InQuikRail

Product Catalogue



Rail bridge construction system

Innovative Modular Bridge System

Accelerated Bridge Construction Award

Resilient Monolithic Structures

InQuik®
accelerated construction



We developed the InQuik bridge to keep communities connected, and we're so proud to be delivering robust and resilient bridges to regional areas across the country, which will serve the residents for the next 100 years or more.

Ben Mullaney,
CEO of InQuik.

Awards

- Winner of the Excellence in Innovation Award
Austroads Bridge Conference 2022

- Winner International Accelerated Bridge Construction (ABC) Conference 2021
Most Innovative ABC Bridge System

- Finalist in Sir William Hudson Award 2020
Australian Engineering Excellence Awards

- Winner Association of Iron & Steel Technology (AIST) 2019
TC Graham Prize for Innovation

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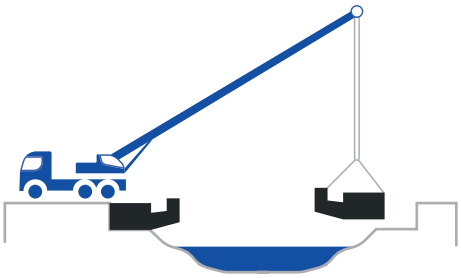
InQuik®

The InQuik Bridge

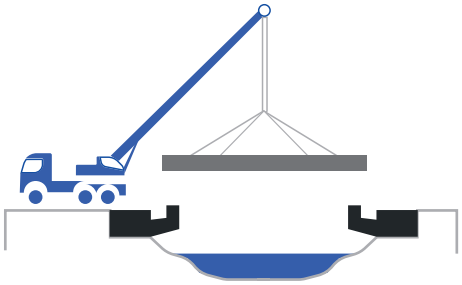
The InQuik® bridge is a semi-modular system, where the integrated steel formwork and reinforcing components are prefabricated off-site, then completed when concrete is poured on-site to form a single homogeneous mass.

The bridge panels are self-supporting, and the formwork is aesthetic and sacrificial, so beneath the steel form is a conventional in-situ poured reinforced concrete bridge, with all the benefits that provides. The InQuik product range includes abutments, wing walls, headstocks, blade piers and deck panels.

Installation process for an InQuik bridge:



Place abutments and concrete



Place decks



Deck concrete



Bridge complete

Key Attributes

- No temporary formwork support is needed.
- Bridge construction occurs from above, with minimal need to work under the bridge, improving worker safety and reducing environmental impact.
- The semi-modular deck panels are placed side by side to give the desired bridge width, and then concrete is poured to create a homogeneous slab.
- Can create multi-span bridge structures with pier/headstock components.
- The InQuik bridge structure is designed for a minimum 100-year service life.
- InQuik abutments, wing walls, headstocks and blade piers are constructed using a similar semi-modular method as the deck.
- Single-span lengths up to 15m, with engineering certified by SMEC Australia to the Australian Standards, AS5100 (2017) Bridge Design requirements.
- Reduced long-term maintenance requirements when compared to precast structures through eliminating longitudinal deck joints, and the integral design also removes tie-downs and bearings.

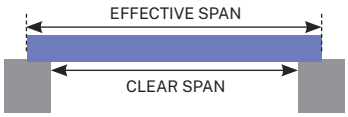


Bridge Configurations

The InQuik Rail Bridge has been designed for single track of 300LA loading in accordance with AS5100.

All structural elements designed comply with the below listed Australian Standards:

- AS 5100.2
- AS 5100.5
- AS 3600 (fatigue requirements for welded reinforcement)

Description	Width	Max. Span Length	Configuration
Single Span Integral Bridge	Internal 3.7m External 4.1m	Effective Span 15.4m Clear Span 14.2m	
Multiple span Integral Bridge		Effective Span 15.4m Max. Integral Length 60m	
Single Span Semi-Integral Bridge		Effective Span 13.2m Clear Span 12.0m	
Multiple Span Semi-Integral Bridge		Effective Span 13.2m Max Integral Length Between Joints 40m	
Simply Supported Bridge		Effective Span 11.85m Clear Span 10.65m	

All Rail Bridges have a deck depth of 1020mm.

It is the responsibility of the site-specific designer to validate and satisfy the design parameters for each specific site condition.

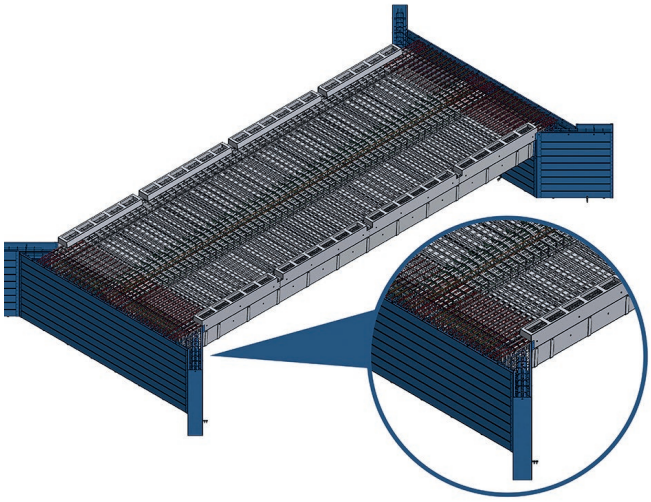
- Exposure Classification B1 and B2 - Minimum 28-day concrete strength 40MPa



InQuik Integral Bridge

Though the InQuik system can be simply supported on bearings, a major benefit of pouring the concrete fully on-site is that it allows the construction of a fully integral bridge, where the bridge deck and top of the abutments are cast at the same time to make an integrated concrete structure. This results in a very strong and stable structure, providing greater damage resistance to flooding and earthquake events, and eliminates the need for bearings and tie-downs (and the associated long-term maintenance requirements).

For an integral bridge, the formwork is removed from the abutment backwall rebate, and the end beams of the deck panels. On-site, additional tie-bars are placed to connect the decks and the abutments.



Design for a single-lane InQuik integral bridge, showing deck-abutment tie-bar detail.

InQuik Features and Benefits

Pre-engineered, pre-certified, pre-fabricated	Simple and fast on-site installation
No bearings, tie-downs, or joints	No long-term structural maintenance over 100-year design life
Pre-fabricated components with concrete poured on-site	Reduced WHS risk, reduced trades, reduced installation time on-site
Lightweight components	Reduced WHS risk, small local cranage, ease of transportation
No joints in structure	No joints to allow salt and water ingress
Self-supporting modular structure	No temporary supports required
Faster, simpler, safer with no maintenance	No temporary supports required

Formwork Cladding Material

The deck formwork is a permanent fixture and remains in place, providing a protective barrier for the concrete against corrosive influences from the environment that can cause concrete degradation.

There are three options for the deck formwork cladding: Weathering Steel, Magnelis®, and Stainless Steel, which each have different corrosion behaviour.

The most suitable cladding component would be selected based on its corrosion performance in each bridges' specific environment. Other materials would require a special order.

If necessary for inspection requirements, the formwork of the deck beams can be removed. However, we strongly recommend that it remains in place, due to the long-term protective benefits that it provides to the concrete beneath.





MAGNELIS® (STANDARD FOR INQUIK)

Magnelis® is a proprietary product which is steel coated with an alloy of zinc, aluminium, and magnesium. This coating has been shown to have far superior corrosion resistance properties to zinc galvanised steel, particularly in salty environments. Due to the high corrosion resistance, less material is needed to coat the steel, and it achieves a superior result. In a marine environment, the coating loses ~0.3 µm/year in thickness. Magnelis® is the only metallic coating product certified for use in a C5 environment.

BLUESCOPE REDCOR® WEATHERING STEEL

REDCOR® weathering steel is a high strength formwork cladding material that develops a stable oxide layer on the surface of the steel, known as the 'patina'. When used in the appropriate environment, the patina enhances the corrosion resistance of the steel compared to conventional uncoated steels, effectively 'weathering' the steel in a natural way. Once fully formed and weathered the appearance is usually dark brown to a purple colour that nicely blends with the environment. Weathering steel has been used since the 1930s in railway coal wagons, bridges, facades, and many architectural features such as sculptures and landscaping. When designed and detailed correctly, considering the environmental factors that govern its use, it has exhibited enhanced corrosion resistance. This means REDCOR® weathering steel formwork cladding may be used without the need for protective coating systems, significantly reducing both initial fabrication and ongoing lifetime maintenance costs.

STAINLESS STEEL

For bridge projects where aesthetics is important in the long-term, and/or the bridge is to be constructed in a highly corrosive environment (e.g., tropical, industrial, etc.), stainless steel cladding can be used, which has extreme resistance to corrosion. For 316 grade stainless steel, the estimated time for pitting to penetrate 1mm is 260 years in a marine environment (the steel cladding is 3mm thick), implying the formwork is likely to outlast the bridge structure.

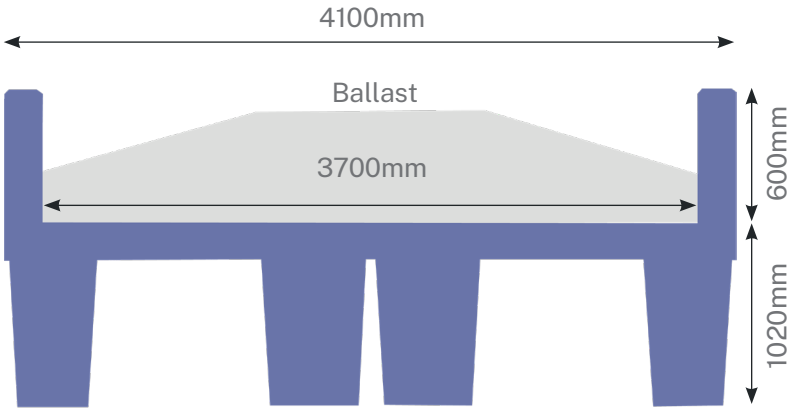
Kerb and Barrier Options

Standard InQuik bridges have a Ballast Kerb which has been designed to retain the ballast from falling off the edge of bridge once the rail line is installed. The Ballast Kerb Is 600mm high with a width of 200mm.

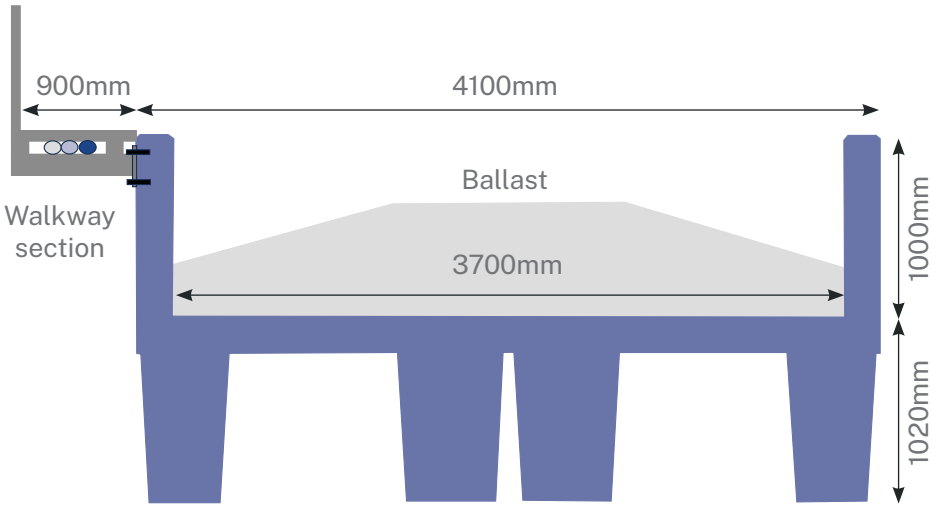
InQuik also offers the option of a Derailment Kerb which is designed to retain a derailed vehicle on the bridge near the running rails. The Derailment Kerb is 1000mm high with a width of 200mm.

A walkway can be attached to the kerb as required. The walkway is 900mm wide and attached to the side of the kerb. Services can be carried under or attached to the walkway if required.

Rail Bridge with Ballast Kerb



Rail Bridge with Derailment Kerb



Deck Panels

A standard single track InQuik Rail Bridge comprises two standard InQuik deck panels each 2070mm wide with a 40mm overlap between the deck panel forms to allow for construction tolerance during placement. The overall deck width is 4100mm, with inner kerb to inner kerb being 3700mm.

The top deck section is 200mm deep, and the deck formwork between beams in a deck panel is a corrugated steel form of 40mm depth, leaving the minimum concrete thickness as 200mm.

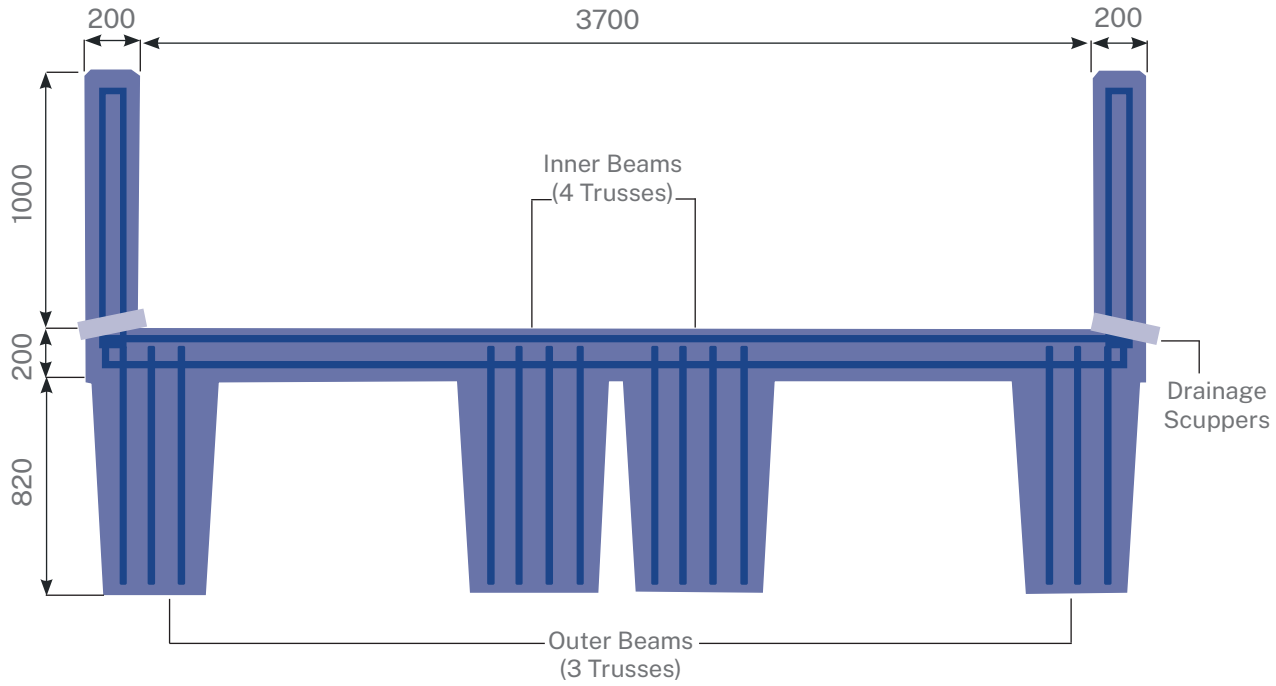
Each panel comprises an inner beam and an outer beam as shown below, with an overall depth of 1020mm. Each outer beam is provided with a 1000mm high derailment kerb, or 600mm high ballast kerb as required by the authority.

Each beam of the deck panel comprises a number of welded trusses. The outer beam has 3 trusses while the inner beam has 4 trusses.

When the concrete is poured on-site, the trusses in the beam carry all the construction loads before the concrete has hardened. Once the concrete hardens, the steel formwork is no longer required and is considered a sacrificial element, though it is typically left as a protective barrier for the concrete.

Once the deck panel concrete has achieved its design strength, the ballast kerbs can be poured.

Drainage scuppers can be installed at the base of the kerbs to allow rainwater to drain from the structure.



Abutments and Wingwall

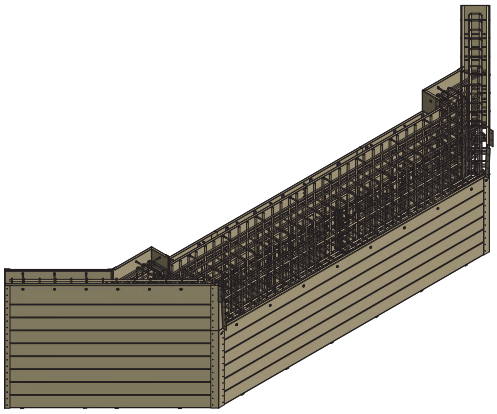
InQuik abutments and wingwalls have standard configurations.

The abutments are 1200mm thick and 4100mm long (to suit the width of the deck).

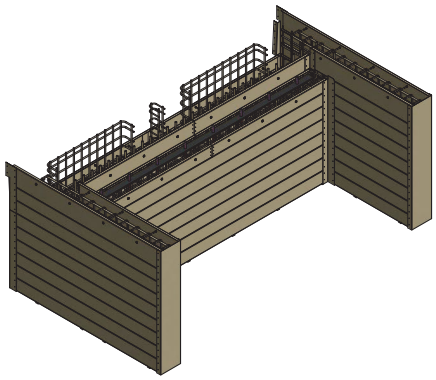
The maximum pile diameter is 900mm to suit the 1200mm thick abutment. A maximum of 2 piles at 2.4m spacing can be provided at each abutment within the abutment length.

The wingwalls are 350mm thick. They can be provided at either 45^{0} or 90^{0} angles to the abutment. The 90^{0} wing walls have kerbs incorporated into their design.

They are rectangular panels, and have lengths of 1.8 or 2.7m measured from the deck face of the abutment.



45^{0} wingwall



90^{0} wingwall.

FOUNDATIONS

- Foundation conditions (size and number of piles, soil springs and length of the piles) are site specific and would need to be confirmed by the site-specific consultant when soil conditions are known.

Multi-Span Bridges and Structures

In addition to single-span bridges, the InQuik system can be used for multi-span bridges.

InQuik has developed its own headstock design to complement the Rail Bridge structure, which is similar in construction to the abutment design.

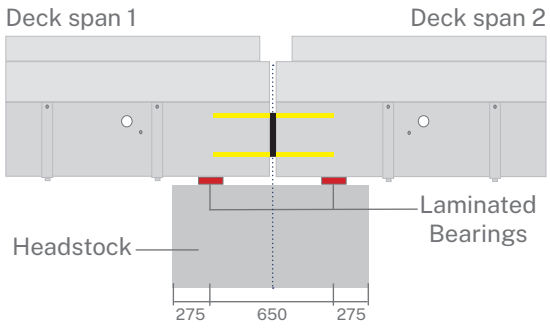
InQuik Rail Bridge headstocks can be ordered as Multi-span Fully Integral design, or a Multi-span Semi Integral design, with either a fully integral connection, or a simply supported articulation on the piers.

For the integral headstock design, rebar connectors are positioned between the headstock and the deck panels and tied into placed before the concrete for the deck panels is poured, providing a linkage and load transfer path once the concrete is poured and cured.

For simply supporting headstocks, the decks can be tied down to the headstocks using brackets. Laminated bearings are generally used for the headstock shelf, as well as buffer bearings for the downstream side of the bridge. Through-bolts to tie together adjacent spans are also typically used to help transfer loads between the spans.

All simply supported decks have a 120mm gap under the end beam, so that a jack may be used to lift the deck for bearing replacement in the future.

The elastomeric bearing pads are restrained in position via keeper plates attached to the abutment or headstock.



Laminated Bearing Pads location



Road Bridge Headstock with Bearing Pads

Simply Supported Articulation

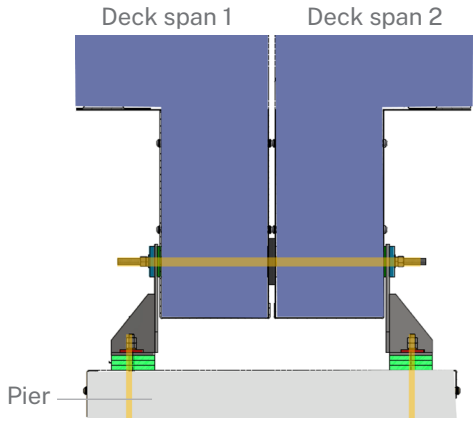
The simply supported structure relies on tie-downs and brackets to make the connection and requires bearing pads between the deck and the headstock to transfer the loads.

Tie-down brackets are used to connect the deck panels to the headstock and are designed to resist vertical loads from floodwaters (to prevent uplift).

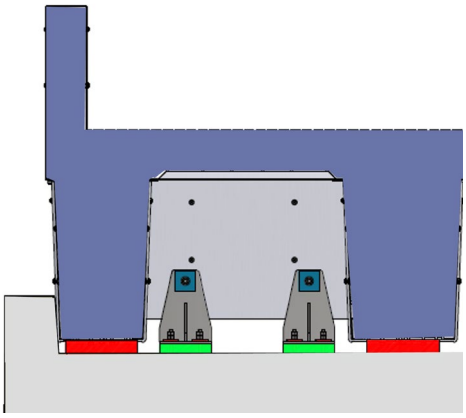
They can be included for simply supported ends of deck panels (this is not required for integral bridges). The details of hold down bolts numbers and sizes are dependent on site-specific factors such as the flood loads and shall be checked by the site-specific designer for each bridge. These are only required where a bridge has a risk of experiencing significant flood loads.

Lateral restraint blocks are also provided on the outside of the outer beams. The size and reinforcement of these elements are as per the standard InQuik bridges. All InQuik bridge joints are sealed with suitable bridge joint material.

In addition to vertical tie-down brackets, InQuik also offer a lateral restraint bracket if required due to heavy flood loads. This bracket is bolted into the headstock next to the intersection of the two deck spans (thus resisting lateral movement for both spans at once).



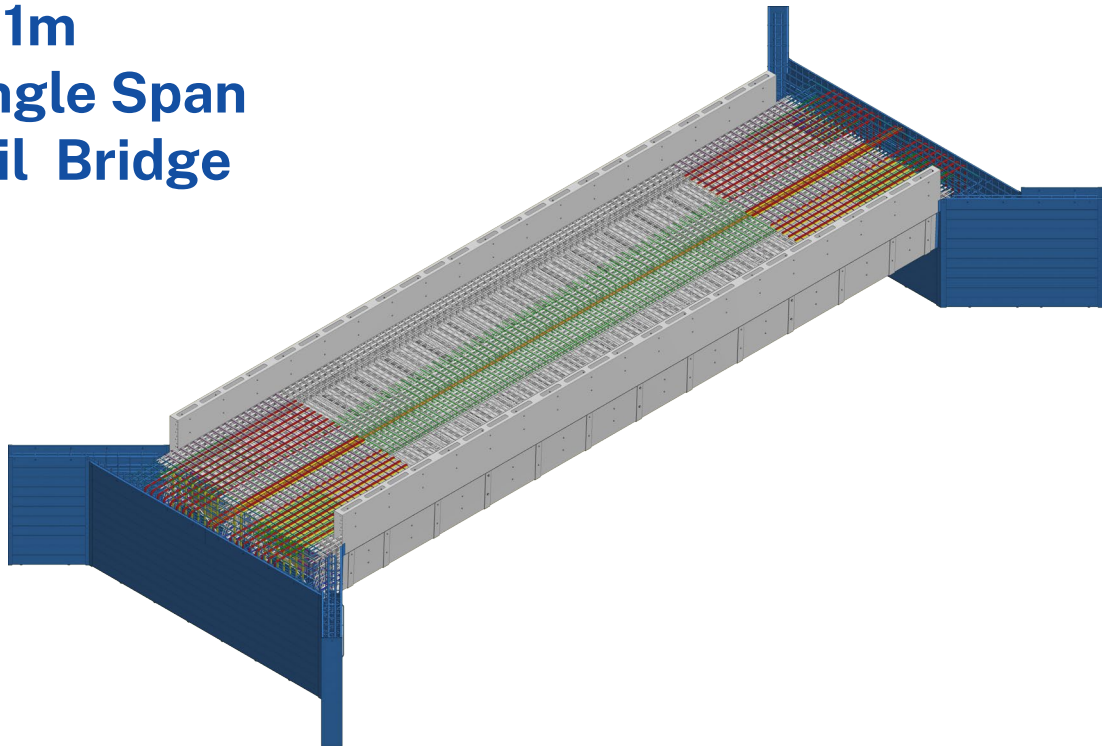
Tie Down Brackets (Side view)



Tie Down Brackets (Front view)

Sample Order

15.1m Single Span Rail Bridge



This single span bridge has a 300LA loading in accordance with AS5100 (2017) and uses 2 × 2.07m-wide deck panels to give a total deck width of 4.1m. The abutments are 1.2m high with a 1.02m rebate.

QTY	INQUIK COMPONENTS	TOTAL MASS (t)	CONCRETE (m^3)
2	15.1 × 2.07m Magnelis 300LA Rated Rail deck panel	19.2	32
2	Single Track Abutment (4.1 × 1.2m) + 45° 2.7m wing wall set	5.8	38
1	Deck-abutment integration tie-bar set	2.2	
	TOTAL	27.2	70

Typical InQuik Bridge Timeline

Client	InQuik
Design Basis report - project scope Design will typically require Geotechnical report, flood study, traffic volume data, survey detail and environmental impact report. Global bridge design details the bridge foundation and scour protection required. REF - Review of Environmental Factors - Safety in Design assessment Ensure all necessary Council and DPI Fisheries approvals have been submitted and approval time-frame known.	
	Quote sent to customer
Global Design/Structural Plans	
Accept quote, give purchase order	
	Send sales contract and deposit (50%) invoice
Sign contract, pay deposit	Counter-sign contract, initiate production
Arrange site preparation works (earthmoving, foundations, etc.)	
	Liaise with customer for estimated delivery date
Abutments/wing walls/headstocks installed, and concrete poured	Abutments/wing walls delivered
Deck panels installed	Deck panels delivered Final invoice sent
Deck concrete pour	
Kerb concrete pour	
Install ballast, sleepers, rail and walkway	
Unrestricted traffic after deck concrete reaches design strength (usually 40MPa) (**~28 days after concrete pour**)	
	Upon project completion, supply Material Data Records (MDR)

InQuik®

accelerated construction

InQuik® bridges have exceptional resilience to impacts caused by severe weather events and requires minimal to no structural maintenance over its 100-year design. We have manufactured and delivered over 200 bridges across Australia, Paci ic and USA. We provide environmentally friendly long-lasting solutions for communities, and enable the use of local resources, on-site labour, plant, and materials.

InQuik®

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