

N22BBM S24 Coolyhanne Overbridge

S24 Coolyhanne Overbridge is a 3-span overbridge, carrying the L-7480 Coolyhanne Local Road, which crosses over the new N22 mainline. This structure is significant as is the first structure on the project to be open for public use.

The bridge is 13m wide, with an overall length of 60m. The main span of the structure is over 25m in length, with side spans of just over 10m. On this scheme, it is considered to be a mid-sized structure.

The Design Speed for traffic crossing the structure is 60kph

Overview

It was important that this particular bridge be constructed as early as possible in the scheme for a number of reasons. Specifically, to remove the public interface with the main works, to minimise the inconvenience caused to the locals, and also to allow the contractor remove the fill in this area, which enables more works to be completed off line on other sections.

Work commenced on the structure in July 2020 with the construction of a temporary diversion road to maintain local access. This ensured that access on the local road was not restricted, with the result that to our neighbours were spared from significant disruption during the construction phase. A significant number of houses are located in the immediate vicinity of the bridge and due consideration had to be given to how construction was to be managed, without giving rise to significant impact on these residents. Late working was restricted and, where possible, low-noise machinery was used to minimise noise disruption. The use of tower lights was minimised and dust suppression mechanisms were put in place, with stringent monitoring of same by the contractor's environmental team. Some out of hours and extended working times were required during delivery and installation of the precast beams and our PRO kept the local residents informed of same. We are grateful for the cooperation we received from these residents while the construction works were underway at Coolyhanne and would, once again, like to express our thanks for their understanding during this phase of the works.

The temporary diversion road was completed in early July 2020, the existing local road was rerouted and the mass excavation commenced in mid-July, with the bridge opening to public traffic at the end of April 2021.

The superstructure is supported on reinforced concrete bank seat abutments at each end and supported on reinforced concrete columns, crosshead and diaphragm at the intermediate supports' location. The pier columns are supported on 2 reinforced concrete bases.

The superstructure consists of 3 spans, each with five precast prestressed W9 beams, with an in-situ reinforced concrete deck slab, cast on permanent formwork. The reinforced concrete abutment bank seats are aligned parallel to the N22 mainline with the Local Road passing over the N22 at a skew angle of 12.5 degrees.

Because of the span and skew, the structure is fully integral, which avoids the requirement for bearings in the bridge. This results in lower maintenance costs over the life time of the bridge



Beam Lift



Beams being placed (looking west)

Design

The structure is designed with the standard permanent loadings in accordance with IS EN 1990-1-1:2002, with snow, wind and thermal actions as well as abnormal, accidental or crowd loads all taken into account during the design process. The design was carried out by Barry Transportation. The intended life span of this bridge is 120 years.

The parapet has a galvanised structural steelwork vehicle restraint system, bolted directly onto the parapet upstand, with suitable transition systems on the approach and departure.

Spray applied waterproofing was applied to the deck slab and all buried surfaces have received 2 coats of epoxy resin waterproofing to protect the buried faces and ensure the durability of the structure during its anticipated lifespan.

There are 3 runs of continuous drainage kerbing system along the full length on the bridge, to collect surface water. This drainage, with additional subsurface and back-of-wall drainage, connects to the road drainage network running along the mainline.



Beam Installation



All beams in place.

Construction

The 2 lower pier bases were constructed first, each with 3 columns of 900mm diameter, on which the main crossheads sit, which in turn support the longer beams.

After completion of these, we focused on the abutment walls at the end of each span.

The crossheads at the top of the columns, hold beams on both the short and main span.

As with many of the structures on the project, we chose a W9 precast concrete beam to span between the abutments and crossheads. There are 15 beams in total on this structure. Prior to delivery, the beams were inspected by our Quality Manager, to ensure the beams are acceptable for use. Thorough checks were completed to ensure the beams were in compliance with all the relevant design criteria. Concrete tests were completed on each beam to ensure the concrete had gained the required design strength.

The shorter 10m beams on both ends each weigh approximately 18 tons, with the longer beams weighing just under 50tons each. These were manufactured by Banagher Precast Concrete Ltd. in Co Offaly. The shorter beams were transported using standard delivery methods, with the longer beams being delivered in convoy overnight, in collaboration with a number of County Councils, Cork City Council, the Garda Authorities, TII and the management team of the Jack Lynch Tunnel, under special abnormal load escort to minimise disruption to traffic. This was organised by Whitten Transport, in collaboration with the contractor.

The shorter beams were pre-delivered to allow the site team fix access brackets and walkways to the external beams, which allowed safe access and work platforms for the construction crews.

A 750-tonne mobile crane was used to install the beams. The planning and installation were managed and delivered safely by the contractor's management team. All 15 beams were installed over 2 days in October 2020.



Preparing for the Deck Slab



Vehicular parapet construction

Following installation of the beams, the abutment and pier diaphragms were poured, tying the entire structure together. The next critical element of works was the pouring of the concrete deck. This was completed on the 15th Dec 2020, using a 60m concrete pump, with over 200m³ of concrete placed in 1 day.

After completion of the concrete deck, we moved on to work on the in-situ concrete parapets and the separation barrier which runs the entire length of the structure. Over 750m³ of concrete was used in the construction of this structure, with over 160 tonnes of steel reinforcement.

This was followed by the waterproofing element, which requires a spray applied waterproofing on the deck, protected by a layer of sand asphalt. This ensures that rainwater does not permeate into the main structure and ensures that it is protected for its lifespan.

Kerbing, asphalt, services and footpath were laid along with drainage and associated chambers and manholes. The vehicular barrier system was installed on the structure and extending onto the existing road. The new road surface was tied in to the existing road at either end of the structure, to ensure there was a seamless transition for road users from the existing road, over the structure and onto the existing local road on the opposite end. Surfacing was completed on 20th April & the road was opened to public traffic on the 21st following an independent Road Safety Audit.

The bulk of the work was carried out by the contractor's site team, which allowed us manage and resource the works and programme, to ensure it was delivered on time. The contractor's carpenters and steel fixers completed the main reinforced concrete works. The contractor's management team and appointed person for lifting operations organised and safely delivered installation of the precast beams. Our groundwork team completed the tie-ins, drainage and services with specialist contractors brought to site to complete waterproofing, safety barrier, and asphaltting. There were over 80 separate people involved in the construction from design to completion.



Separation Barrier and completion works



Main Works Complete

Constraints and Challenges

One of the main challenges in delivering this structure, and indeed the project as a whole, has been the Covid-19 pandemic. Works were suspended for a period of 6 weeks from early 2021 in accordance with Government guidance. Construction, by its nature, requires groups working in close proximity for extended periods. Management on site ensured we had necessary protocols in place with standard operating procedures for the construction team with extra welfare, strict adherence to social distancing and PPE as necessary. It is a testament to the crew that, as works continued on this critical piece of infrastructure, we experienced no confirmed case of Covid 19 for the entire duration of works.

Another challenge was the weather, particularly on the day of installation of the beams, when the lifting process, which is particularly susceptible to high winds, had to be suspended for a time due to the wind speeds. As always, safety took precedence, and after a few hours we were able to resume works. When pouring concrete during the winter we had to monitor temperatures and construction industry standard procedures were put in place to ensure the concrete was placed and cured correctly under the appropriate conditions.

Brexit has also had an effect on delivery of the structure, with specialist items such as the drainage kerbs and vehicular barrier delayed in production and delivery to site. These delays were minimised by predelivery, planning in advance and having back up materials and supplier in reserve to use as necessary so as to ensure that this section of the works was completed efficiently.



Reinforced Concrete Works Complete – View from the new N22 mainline.

Summary

S24 Coolyhan Overbridge was the first structure of the new N22 Baile Bhuirne to Macroom Road Development to open to general traffic. Construction of the structure took over 18,000-man hours to complete, with no lost time due to accidents or incidents related to the works. This was achieved due to the safety culture instilled in the team, with the health and safety of the team themselves, their co-workers, and members of the public, a key focus at all times.

The contractor was pleased that the structure was completed in 32 working weeks, thereby ensuring that it did not delay other aspects of the project or have an adverse effect on the overall project programme

The construction team continue to make progress on various structures, culverts, accommodation passes, and the mass cut and fill; earthworks operations, with a targeted completion date for opening of the entire project of Q4 2023.



Completed Works

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