Network Rail

ITT 8611 – SBA2 Timber Structures Urgent Works

Cottage viaduct urgent works

Methodology

ELR: SBA2 80m 19ch

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Contents

2.1.1	Technical Submission and Methodology

1 COVID -19 Consideration

In producing our methodology and program, we have considered and made specific arrangements for managing the effect of the Coronavirus (COVID -19) and complying with NR/L2/MTC/CP008 - Delivering On-Site Works during COVID-19 Response and NR/L3/MTC/CP009 - Coronavirus COVID-19 Safe Working Practices.

We have assessed the cost of implementing COVID-19 measures and have included this cost in the pricing document as a provisional sum item. Griffiths will work collaboratively with Network Rail to ensure the safety of all project staff, site operatives and specialist subcontractors in delivering Cottage safely and to agreed program and cost.

We have carried out a thorough review of the scope of work and activities for Cottage Viaduct Repairs and assessed that most of the works can be carried out without any additional intervention. To minimise the risk of COVID-19 we have considered social distancing controls for activities, such as, travel to site, site briefings and messing. Our Methodology and program limits the number of operatives, subcontractors, supervision and management staff on site at any one time.

The site set up has been extended to include additional canteen and drying room facilities to maintain the COVID-19 restrictions. Additional parking will be required to allow for increased vehicle use. Briefings and breaks will be staggered to allow maintenance of 2m separation, with briefings carried out outside where possible. Where operatives have to be within 2m to carry out certain tasks this will be subject to a specific risk assessment and include appropriate RPE and PPE as required

2 Introduction

Alun Griffiths (contractors.) are committed to safety, sustainability, social responsibility and engineering excellence. During this tender submission and preparation, the team have developed a robust construction methodology that focuses on the safety of the team, not putting public and passengers at risk and ultimately putting them first.

Our plan will consider the safety and wellbeing of all working on the structure, and the people who live and work in the area.

As always rail passengers come first and because of this we will be carrying out as much preparatory work as possible while passenger trains are still running as not to cause disruption. The main blockade, consisting of a -> 54 hr possession of the line in week 47 (2021), this is where the main structural elements of the works will be completed.

The viaduct spans across the river Einion over 4 spans supported by 5 trestles: 2 at abutments and 3 intermediates. Each abutment trestle is packed in stone and comprises of 4No. piles with a crosshead over, two diagonal bracings only on one side of the trestle and two low level horizontal wailings on either side of the trestle buried under ground level.

Each intermediate trestle comprises 6No. piles with a crosshead over, two low level horizontal wailings and one diagonal bracing to each trestle face providing lateral restraint

We will successfully deliver this project using TXM Road Rail Vehicles (RRVs), Mabey deck lifting system and a highly skilled workforce who have already have experience on other similar wooden structures in the area on the same line.

Due to the works required to this structure it is not anticipated that a dive team will be required.

All of the above combined will reduce any risk of an overrun to the possession and the project program timescale.

Key dates:

Site set up	1st to 8th February 2021, including access across field
Prep works including scaffold	8th to 19th February 2021
Prep/delivery possessions/LB's	Sat nights; 6th February and 13th February 2021
Main Possession	Fri night 19th to Mon morning 22nd Feb 2021 - 24/7 working
Removal of scaffold/snagging	22nd Feb to 5th March 2021
Snagging/removal of material possible	Mid week nights; 1st to 5th March 2021
Site demobilization	8th to 12th March 2021

3 Overview.

The project will be delivered using pre-blockade day shift working, works will include replacing lateral stability timbers at most trestles (some previously completed), changing of both HM and LM diagonal bolts around trestle 4 to enable the safe removal of the crosshead, (during blockade shifts) resin pack works at various locations and the changing of a top half of pile stub utilizing the pile splice assembly detail, (detailed later in this document). Hardwood packing and corbel replacements at various location of the viaduct. Blockade works include the following, crosshead removal, pile replacement with pile splice assembly and corbel replacement works.

Above picture of T2, T3 showing general arrangement of trestles on this structure.

Trestle No.	1	2	3	4	5
Crossheads to be replaced	0	0	0	1	0
Piles to be pile splice repaired or packed at scarf joint	0	1	1PSR	0	0
No. of lateral restraint diagonals to be replaced	4	0	4(1 pack)	4	4
Corbels to be replaced or packed	1	4	5	Resin 2	
TA Bolts	0	0	0	13	0
SA1 straps	0	0	0	6	0

Above is a table of wooden elements needing changing or repaired during the project, NB New steel clamps and straps will be put on all new timbers and where detailed. New TA assemblies will be changed out for new on both diagonals on trestle 4 to enable the safe removal and reinstallation of the crosshead. New SA1 straps to all piles also on this trestle.

4 Pre-Commencement

Following award of contract and prior to commencement on site, Griffiths will undertake a review and gap analysis of all supplied documentation, identify any missing information, put plans in place to undertake further surveys, if necessary, and supply the following documentation to Network Rail.

- **Construction Environmental Management Plan, (CEMP)**
- **Quality Management Plan (QMP)**
- **Construction Phase plan (CPP)**
- **Work package Plans (WPP) for survey and construction works.**
- **Task Briefs (TB) for survey and construction works**
- **Form 002/003 for temporary works**
- **Form 002, Form 003 and Approved for Construction (AFC) Drawings for permanent works**

Environmental Issues: -

As the structure to be worked on is over the River Einion, an application for a FRAP and marine licence is being progressed under a separate contract to allow sufficient approval time. Due to the works being in close proximity to local residents and businesses, noise generated from plant, equipment and compound activities, especially at night during the possession over a weekend, a section 61 noise application will be required

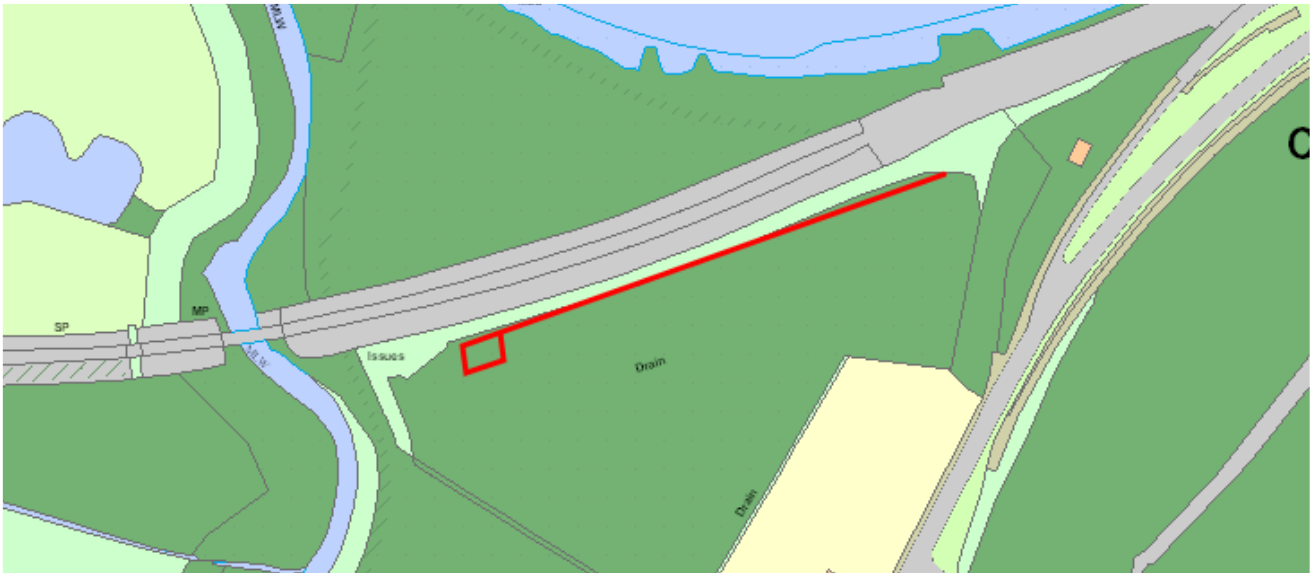
We will adhere to Guidance for Pollution Prevention (GPP) section 5 – Works and maintenance in or near water 2017

Having worked closely with Ceredigion County Council on past projects in the area we have the benefit of being fully aware of the requirements in relation to the form and the content of the section 61 Application.

Although not seen on any visits, due to the location of the structure and the works an otter disturbance license will be needed prior to works starting, this will be applied for in advance of the contract.

5 Site Compound location, access and bridge structure area.

The proposed site compound is via access into private land off A487



Above shows the location of the trackway and a small holding compound at corner to bridge where an access will be formed from the field to the underside of the bridge, to allow for the safe access of the workforce. The main compound will be within the 'timber yard' just off the A487 adjacent to the trackway entrance.

It is unlikely we will be able to launch an RRV from here for the crosshead works during the blockade, so we will utilise the compound at Dovey Junction Station where there is sufficient room for the RRV and the building and loading of the Mabey lifting system onto RRV to travel down to the bridge to carry out the works.

6 Preparation and possession work's

Site establishment: -

Site compound set up will begin on the 1st February 2021 which will consist of delivery of units including welfare, offices, toilets and storage containers for tools and steel components.

During the phase of mobilisation, a trackway system will be laid double width from gate access at main compound to the entrance to the bridge access and small holding area. (Trackway detailed later in this document). This field is very wet all year round and high tides regularly flood it, hence the requirement for double width trackway and only utilising area for temporary storage away from water course and not within flood plain.

Structural survey:-

Griffiths will assign an engineer to conduct a full dimensional survey of the structure including baseline track levels and cross-head dimensions to ensure we have the correct levels once the new crosshead, corbels and pile have been installed. On completion of the works a program of track monitoring will be carried out by our team on a 5,2,2,1 monitoring regime for the following month.

Delivery of timber elements and Mabey system to compound.

Wooden elements will be procured and delivery will be to the main compound. A lay down area will be set up close enough to the running rail at the Dovey Junction Station carpark area so the RRV can have the Mabey system loaded onto its trailers safely. (Details of this operation will be detailed later in this document). Mabey Hire will build their lifting system at the Dovey Station compound which will be set up during week 1 of the project. There is sufficient room there compared with the small set up at Cottage. The unit will be prebuilt to allow gauge clear, with the final sections added once on the structure.

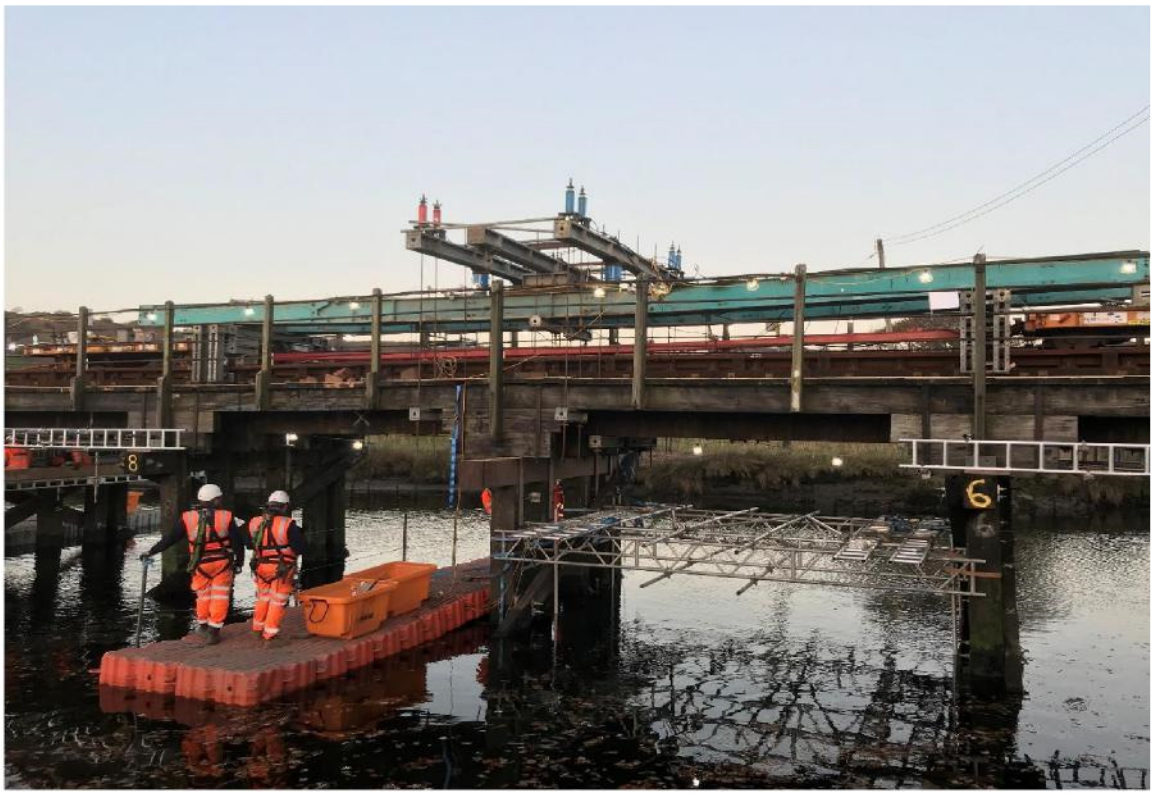
Possession strategy. The 55.5hr possession will be ran with 3 shifts per 24hr, each shift will have 8hours working with an hour handover, this will allow fatigue management and will also limit those requiring overnight accommodation as this is extremely limited due to Covid 19

Crosshead replacement trestle 4.

The crosshead to trestle number 4 is decayed beyond repair and needs changing out for a new one. During the blockade phase of the works an RRV will bring the full Mabey lifting system to the location above trestle 4. The system will be set up and checked by specialist lifting engineers from Mabey lifting. The deck planks will be drilled through and the lifting bars slid down and attached to the lifting beams below. Prior to strapping up the crosshead for lifting, all old SA1 straps will be cut off and completely removed well away from the lifting area, the angle brackets from crosshead to corbels at all locations must also be removed at this point. The diagonal to the low mileage end will be taken off and set aside for replacing once the new head is in place. The bridge-deck will now be lifted clear of the crosshead by approx. 25mm.(exclusion zones set up both sides of the jacks before pressurising and lifting) the crosshead itself will now be block and tackled clear of the existing piles by 10mm.

Then from above, the sliding mechanism attached to the lifting gear will move the now free crosshead over until clear of the piles, and chained down to the waiting pontoon below. The new crosshead will be attached and lifted up, slid along the system until it's in its required place and gently lowered onto the piles. All new straps will be placed over the crosshead in their correct positions and the Mabey jacks will now be released to lower the bridge-deck back onto the crosshead. Engineer will check for correct levels of the track, once this has been satisfied as complete the jacking system will be dismantled from below and the RRV will move it along to its next place of work. (Trestle 3 where a top half of pile is to be replaced and a pile splice assembly installed).

Below is a picture of the full Mabey lifting system used at Artro and can also be used to replace piles.



Diagonal TA bolt

A number of bolt assemblies will need to be changed on the diagonals on trestle 4 to enable the safe removal of them prior to the crosshead coming out, this will be on a 1 in 1 out basis, the original bolt will be removed, the hole in the existing SA1 strap drilled out to 36 mm if required with MAG drills sat on pre-fabricated holding plates which are fixed to the pile prior to drilling the SA1 strap. A wooden 32mm bit will then be used to re-bore the hole through the pile, new bolt installed, torqued and tested with double nut to lock off. (NB, - New SA1 straps fitted once the new crosshead is installed)

Additionally in order to replace trestle 3 Pile 6 upper section the diagonal will need to drift away from the piles and crosshead, therefore these existing bolts will be checked and replaced with new TA bolts as required.

Corbal replacement:-

Below are photos of corbels needing replaced at Cottage Viaduct. The methodology for changing these, is detailed below and is the same for all structures to date that we have worked on.

Figure B.4 - Heavily decayed main beam outer corbel (Main Beam 2. Requires replacement in the next 6 months.

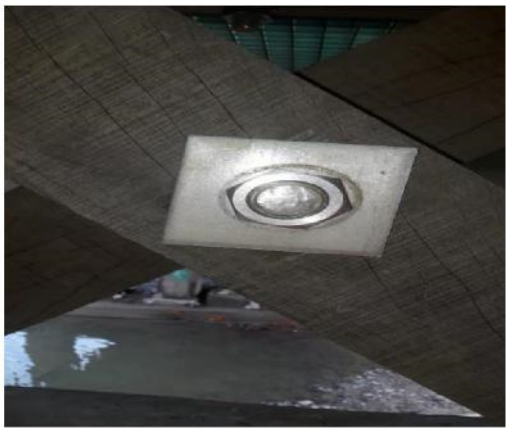
Figure B.5 — Edge beam loss of section and heart rot over bearing interface with upper corbel.

The methodology of replacing these is as follows, the Mabey lifting system will be used to slightly lift the main edge beam away from its corbels. Firstly, the coach screws will be removed from the holding bracket from the crosshead to the lower corbel, all old TA8 straps removed. The lifting system will then lift the main beam, then we remove 2no corbels safely using block and tackle. The new lower corbel will be lifted back into position using block and tackle and the holding bracket replaced securing the timber, then the same applies for the top corbel. The main beam will then be lowered back into position and the onsite engineer to check levels against his base notes for correct levels. Tighten and test new SA8 straps and install double nuts

Lateral restrain diagonals throughout structure: -

On inspection of the structure it was determined that numerous Lateral Restraint diagonal timbers were missing, lose or not up to standard, these will be replaced under live load at any time during the project.

A competent team of joiners will be deployed to re-install these timbers; measurements will be taken so that a template made for each individual timber prior to cutting. All end to timbers must be 45-degree angles and no cut to a point. Fitting must be tight, any packing is to be at the bottom cut not the top. Timber will be fixed with Stainless Steel fixings throughout. The 4ft timbers will be fixed through the centers with a M30-300mm bolt and double nuts installed, all torqued and tested prior to being signed off.



New diagonal restraint timber photo with center bolting installed at Artro. Top of pile 6 T3 replacement works during possession: -

Figure B.11 – Trestle 3 Pile 6. Decay to bearing area at crosshead, loss of contact area.

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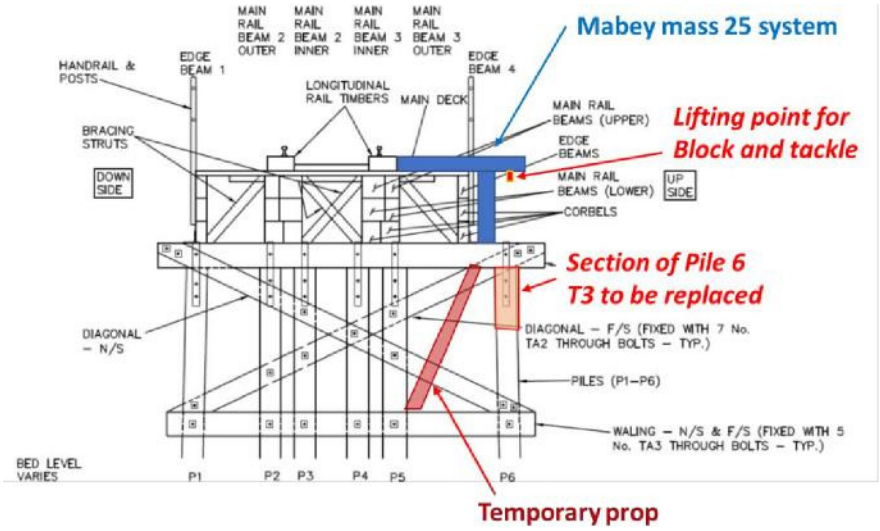
During the main 54hr possession the support for the Mabey bridge deck lifting system will come from Trestle 3 and 5. Therefore it is essential that Pile 6 to trestle 3 is repaired prior to this load being applied. The intention is to carry out this repair within the first shift of the main possession, whilst the Mabey system and RRV are being loaded at Dovey Station.

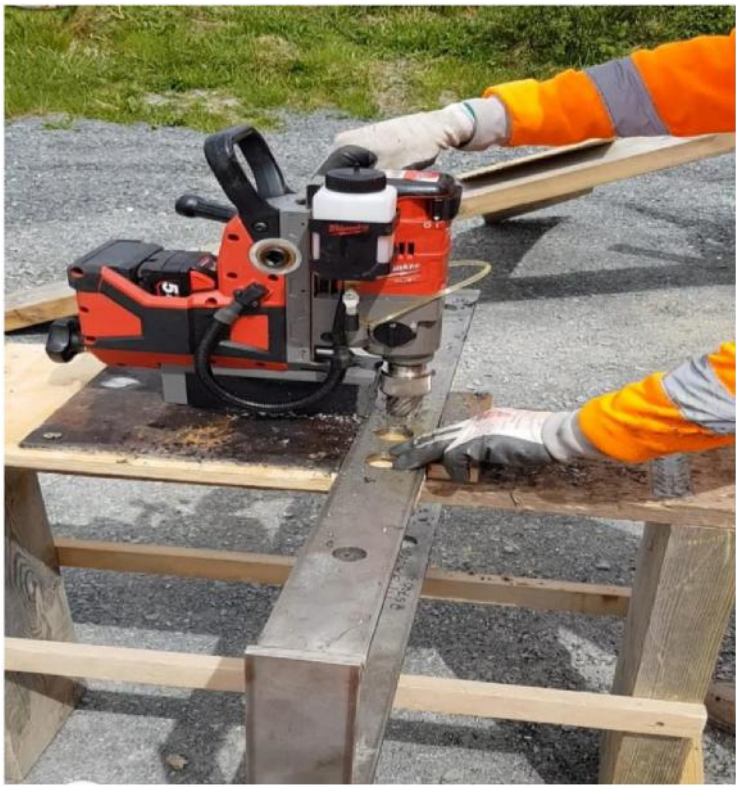
Prior to the main possession access scaffold will be installed to trestle 3 to allow free access to the top of pile 6, additionally part of a Mabey mass 25 system will be installed on top of the crosshead and a propping system installed beneath the crosshead. *Note the scaffolding will allow adaptation to lift the new pile section from beneath.*

At the start of the 54hr possession the remaining Mass 25 system will be installed at track level to give a lift point for the block and tackle. The diagonal will be drifted away from the crosshead and piles, the SA1 strap will be removed and the top of existing pile cut down to required position, this will be cut into 25kg sections to enable them to be removed without lifting equipment. Then a new section of pile will be cut

and lifted in place from pontoon beneath and re-positioned ensuring a tight fit under the crosshead and onto existing pile, the pile splice assembly will then be fitted, once fitted the existing SA1 strap will be fitted with holes drilled through for the SA1 bolts. The lifting system will be removed and the diagonal bolts tightened.



All bolts reinstalled and double nuts put on Steel work to be replaced during the urgent works: - Any old bolts or straps needing replacing will be new for old. They will be replaced with stainless steel throughout. New SA1 clamps will be supplied without predrilled holes for the pile holes, the methodology for this is to drill the new pile and insert the TA1bolt assembly at both locations. With the bars inserted, we will offer the blank SA1 strap to the bolts and mark off where the holes are to be drilled, we have had a trial run of this system at Dyfi, and it worked well.

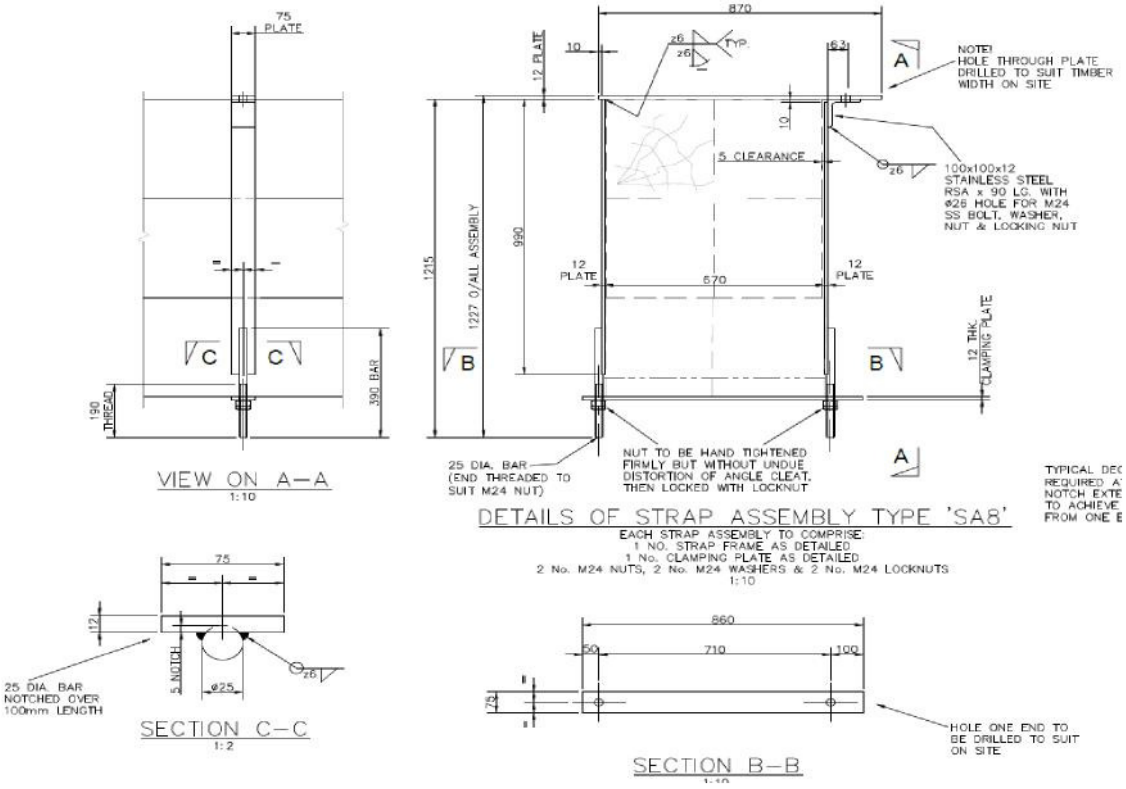


Above, is a photo of the trial mentioned. This is a battery-operated magnetic drill; we have had plates fabricated which fasten to the pile allowing easy and very precise drilling of the wood.

SA1 strap. The older method of pre-drilled steel straps needed very accurate drilling through the strap, pile and strap again in situ, and was never easy!

SA8 and SA9 strap assemblies are required for the corbels and also the main beams at some locations, these will be done during the possession, on a 1 in 1 out basis. We will be using the adjustable straps as these are easier to install and fundamentally easier to remove for wood maintenance in the future, once the straps are replaced, they will be torqued, tested and double nuts installed as standard. Any packing requirements will be dealt with at the time of installation cutting down on revisit times.

Below are drawings of the strap assemblies to be used on this project. SA8 CORBAL STRAP AND SA9 MAIN BEAM STRAP DETAILS



7 Plant requirements

An RRV (TXM Monster Crane) will be required for the blockade, works include taking the Mabey system to trestle 4 and other trestles during blockade, Below is the crossing at Ynys -las where the RRV will on-track and have 3 no trailers loaded on, pushing 2 with a 13m draw bar making it long enough to have the Mabey system loaded onto it after travelling down to Dovey Junction, the 3rd trailer will be for general equipment and steel straps etc., During both pre & post blockade a 13t machine will be used to load the pontoons with the crosshead and other wooden items from the trackway holding area.

The Mabey system will be lifted onto trailers as a complete unit (gauge clear) using a crane.

8 Pontoon works

Most of the works on Cottage viaduct, will require the use of pontoons. Changing crossheads, steelwork, resin and diagonal restraint timbers will require a scaffold tower erected on them to reach these works the pontoons will be launched at a pre-arranged location and tied off while not in use, the pontoons will be managed by a water rescue team who will be on site at all times for emergency procedures and moving pontoons around the bridge safely.

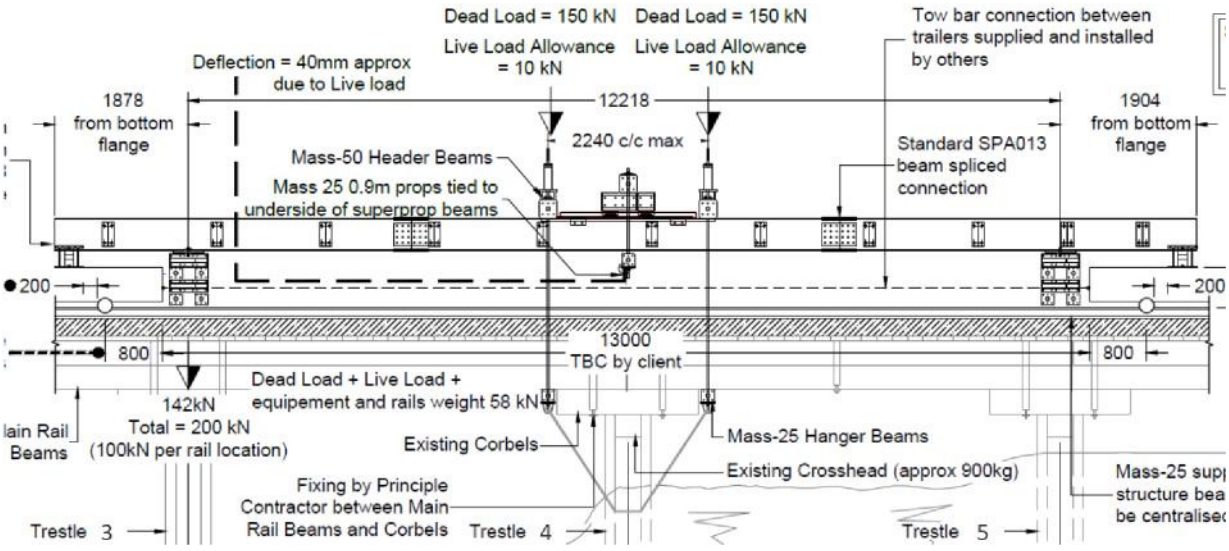
Picture taken at ARTRO showing jetty pontoon which serviced op's getting underside of structure via safety boats.

9 Trackway installation

Due to the saturated field, a double width trackway system similar to below will be installed to provide a safe access down to the bridge, a small holding area will be laid at the bottom for storage.

10 Mabey lifting system

Below is a drawing of the full Mabey lifting system which is similar to the one used at Artro. This system is suitable for both crosshead and pile removal.



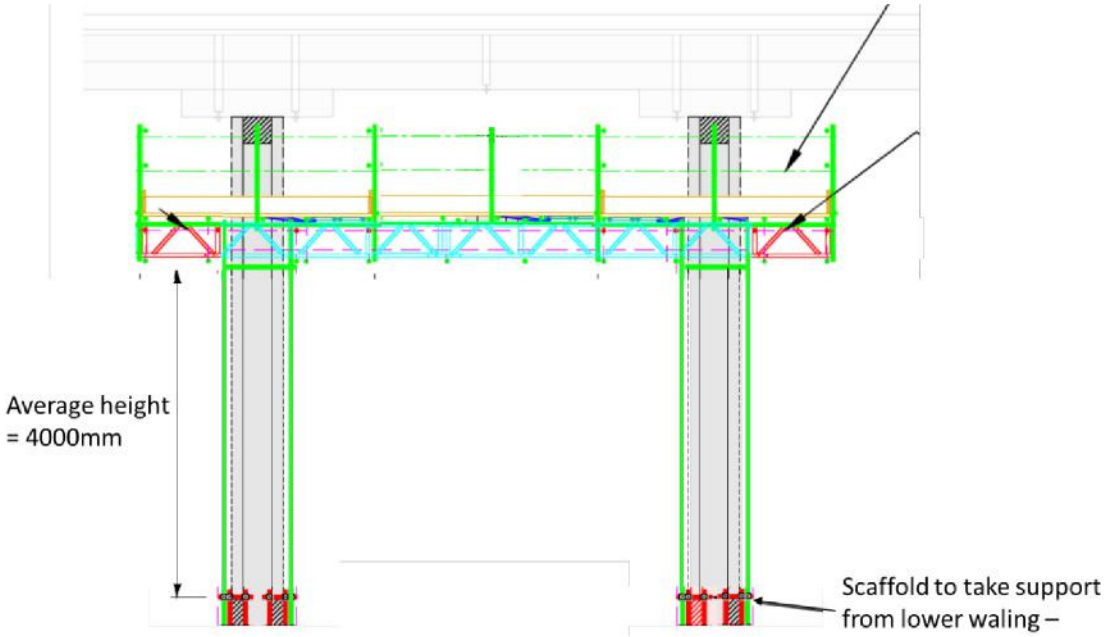
11 Scaffolding requirements

Trestle access scaffold to Trestle 2 and 3

Span 4 propping and access to beams.

Span 3 access to trestle and main beams – installed after main possession (using span 4 scaffold)

Span 4 proposed scaffold



12 Cabins, site set up arrangement

Typical site set up within NR land, note car parking will need to be arranged in nearby land or additional trackway used for parking within field – current price assumes adequate parking supplied nearby by NR