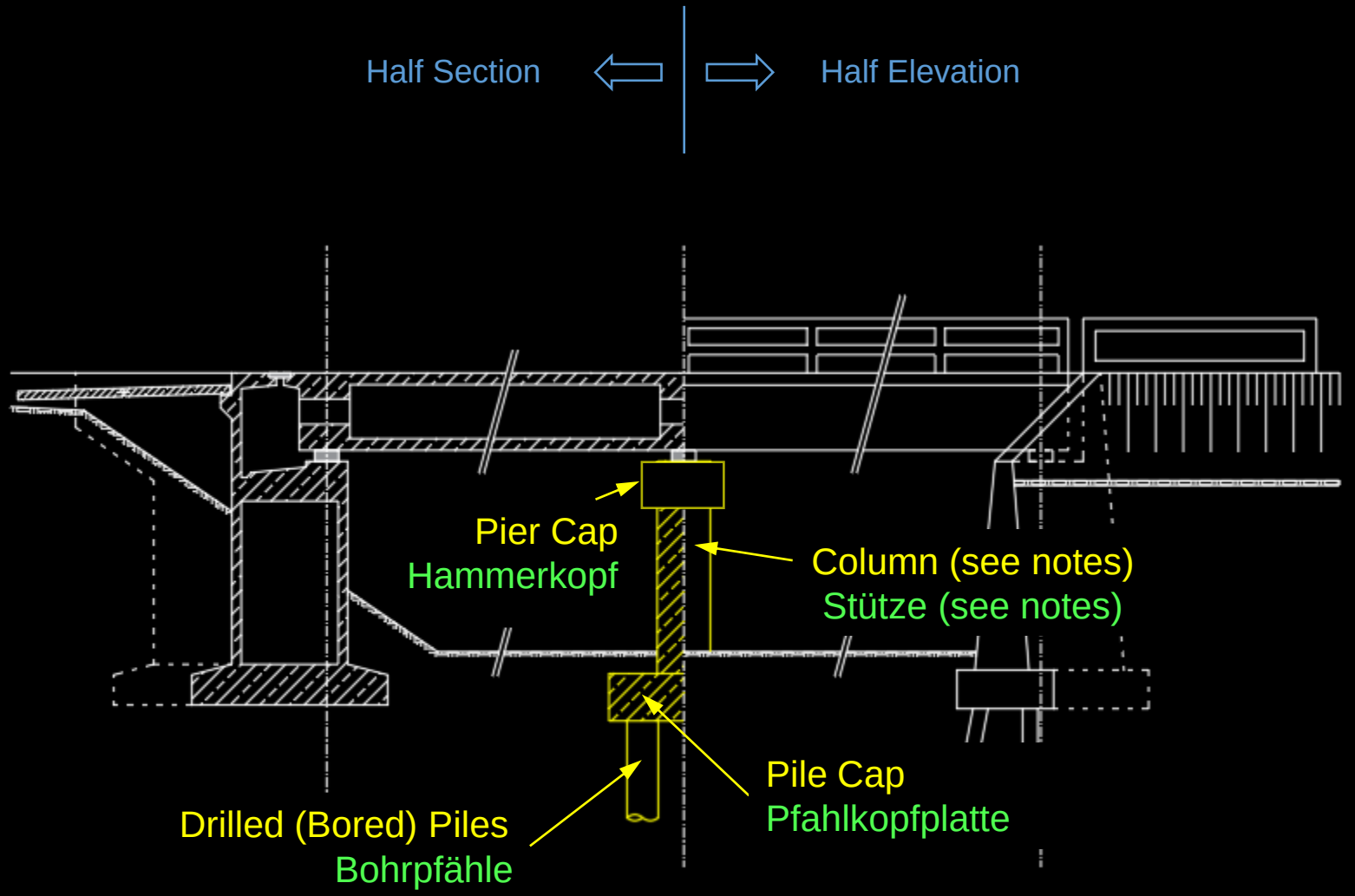
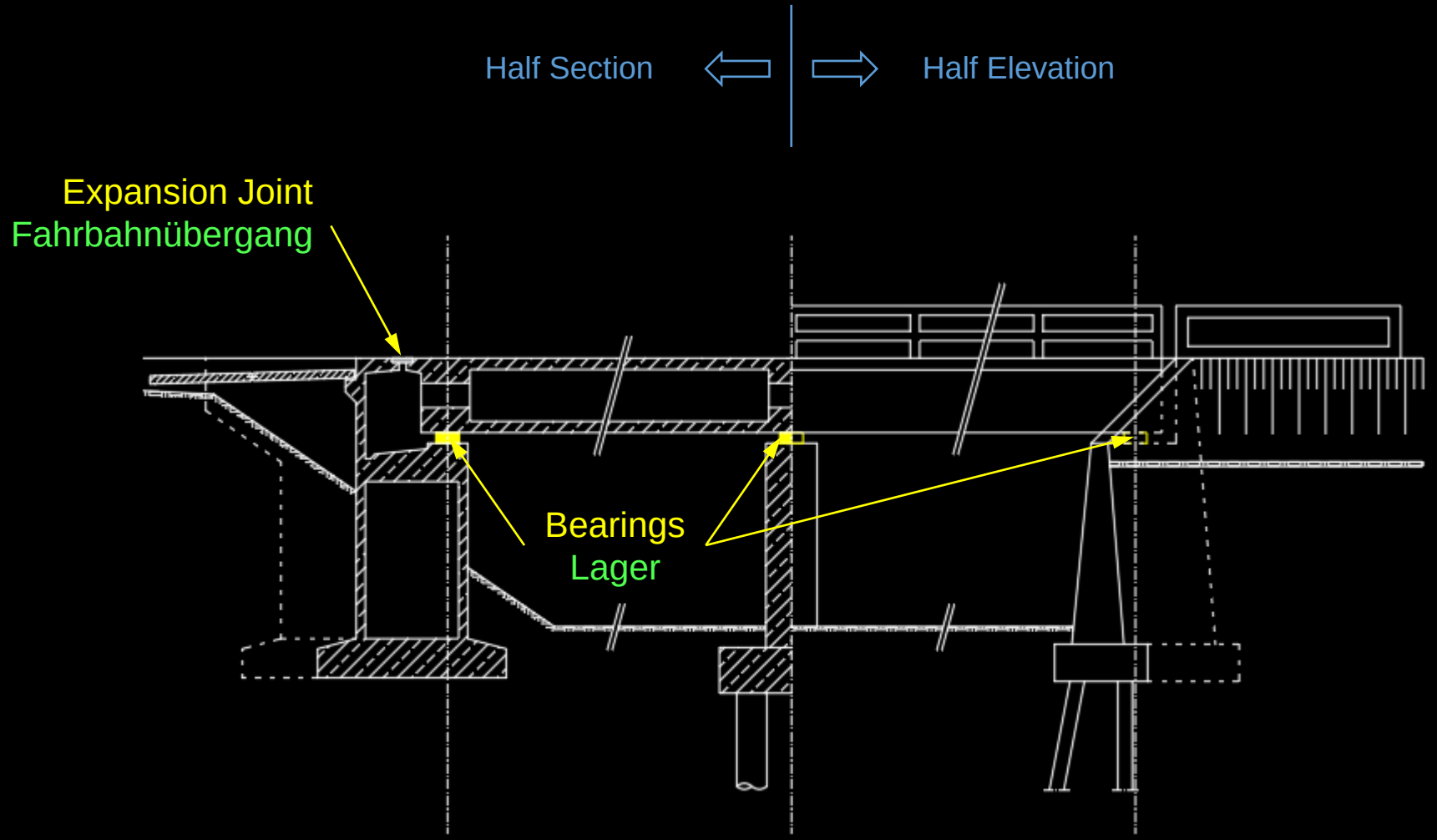


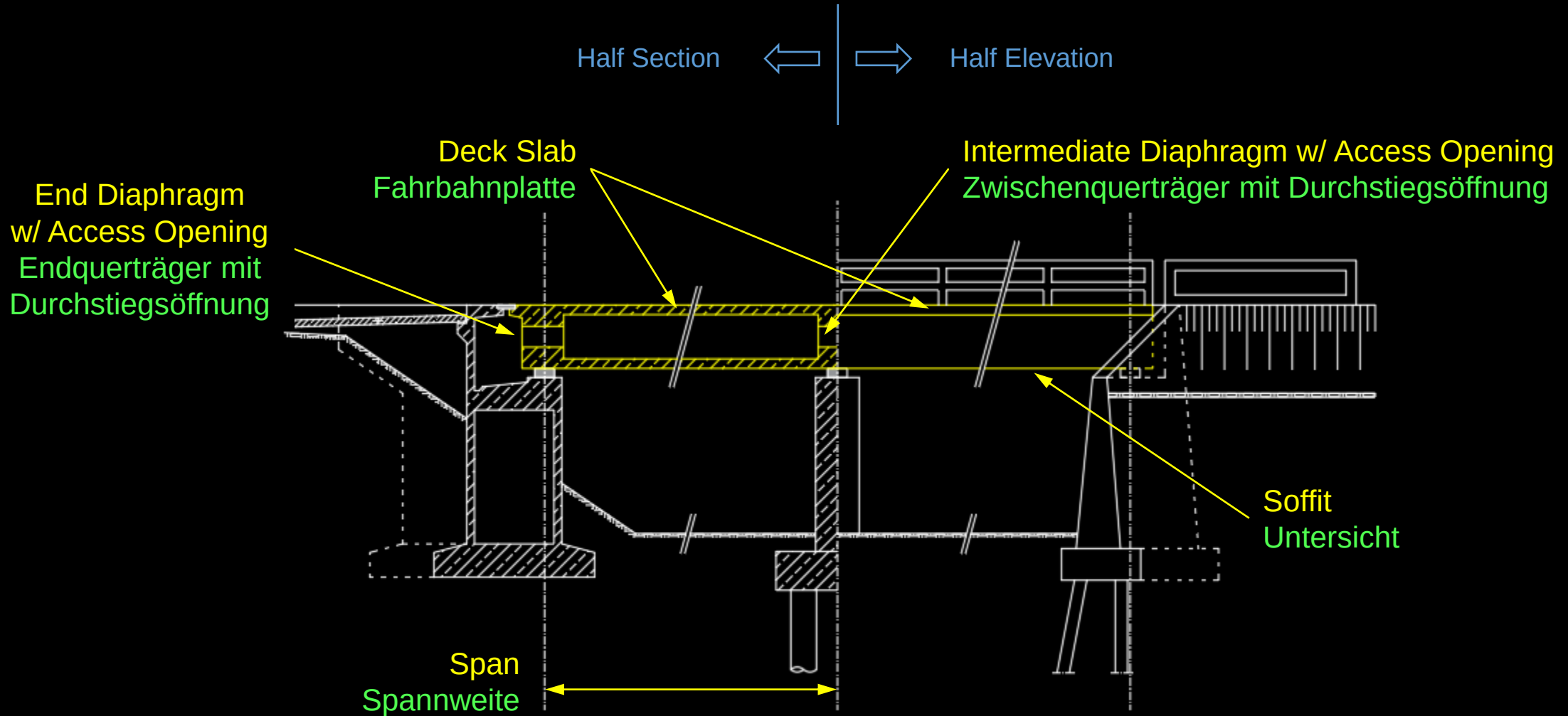
Piers
Stützen / Pfeiler

General Characteristics - Nomenclature



Support and Articulation
Lagerung und Dilatation

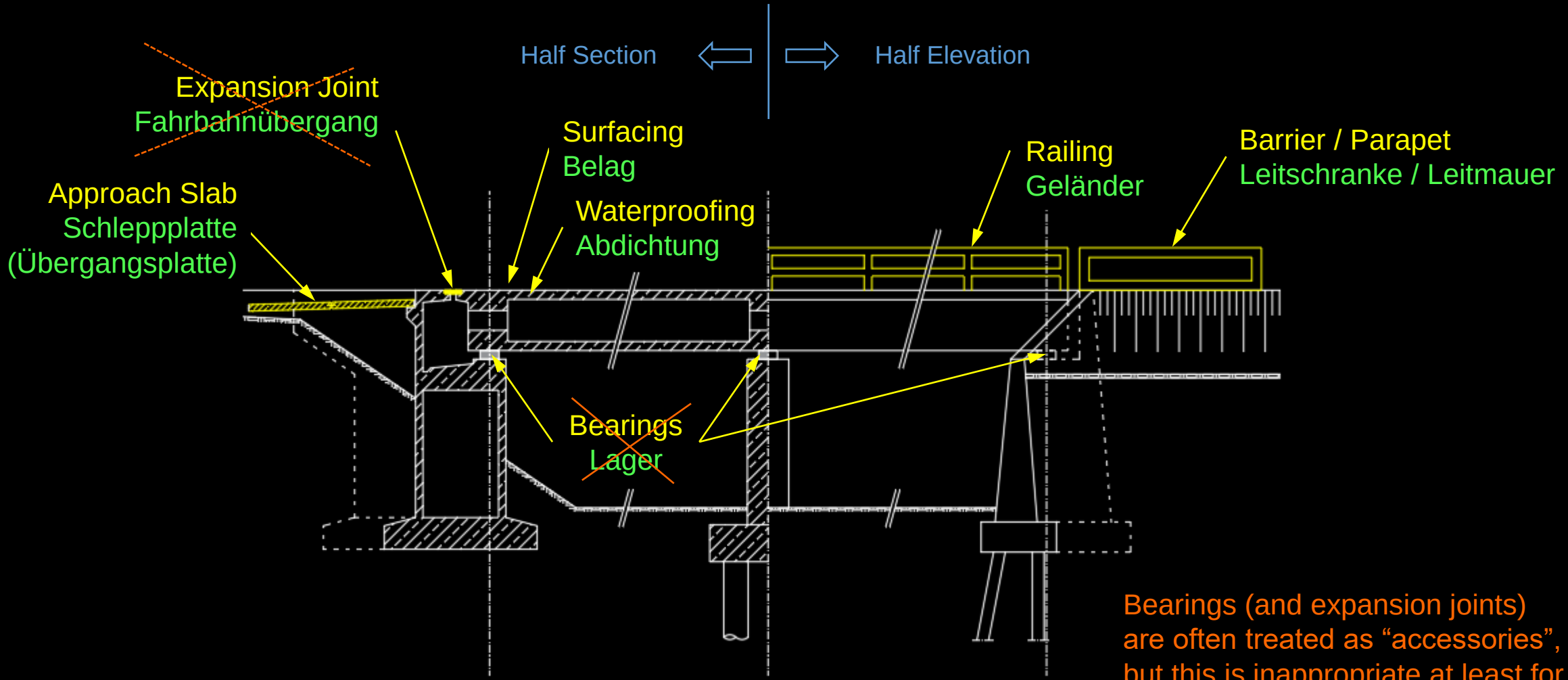
General Characteristics - Nomenclature



Girder
Brückenträger

(Concrete Box Girder shown)
(Hohlkastenträger in Beton dargestellt)

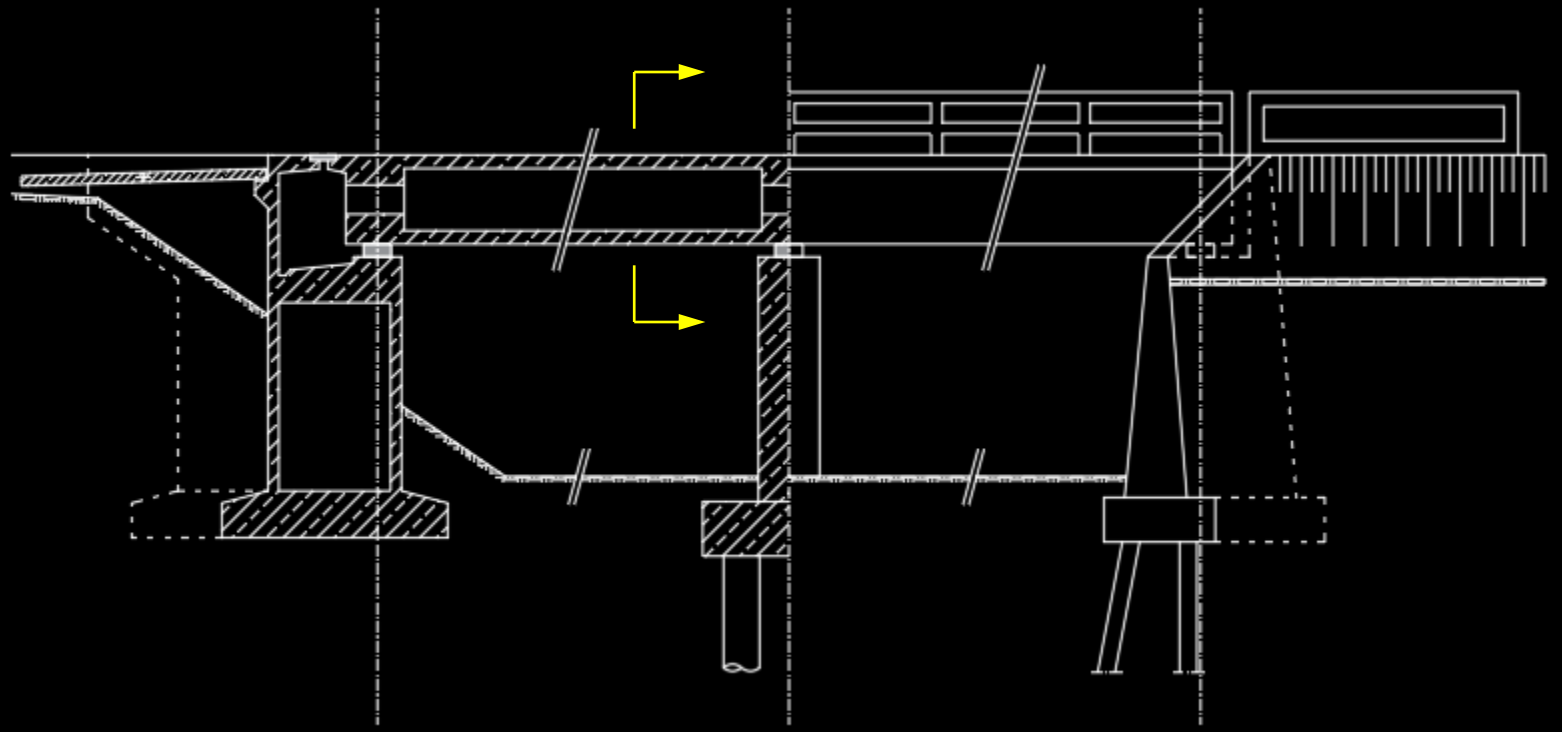
General Characteristics - Nomenclature



Bearings (and expansion joints) are often treated as “accessories”, but this is inappropriate at least for bearings = structural components (see support and articulation)

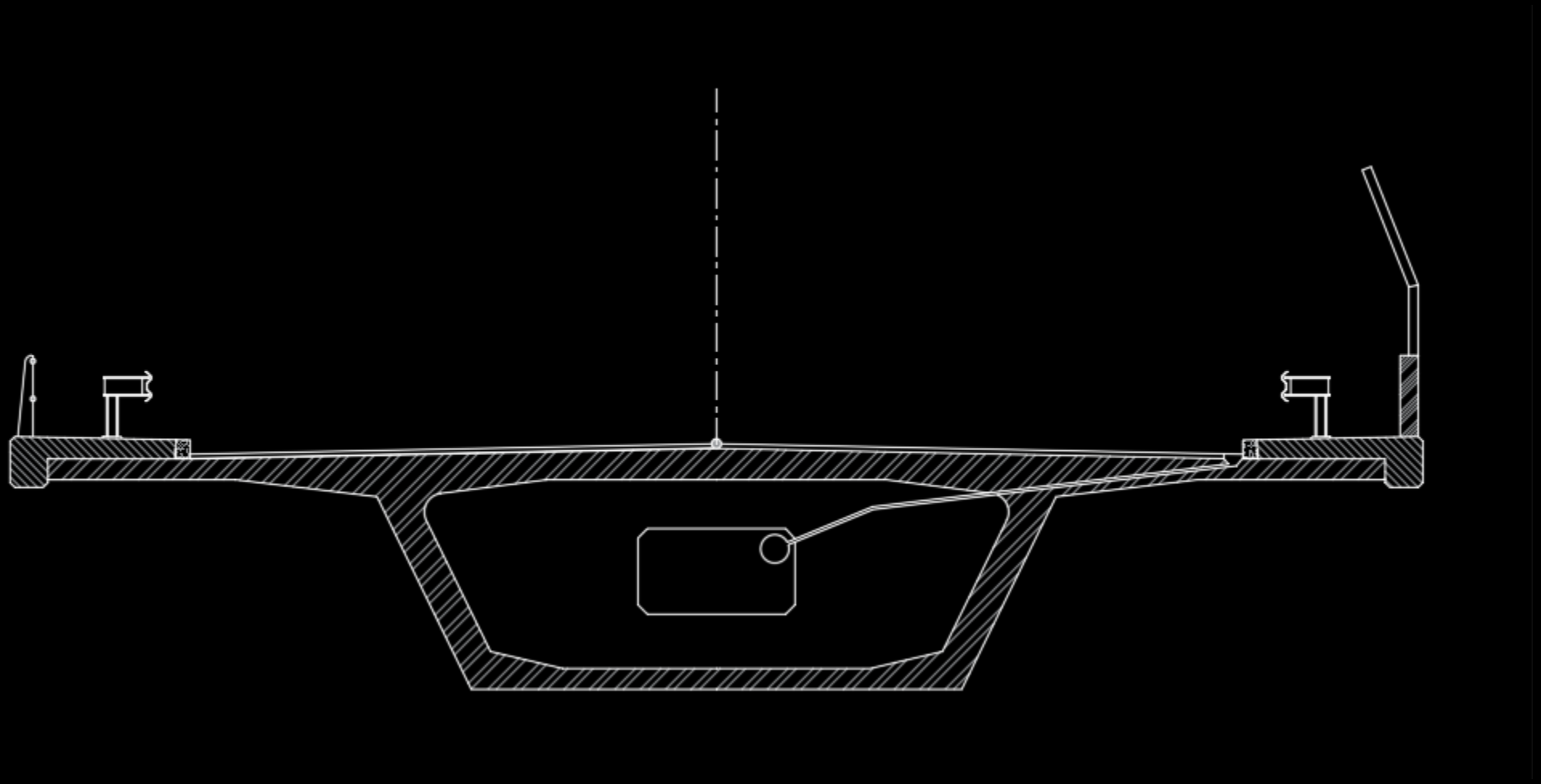
General Characteristics - Nomenclature

Half Section ⇦ | ⇨ Half Elevation



General Characteristics - Nomenclature

Typical Girder Section



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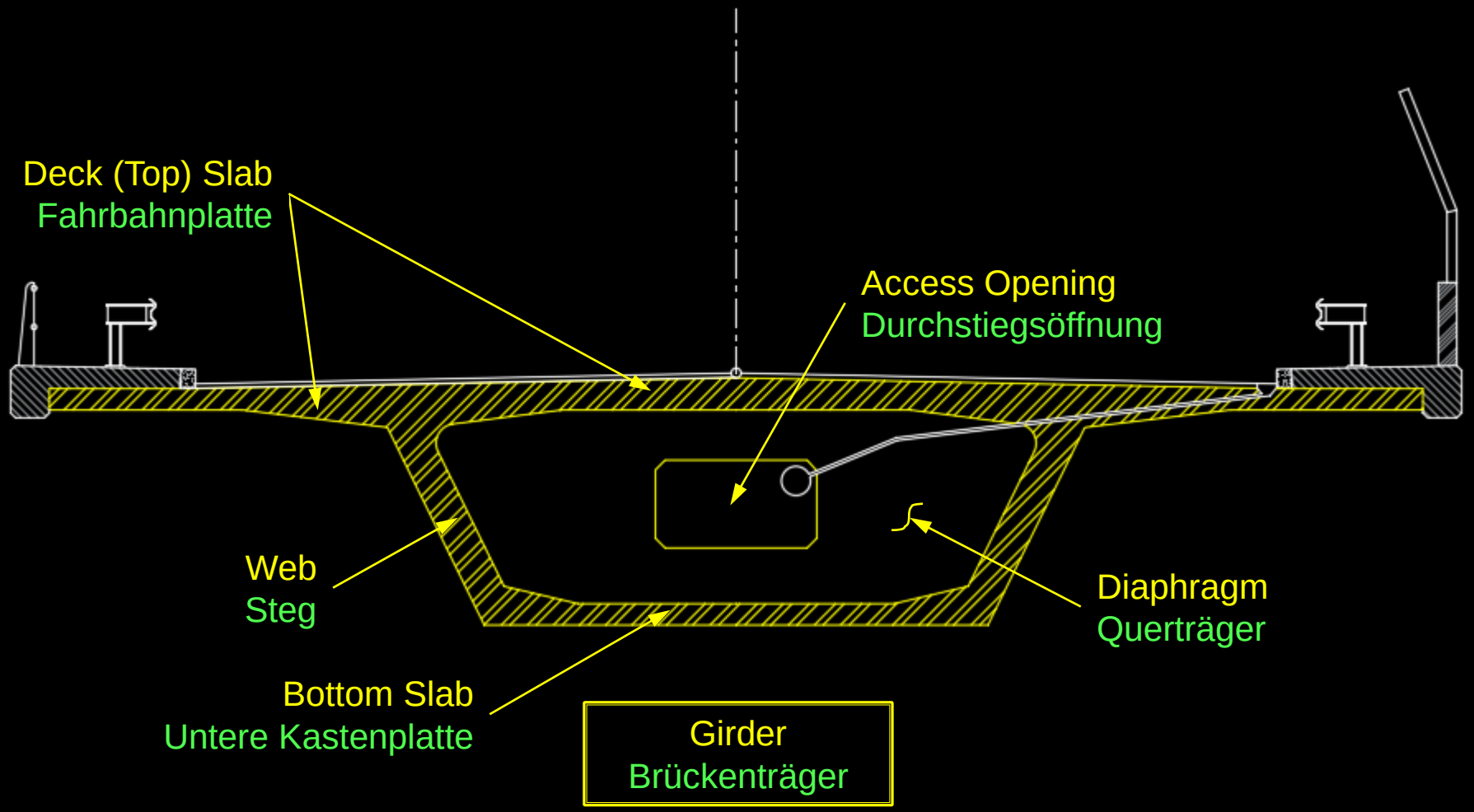

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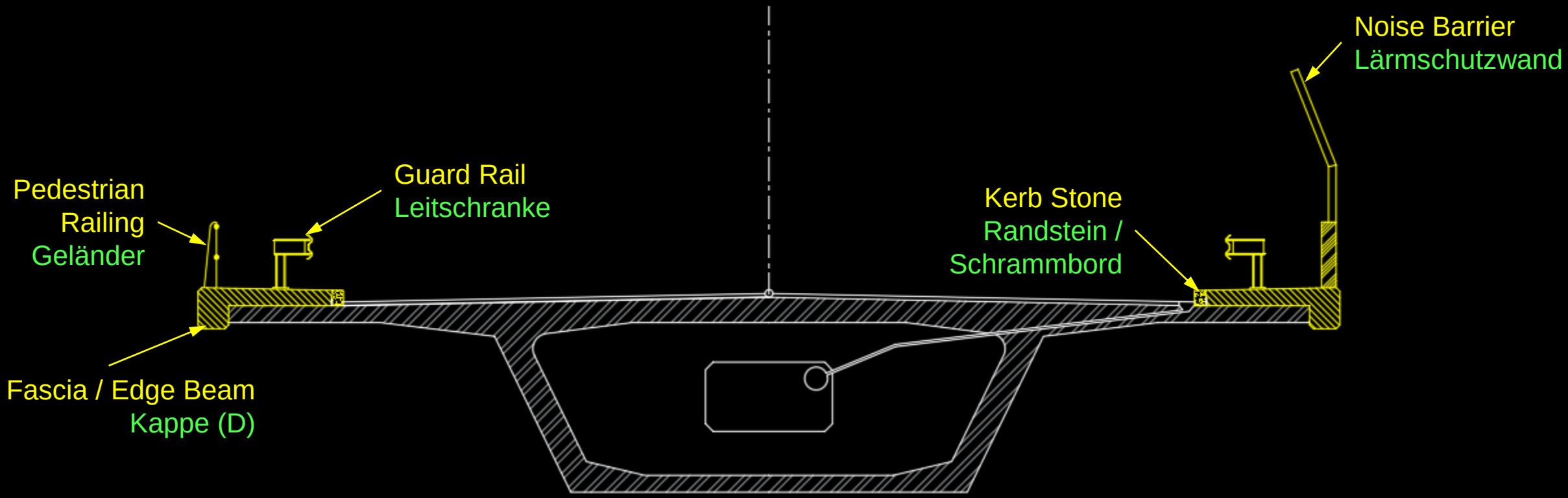
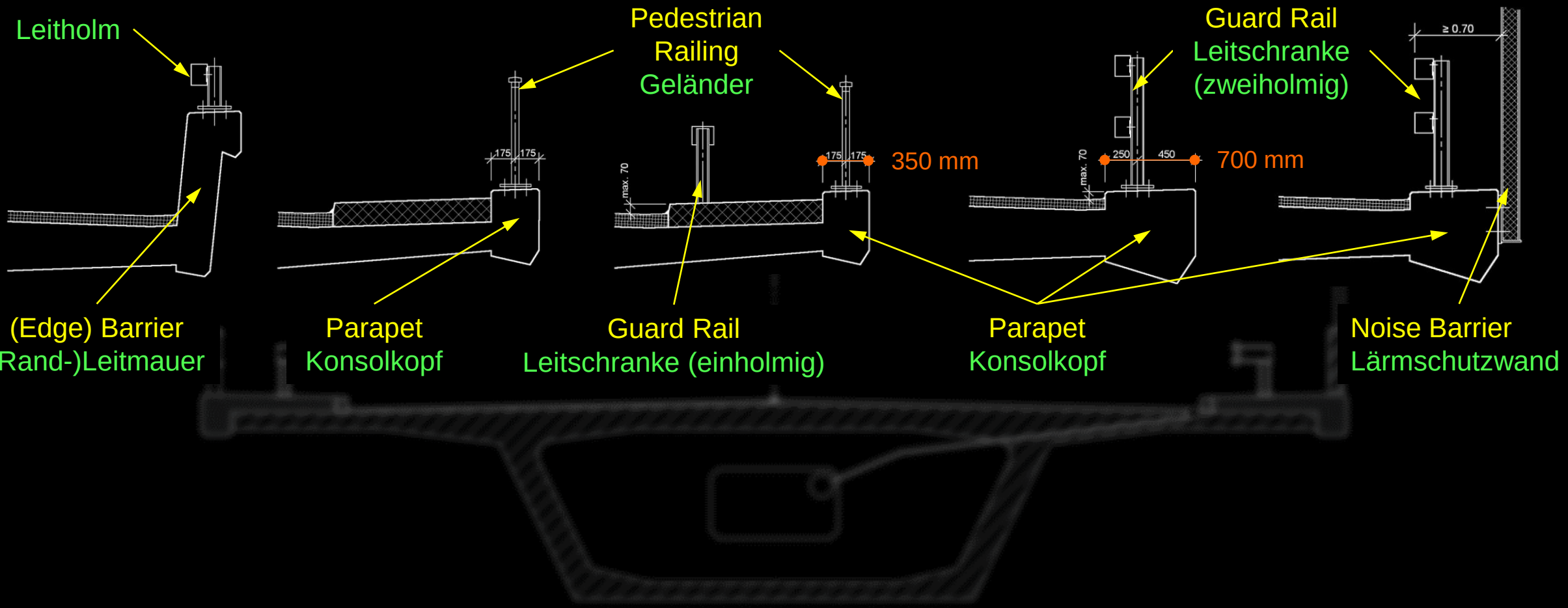


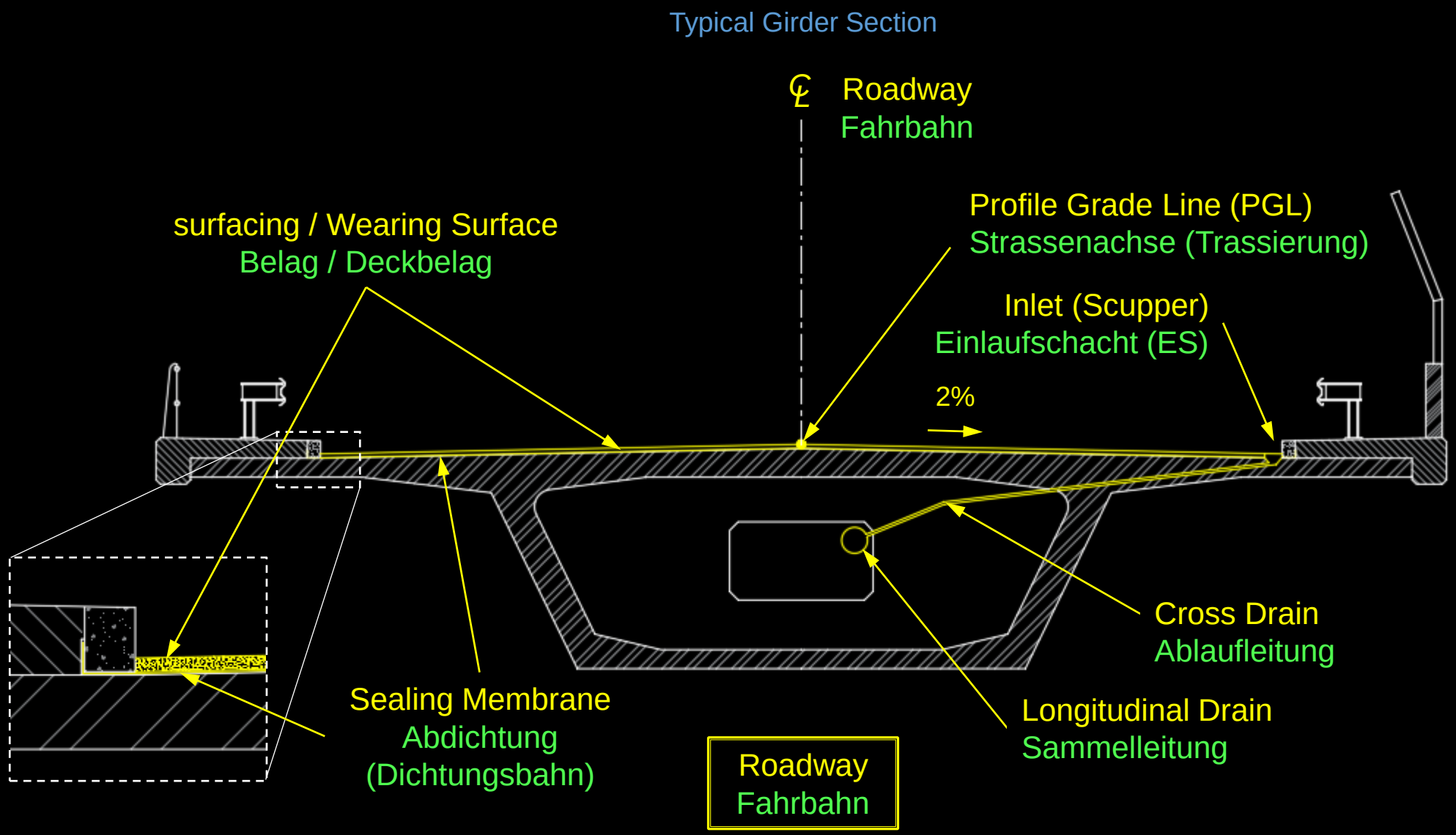
Sidewalk
Gehweg / Randbord

General Characteristics - Nomenclature



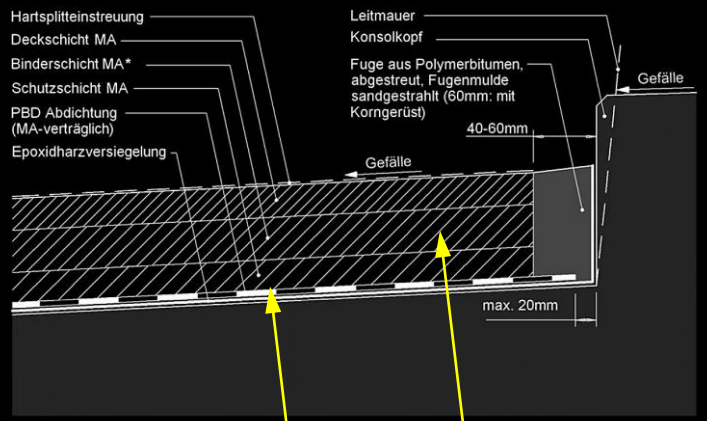
Bridge edges (CH)
Brückenränder (CH)

General Characteristics - Nomenclature

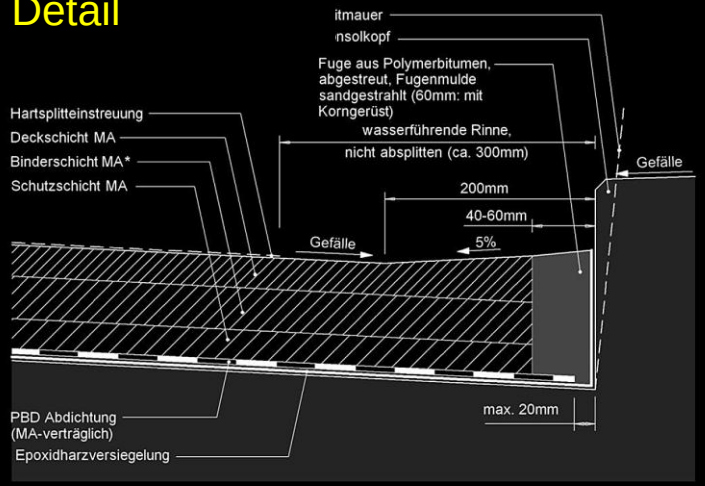


General Characteristics - Nomenclature

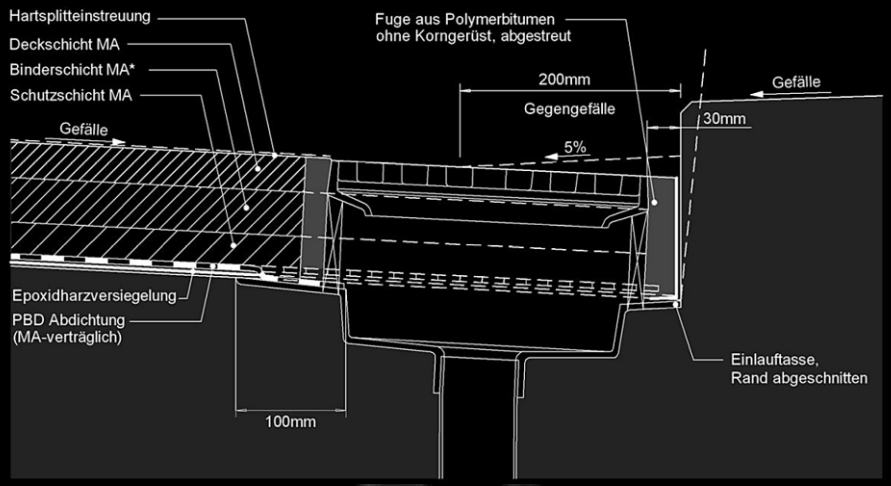
High point Detail



Low point Detail



Inlet (scupper) Detail



3 Layers of Mastic Asphalt
3 Schichten Gussasphalt

Sealing Membrane
Abdichtung
(Dichtungsbahn)

Roadway
Fahrbahn

General Characteristics - Nomenclature

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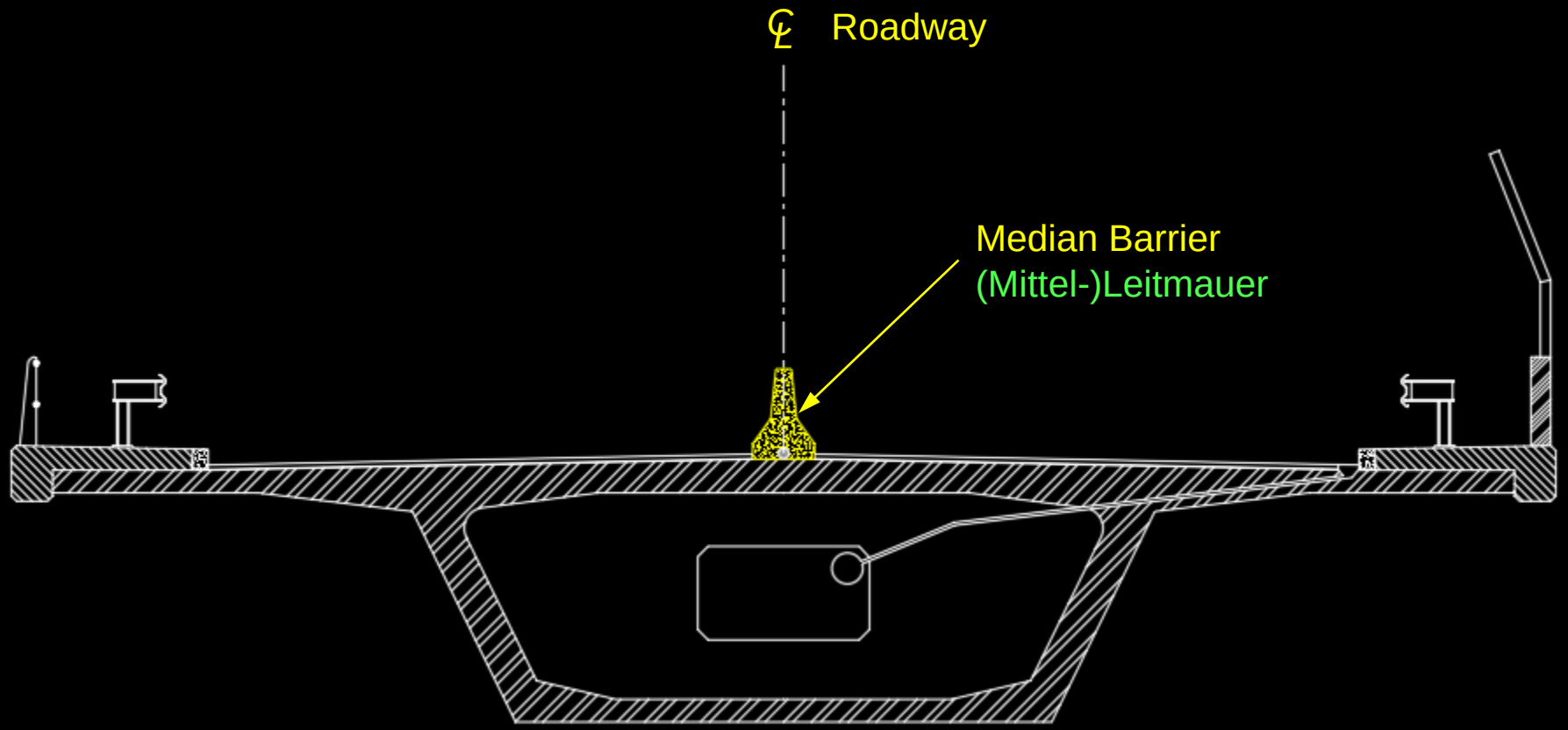
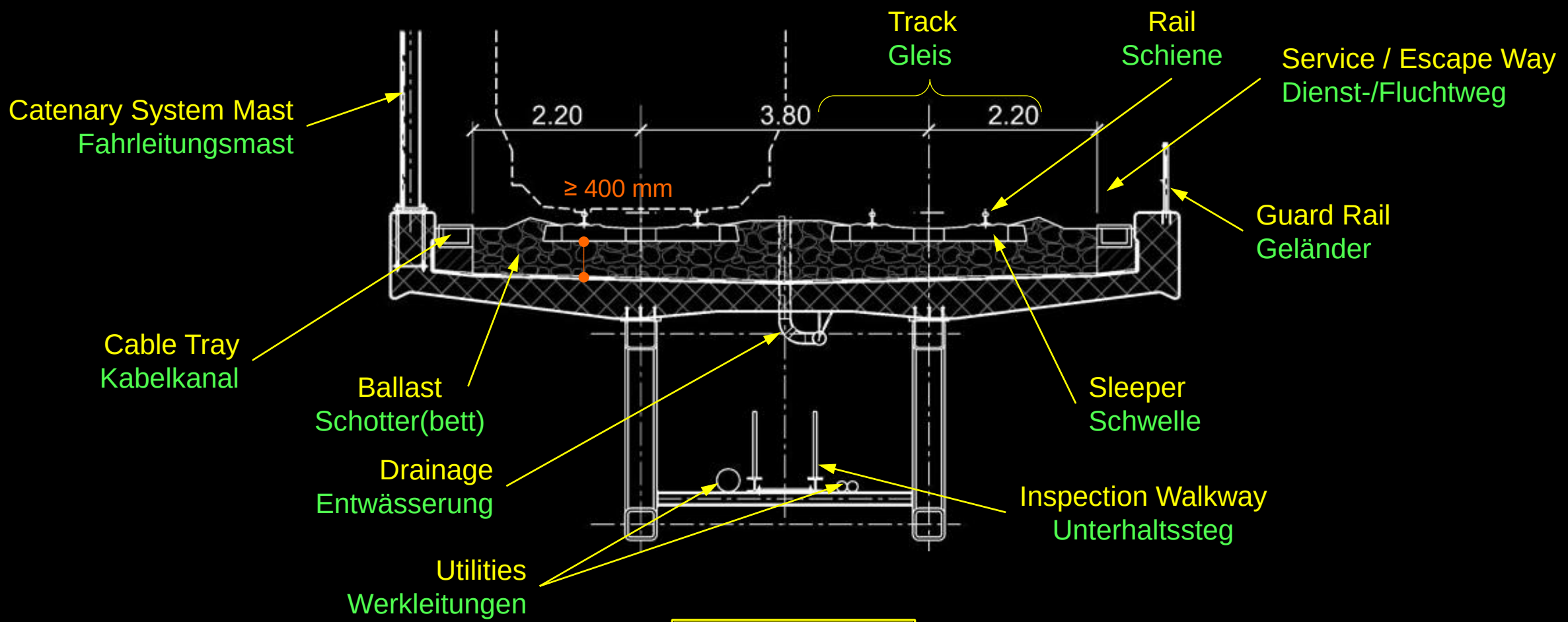


Roadway
Fahrbahn

(With Median Barrier)
(mit Mittelstreifen, Trennung durch Leitmauer)

General Characteristics - Nomenclature

Typical Girder Section



Railway
Eisen-(Bahn)

(Ballasted Track)
(mit Schotterbett)