



GOLDHAWK

Bridge Restoration

In association
with

STRESS

MARS
system

REFORCETM
Permeation systems

BRISCOES UNDERBRIDGE

MARS & ReFORCE INSTALLATION CASE HISTORY -2020

Client: Network Rail

Rail Contractor : AmcoGiffen

Rail Consultant : Arcadia

HISTORIC BRUNEL RAIL BRIDGE



The classic Brunel designed masonry arch rail bridge was found to be deflecting up to 10mm under load from freight trains and did not comply with current loading codes. Goldhawk were commissioned by Network Rail to design and install a strengthening system to bring the bridge up to ROUTE AVAILABILITY 10.

This project was a world first for combining fill consolidation using the patented **ReFORCE** permeation system installed by **STRESS** and the masonry arch strengthening system **MARS** installed by **Goldhawk**

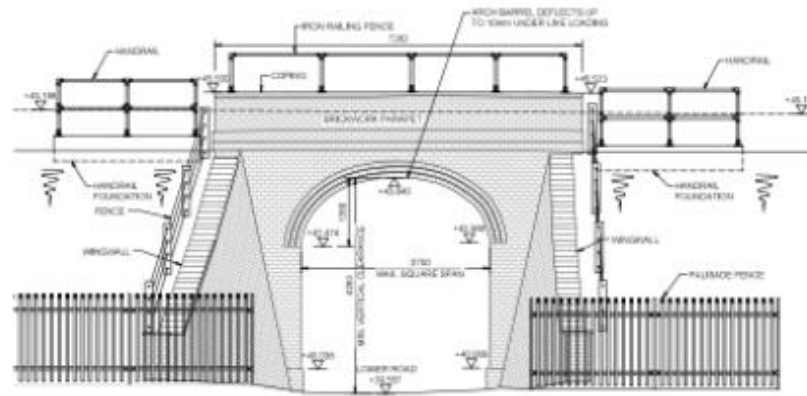
REFORCE[™]
Permeation systems

MARS
system

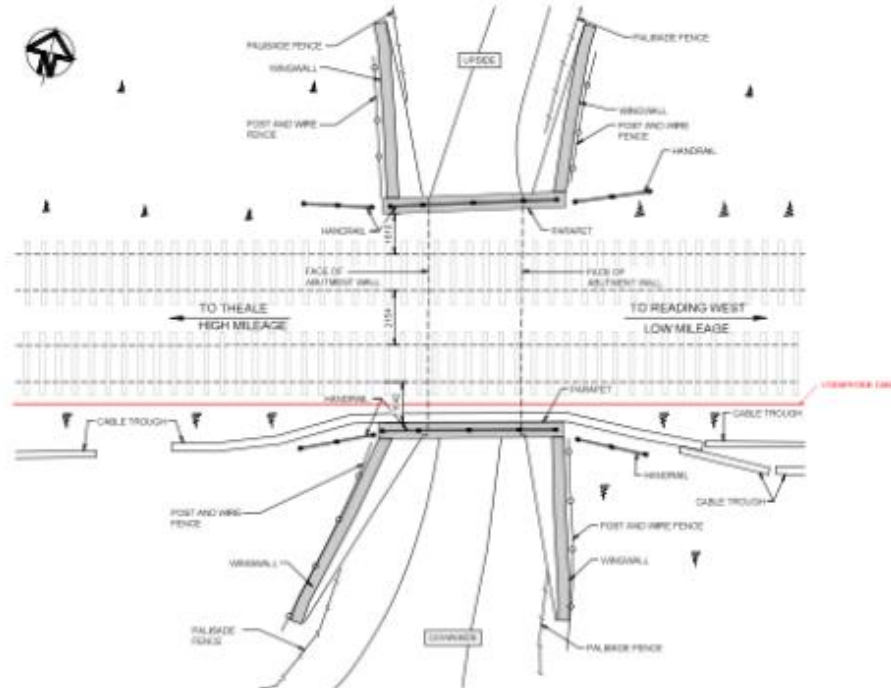


LOCATION PLAN

(OS GRID REF: SU 693717)



ELEVATION



PLAN

NOTES:



Goldhawk Bridge Restoration Ltd
 Can Build House
 Bristol Way
 Slough SL1 3QE
 Telephone: 01753 516755

CLIENT: NETWORK RAIL

TITLE:

**BRISCOE'S
 UNDERBRIDGE**

LOCATION; PLAN AND ELEVATION

DRAWN: REF

CHECKED: DNK

SCALE: NTS

DATE: Feb 2020

DRAWING NO:

GHD1129/01

REV: 0

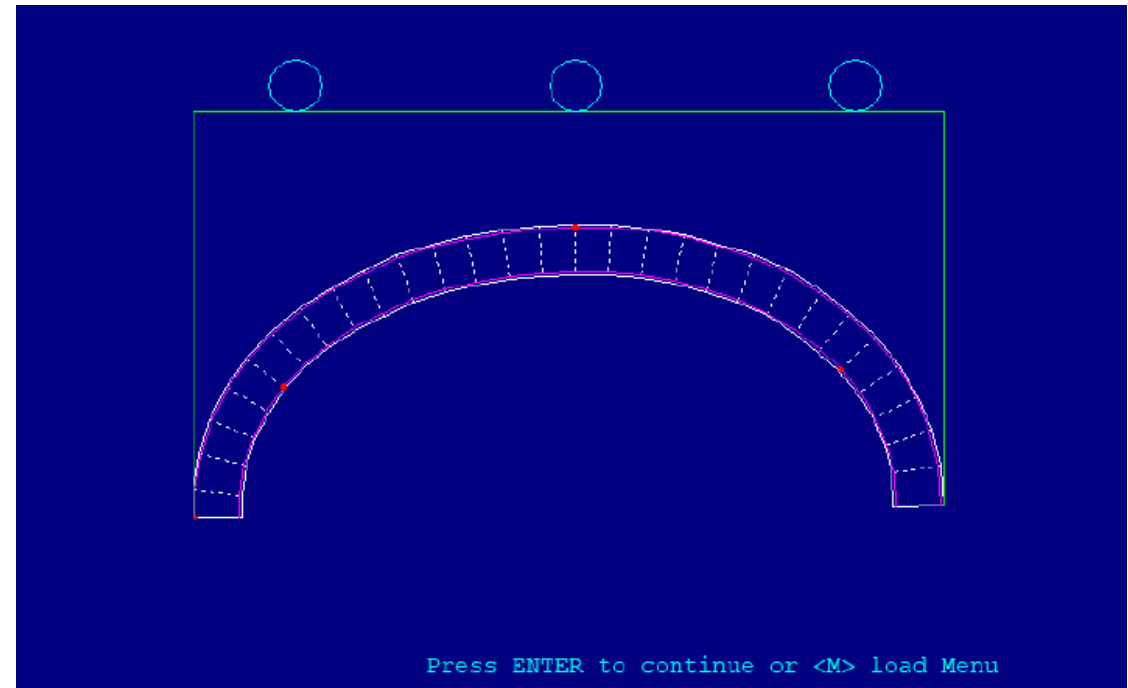
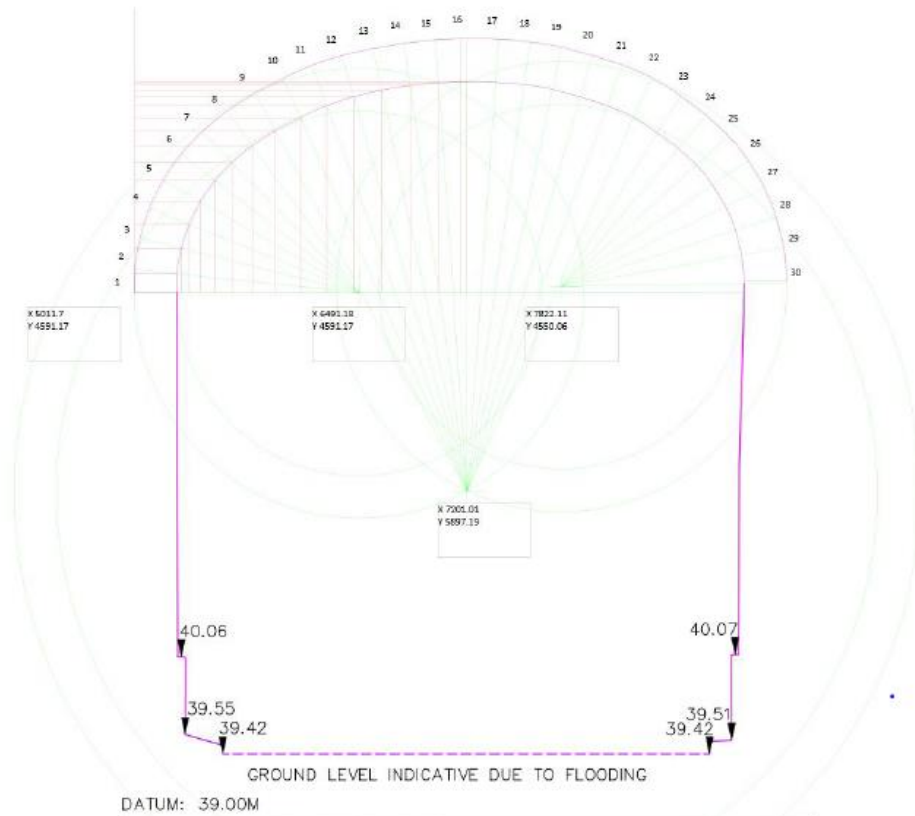
NOTE:

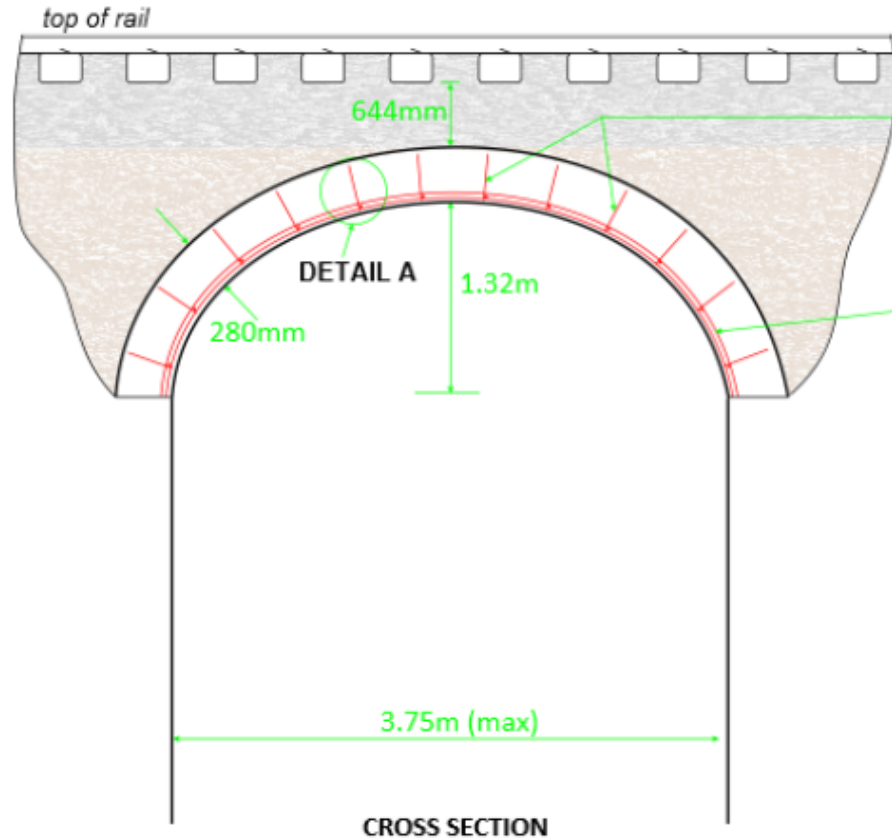
Drawing adapted from ARCADIS
 drawing 153607-ARC-DRG-002

ASSARC ANALYSIS ARCH GEOMETRY



GOLDHAWK
Bridge Restoration





6mm dia. HeliFix Super 6 grade 304 (1.4301) helical stainless steel pins inserted radially at intersections of circumferential and transverse rebar.

Circumferential 8mm dia Betinox stainless steel ribbed rebar in sets of 2 at designed centres transversely.

NOTES:

1. Circumferential and transverse reinforcement to be 8mm Betinox stainless steel ribbed rebar Grade 1.4362 to BS EN 10088-1:2014.
2. Radial pins to be 6mm Helibar Grade 1.4301 to BS EN 10088-1:2014 (304S31).
3. Circumferential and transverse rebar to be encapsulated in MARFLEX coloured to match existing masonry.
4. Radial pins to be encapsulated in HeliBond Grout.
5. To be read in conjunction with Drawing Nos GHD1129/01 and GHD1129/03.

CLIENT: NETWORK RAIL

TITLE:

BRISCOES UNDERBRIDGE

CROSS SECTION

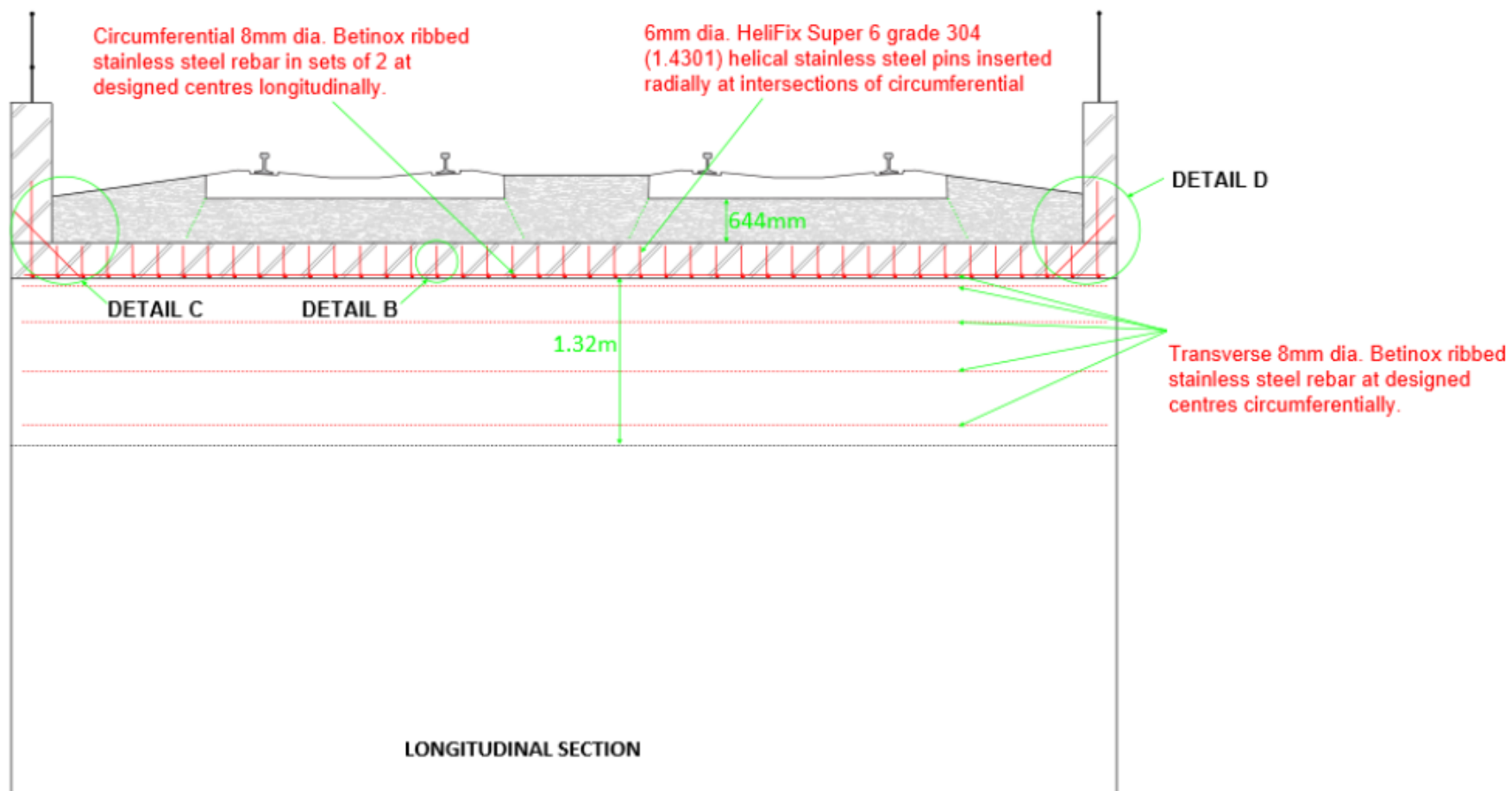
DRAWN: REF

CHECKED: DNK

NTS

DRAWING NO: GHD1129/02

Feb 2020



NOTES:

1. Radial pins to be 6mm Helibar Grade 1.4301 to BS EN 10088-1:2014 (304S31).
2. Circumferential and transverse reinforcement to be 8mm Betinox stainless steel ribbed rebar Grade 1.4362 to BS EN 10088-1:2014.
3. Circumferential and transverse rebar to be encapsulated in MARFLEX coloured to match existing masonry.
4. Radial pins to be encapsulated in HeliBond Grout.
5. To be read in conjunction with Drawing Nos GHD1129/01 and GHD1129/02.

CLIENT: NETWORK RAIL

TITLE:

BRISCOES UNDERBRIDGE

LONGITUDINAL SECTION

DRAWN: REF

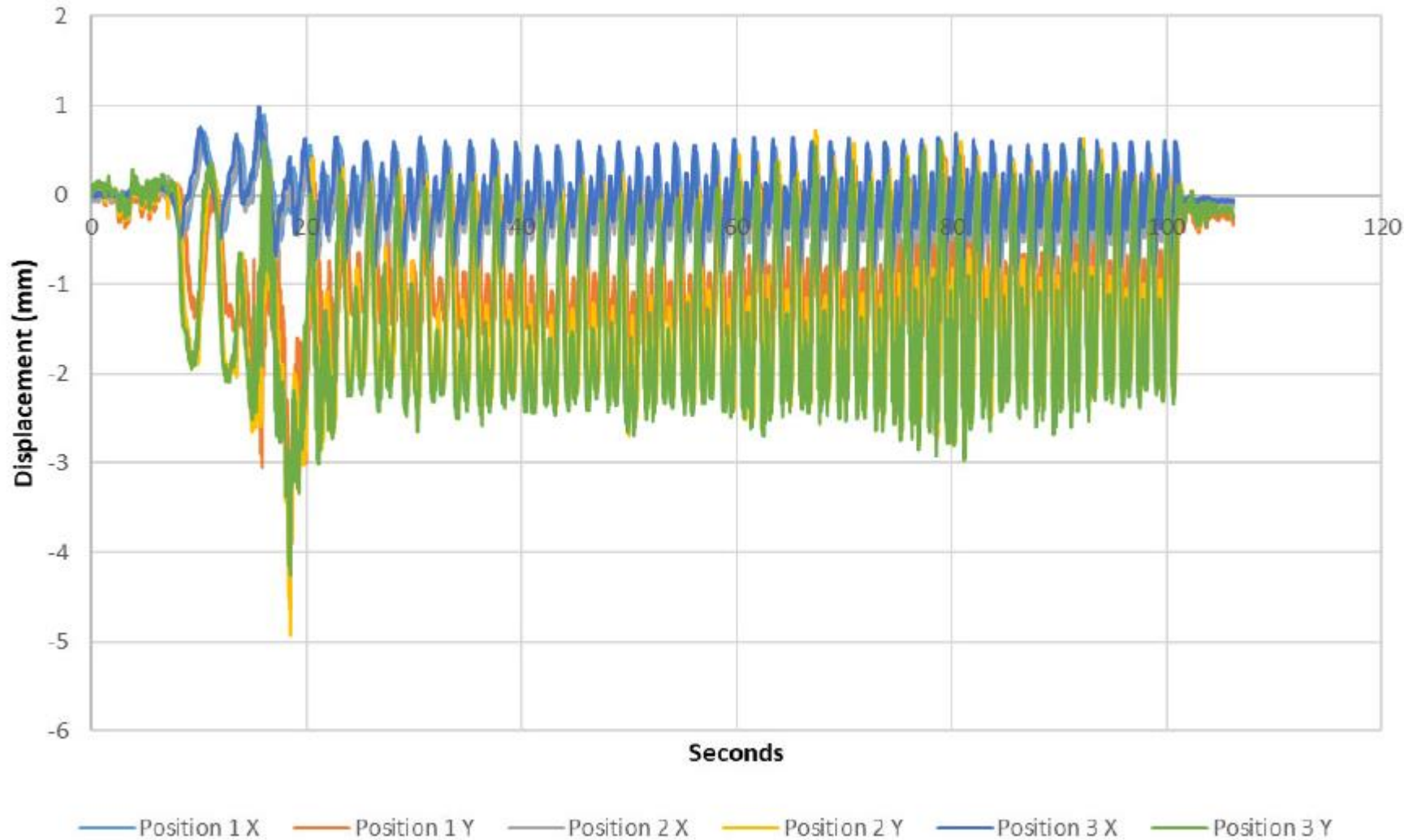
CHECKED: DNK

NTS

DRAWING NO: GHD1129/03

Feb 2020

Freight Train 10.18am



ARCH MOVEMENT MONITORING

The arch crown was measured to deflect (bounce) up to 10mm. This plate shows deflection of 6mm vertical movement prior to any arch fill consolidation using **ReFORCE** or arch strengthening using the **MARS** system.



GOLDHAWK
Bridge Restoration



Access scaffolding together with
Mabey safety shoring system.



GOLDHAWK
Bridge Restoration

Mabey Safety Prop System with flexible gasket to allow the arch to flex and prevent 'hard spots'. Ensuring the safety of the technicians whilst continuing to allow normal rail services during installation

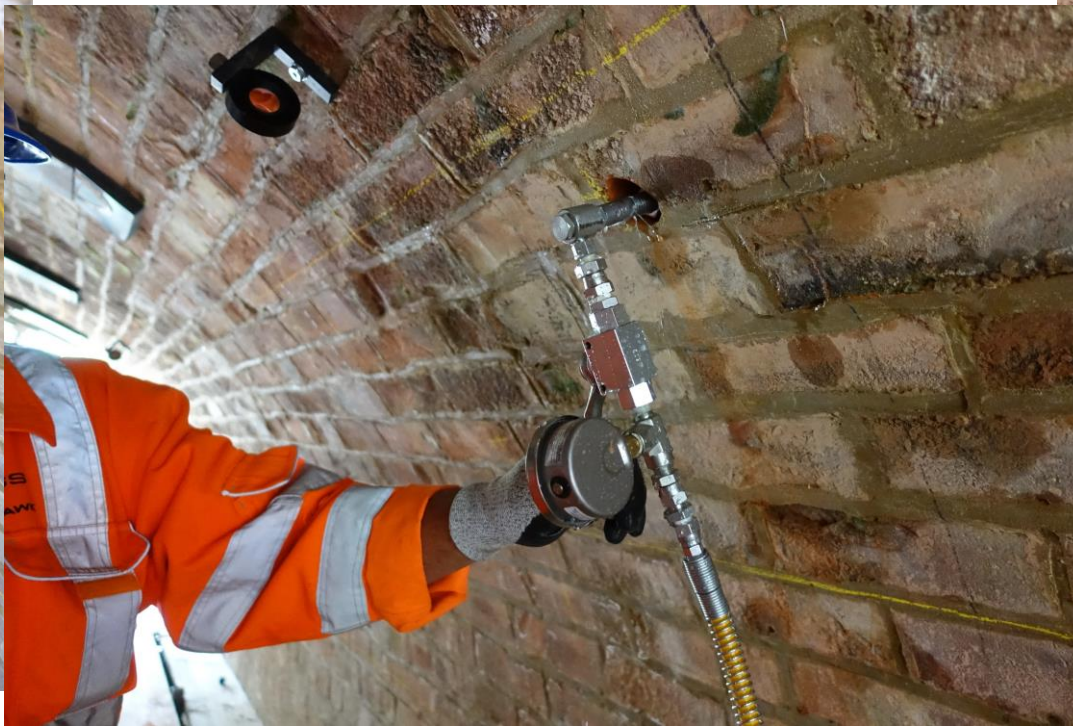




REFORCE™

Permeation systems

Permeation grouting to stiffen the arch backfill in the thrust zones behind the arch. Close to 4m³ of GeoTek LV was accurately pump and distributed into the backfill without the risk of leaking into the track bed.



STRESS

Post installation of ReFORCE System - 21st July 2020



Permeation Grouting of the arch fill has shown to reduce deflection by over 50%



GOLDHAWK
Bridge Restoration

Cutting chases for the
MARS system using
vacuum dust recovery
Hilti chasers.





Installation of Betinox stainless steel rebar



MARS
system


GOLDHAWK
Bridge Restoration

Post installation of ReFORCE and MARS systems and removal of temporary propping - 24th August 2020



The combination of **ReFORCE** arch fill consolidation & The unique **MARS** arch strengthening system reduced arch deflection by 80% and increased capacity to Route Availability 10.

Completed Arch Strengthening Project – On Time – On Budget - without the need to close the rail lines or reduce rail schedules. The scope of works also included brick repairs and pointing.





A refurbished and strengthened Briscoes Bridge now rated to Route Availability 10.

This project was a first for Network Rail and thanks must be given to the Team comprising:

- David Kitching, Bob Falconer from **Goldhawk Bridge Restoration Ltd**
- Simon Collis, Stuart Roberts, Gary Stevens from **STRESS UK**
- Ionescu Andrei; Sear Kevin; Clapham Michael from **Network Rail**
- Ben King, Chris Fernandes, Leonidas Papadopoulos from **Arcadis**
- Mike Edwards, Patrick Rosborough, Ryan McGurk from **Amcogiffen**
- Dave Bradshaw & Steven Howell from **Mabey Hire & Monitoring**
- And our wonderful technicians from both **STRESS and Goldhawk**

