# 4-Level Bridge K360F4

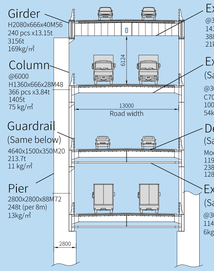
Steel consumption：477 kg/㎡

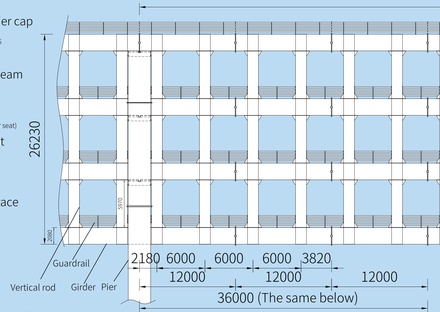
18,720㎡/span

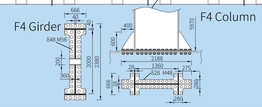
(Pavement projection area)

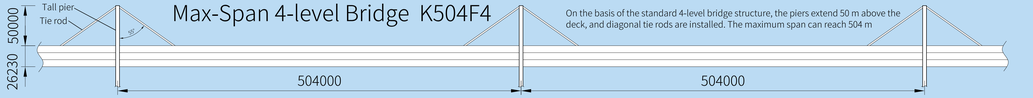
Total load：18,720㎡x1.7t=31,824t　Pier force 72,281 tf　Girder force 98,092 tf　Column force 1,255,746tf (3,431 tf/pc)

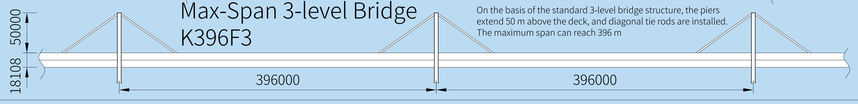
Total load breakdown：Steel consumption 476, Asphalt 336, Live load 900)



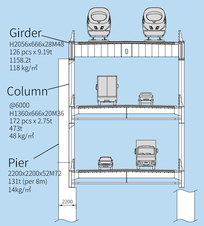

# 3-Level Bridge K252F3

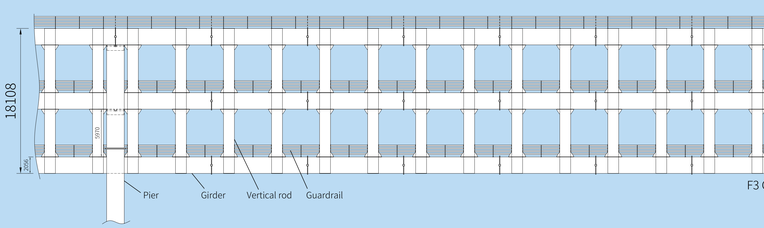
Steel consumption：401 kg/㎡

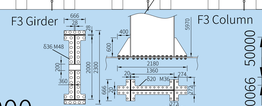
9,828㎡/span

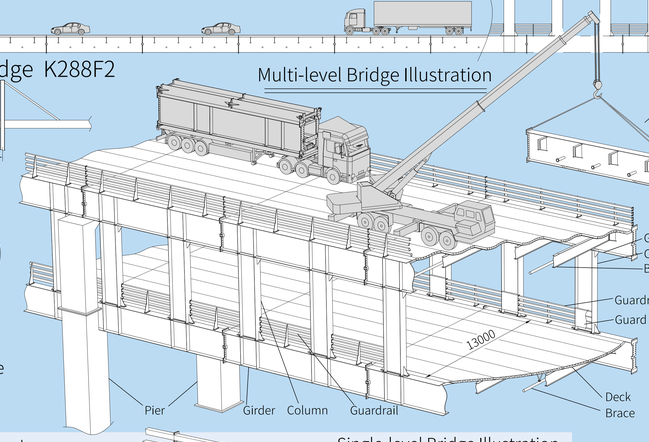
Total load：9828㎡x1.64t=16,118t　Pier force 41,104 tf　Girder force 51,492 tf

Column force 422,776tf (2,458 tf/pc)





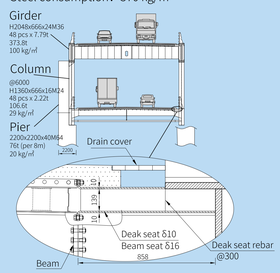

# 2-Level Bridge K144F2

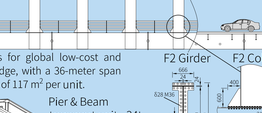
Steel consumption：370 kg/㎡

3,744㎡/span

Total load：3744㎡x1.6t=5,990t　Pier force 31,796 tf　Girder force 24,520 tf

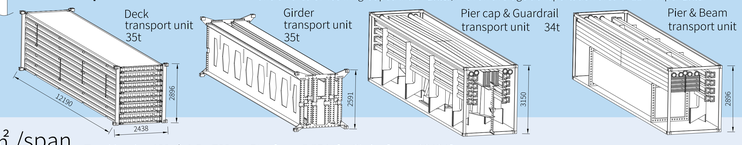
Column force 94,560tf (1,970 tf/pc)






## Transport Unit

All components are grouped into transport unit in 40-foot container sizes for global low-cost and barrier-free transportation. This diagram shows the transport unit for R13 Bridge, with a 36-meter span and an area of 468 $m^2$ grouped into 4 units, with an average transportation area of 117 $m^2$ per unit.




## The Benefits of Multi-level Bridge

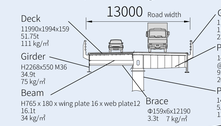
The cost of multi-level bridges is relatively high. However, due to their large spans, they are suitable for building bridges across rivers and seas. Compared with suspension bridges, they have much lower construction and maintenance costs, and are safer and have a longer lifespan.

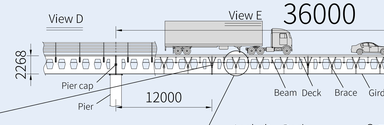


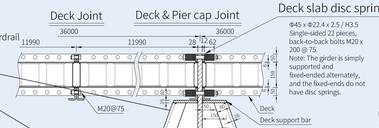

# Single-level Bridge R13 468㎡/span

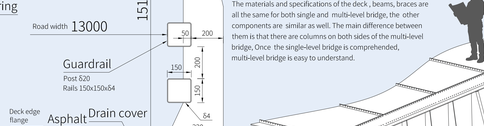
Steel consumption：283kg/㎡

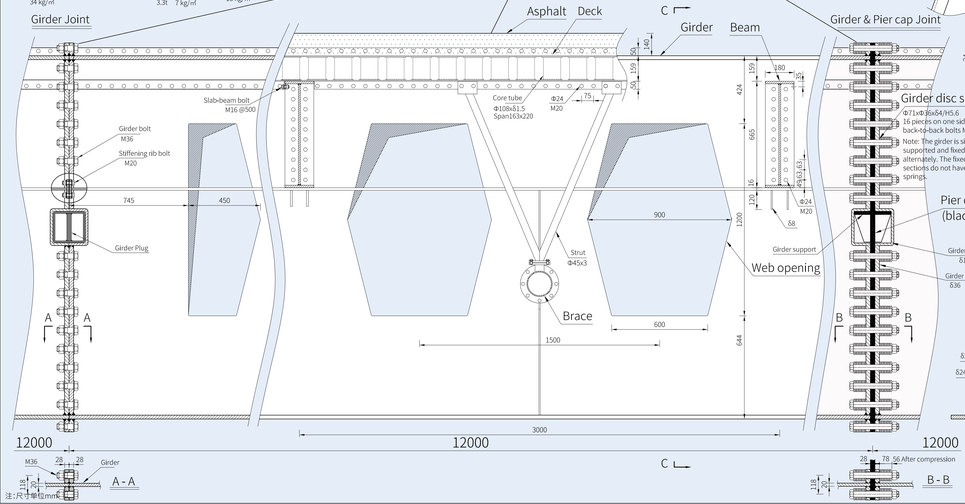
Total load：468㎡x1.5t=702t　Pier force 8,054 tf　Girder force 9840 tf



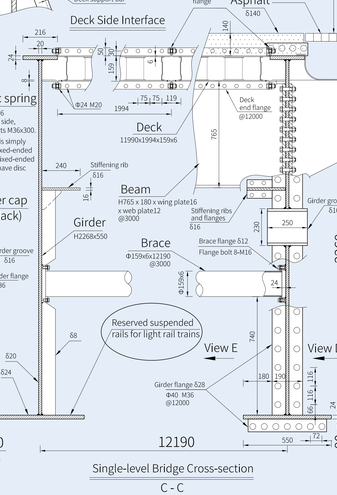



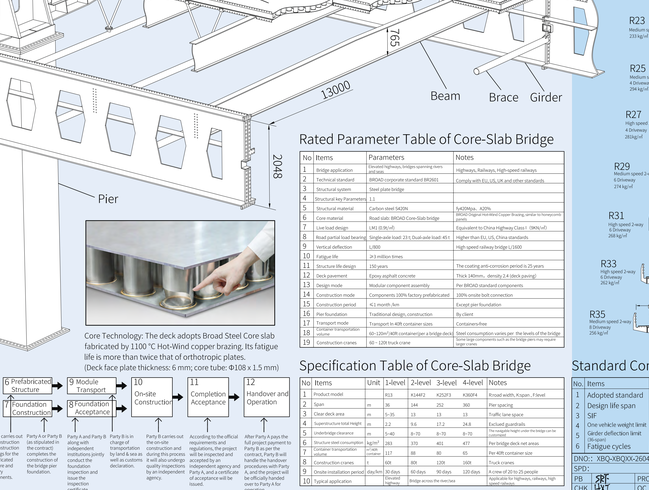










## The Difference Between Single-level Bridge and Multi-level Bridge

The materials and specifications of the deck , beams, braces are all the same for both single and multi-level bridge, the other components are similar as well. The main difference between them is that there are columns on both sides of the multi-level bridge, Once the single-level bridge is comprehended, multi-level bridge is easy to understand.

## Overview of BROAD Core-Slab Bridge

The Core-Slab bridge system is developed by BROAD through the concerted efforts of hundreds of people over nine years. It is a modular bridge system that can be combined with standard modules to construct various types of bridges and elevated roads across rivers and seas, capable of bearing extremely heavy vehicles and meeting the strict requirements of high-speed rail trains for ultra-low deflection. The core technologies are "BROAD Steel Core-Slab" and "Coupled Slab-Girder Brace-Pier System". The bridge components are 100% factory-prefabricated and transported in container sizes, and on-site construction only requires bolt assembly. A single construction team can deliver one kilometer of bridge in a month.

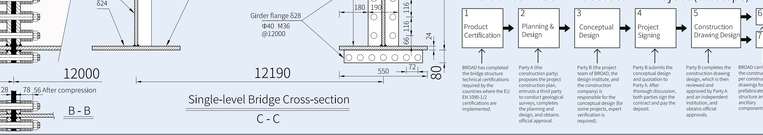
The "Coupled Slab-Girder Brace-Pier System" bridge will completely solve the "three highs and one low" (High design cost, High construction cost, High quality risk, Low construction efficiency) problem that has plagued the global steel structure bridge industry for over a hundred years, and will alleviate various traffic congestion issues worldwide. For example, using a construction method that does not interfere with normal traffic, such as night-time construction in London, to build an elevated road, allowing this most prosperous city in the world to bid farewell to 60 years of congestion; using a multi-span bridge system with a large span and multiple levels that is three times cheaper than suspension bridges, three new bridges have been built over the Burigansga River in Dhaka, Bangladesh, completely freeing the 20-million-person city from its dependence on ferries and avoiding more than 30 capsizing accidents each year.




Core Technology: The deck adopts Broad Steel Core slab fabricated by 1100 °C Hot-Wind copper brazing, Its fatigue life is more than twice that of orthotropic plates.

(Deck face plate thickness: 6 mm; core tube: Φ108 x 1.5 mm)

## The Construction Processes of Project (12 steps)




BROAD has completed the bridge structure technical certifications required by the countries where the EU EN 1090-1/2 certifications are implemented.

Party A (the construction party) proposes the project construction plan, entrusts a third party to conduct geological and topographic surveys, the planning and design, and obtains official approval.

Party B (the project team of BROAD, the design institute, and the construction company) is responsible for the preliminary design for the some projects, expert verification is required).

BROAD carries out the construction pre-construction drawings for the prefabricated structure and ancillary components.

Party A or Party B (as stipulated in the contract) completes the construction of the bridge pier foundation.

Party A and Party B along with independent institutions jointly conduct the foundation acceptance and issue the inspection certificate.

Party B is in charge of transportation by land & sea as well as customs declaration.

Party B carries out the on-site construction and during this process it will also undergo quality inspections by an independent agency.

According to the official requirements and regulations, the project will be inspected and accepted by an independent agency and Party A, and a certificate of handover will be issued.

After Party A pays the full project payment to Party B as per the contract, Party B will handle the handover procedures with Party A. The bridge will then be officially handed over to Party A for operation.

## Rated Parameter Table of Core-Slab Bridge

| No. | Items | Parameters | Notes |
|---|---|---|---|
| 1 | Bridge application | Elevated highways, bridges spanning rivers and seas | Highways, Railways, High-speed railways |
| 2 | Technical standard | BROAD corporate standard BR2601 | Comply with EU, US, UK and other standards |
| 3 | Structural system | Steel plate bridge | |
| 4 | Structural key Parameters | L / H | |
| 5 | Structural material | Carbon steel S420N | fy420Mpa、420Pa |
| 6 | Core material | Road slab: BROAD Core-Slab bridge | BROAD Original Hot-Wind Copper Brazing, similar to Honeycomb |
| 7 | Live load design | LM1 (0.9Load) | Equivalent to China Highway Class I（90kN/㎡） |
| 8 | Road portal load bearing | Single-axle load: 2 t; Dual-axle load: 4T t | Higher than EU, US, China standards |
| 9 | Vertical deflection | L/800 | High-speed railway bridge:L/1600 |
| 10 | Fatigue life | 3×3 million times | |
| 11 | Structure life design | 150 years | The coating anti-corrosion period is 25 years |
| 12 | Deck pavement | Epoxy asphalt concrete | Thick-140mm, density 2.4 t/deck-paving) |
| 13 | Design mode | Modular component assembly | Per BROAD standard components |
| 14 | Construction mode | Components 100% factory prefabricated | 100% onsite bolt connection |
| 15 | Construction period | 4.1 month /km | Except pier foundation |
| 16 | Pier foundation | Traditional design, construction | By client |
| 17 | Transport mode | Transport in 40ft container sizes. | Containers-Free |
| 18 | Container transportation volume | 60~120m²/40ft container(per a bridge deck) | Steel consumption varies per the levels of the bridge. Some large components such as the bridge piers may require 2 or 3 sets. |
| 19 | Construction cranes | 60 ~ 120t truck crane | |

## Specification Table of Core-Slab Bridge

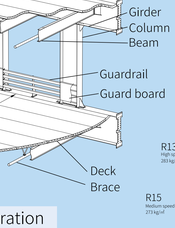
| No. | Items | Unit | 1-level | 2-level | 3-level | 4-level | Notes |
|---|---|---|---|---|---|---|---|
| 1 | Product model | | R13 | R144F2 | *2F3 | R36F4 | R road width, R span , F level |
| 2 | Span | m | 36 | 144 | 252 | 360 | Pier spacing |
| 3 | Clear deck area | m | 5~35 | 13 | 13 | 13 | Traffic lane space |
| 4 | Superstructure total Height | m | 2.2 | 9.6 | 17.2 | 24.8 | Excluded guardrails |
| 5 | Underbridge clearance | m | 5~40 | 8~70 | 8~70 | 8~70 | Determined by high-value the bridge can be connected |
| 6 | Structure steel consumption | kg/m² | 283 | 370 | 401 | 477 | Per bridge deck net areas |
| 7 | Container transportation volume | pcs/40ft container | 117 | 88 | 80 | 65 | Per 40ft container size |
| 8 | Construction cranes | t | 60 | 80 | 100 | 100 | Truck cranes |
| 9 | Onsite installation period | day/km | 30 days | 60 days | 90 days | 120 days | A crew of 20 to 25 people |
| 10 | Typical application | | Highway, railway | | | | Applicable for highways, railways, high-speed railways |

Note: All dim. are in mm.

## Overview of On-site Installation

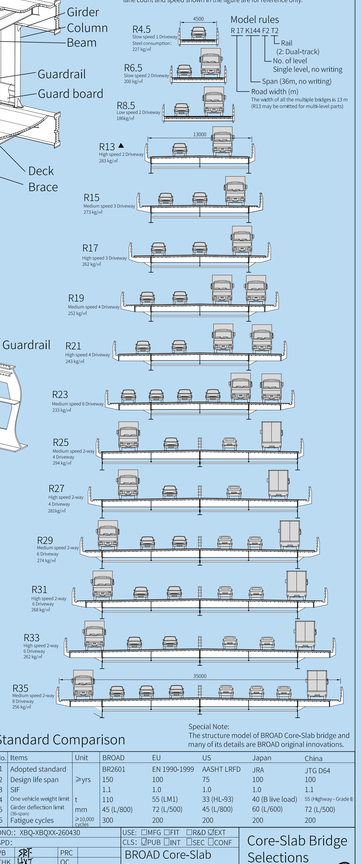
The on-site installation of the Core-Slab bridge is extremely simple:

1. Prepare the reinforced concrete foundation for the bridge piers in advance;
2. All components are transported to the site in 40-foot container sizes;
3. Use the newly completed bridge deck as a construction access road;
4. Use crane truck for installation;
5. All components are bole-connected;
6. Finish pavemene surface.



## Bridge Width Selection

Note: Due to differences in traffic regulations across countries, the definitions of lane count and speed shown in the figure are for reference only.




## Standard Comparison

| No. | Items | Unit | BROAD | EU | US | Japan | China |
|---|---|---|---|---|---|---|---|
| 1 | Adopted standard | | BR2601 | EN 1990-1999 | AASHT LRFD | JRA | JTG D64 |
| 2 | Design life span | 2yrs | 150 | 100 | 75 | 100 | 100 |
| 3 | SIF | | 1.1 | 1.0 | 1.0 | 1.0 | 1.1 |
| 4 | One vehicle weight limit | t | 110 | 55 (LM1) | 33 (HL-93) | 40 (B live load) | 55 (Highway - Grade I) |
| 5 | Girder deflection limit (Max span) | mm | 45 (L/800) | 72 (L/500) | 45 (L/800) | 60 (L/600) | 72 (L/500) |
| 6 | Fatigue cycles | >10,000 times | 300 | 200 | 200 | 200 | 200 |

Special Note:
The structure model of BROAD Core-Slab bridge and many of its details are BROAD original innovations.

DNO.: XBQ-XBQXX-260430

SPD:

| | | | |
|---|---|---|---|
| PB | | PRC | |
| CHK | | QC | |
| APV | | DAT | 26.04.30 |

USE: □MFG □FIT □R&D □EXT
CLS: □PUB □INT □SEC □CONF

BROAD Core-Slab Bridge

# Core-Slab Bridge Selections

V.6.0