Supplementary Information

The following information is associated with Network Rail Standard:
NR CIV/SD/821 Rev A

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CAD Drawing

- CIV/SD/821

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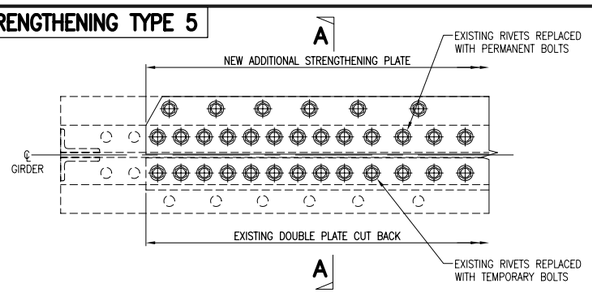
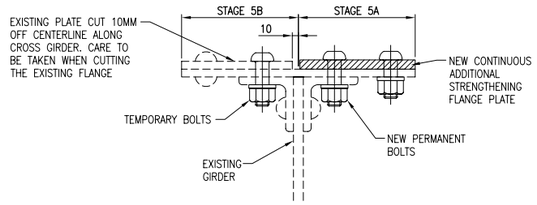
STRENGTHENING TYPE 5



PLAN ON TOP FLANGE – STAGE 5A

SCALE 1:10



SECTION A–A

SCALE 1:5

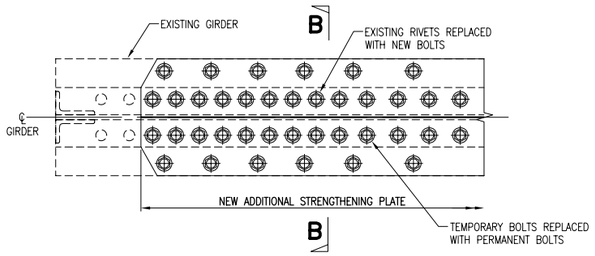
STRENGTHENING TYPE 5
PROPOSED SEQUENCE OF WORKS (INDICATIVE)

1. EXISTING INNER RIVETS TO BE REPLACED ONE AT A TIME WITH TEMPORARY BOLTS
2. REMOVE EXISTING PROTECTIVE PAINT FROM FLANGE TO RECEIVE NEW PLATES TO MEET REQUIRED FAYING SURFACE.
3. HOLES TO BE DRILLED TO THE REQUIRED PATTERN ON THE OUTER ROW AND LEFT BLANK.
4. DURING A POSSESSION EXISTING DOUBLER PLATE CAREFULLY CUT/GROUND 10MM OFF CENTERLINE OF CROSS GIRDER.

5A. DURING A POSSESSION ONE HALF OF CROSS GIRDER, TEMPORARY BOLTS AND ONE HALF OF EXISTING DOUBLER PLATE REMOVED AND ADDITIONAL STRENGTHENING PLATE INSTALLED ONE HALF AT A TIME AND BOLTED WITH PERMANENT BOLTS.

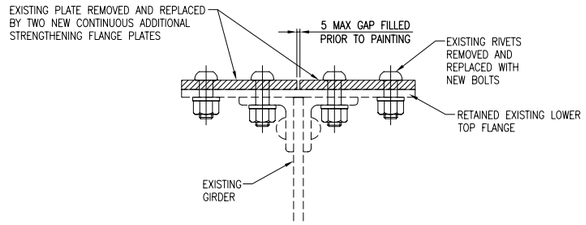
5B. STAGE 5B TO COMMENCE ONLY AFTER ONE IN THREE PERMANENT BOLTS IN STAGE 5A HAVE BEEN TIGHTENED DURING STAGE 5A.

SAFTEY THE DESIGNER IS TO CONFIRM THE INSTALLATION SEQUENCE AND CHECK IF UNDER PERMANENT LOAD CONDITIONS THE CONNECTIONS TO ONE SIDE OF THE DETAIL CAN BE REMOVED AT THE SAME TIME. THE STRENGTHENING ARRANGEMENT IS TO BE ONLY USED WHERE THE CONDITION OF THE UPPER PLATE HAS DETERIORATED SUCH THAT THE MATING SURFACES ARE COMPROMISED WHERE BY A STRUCTURAL CONNECTION CAN NOT BE GUARANTEED.



PLAN ON TOP FLANGE – STAGE 5B

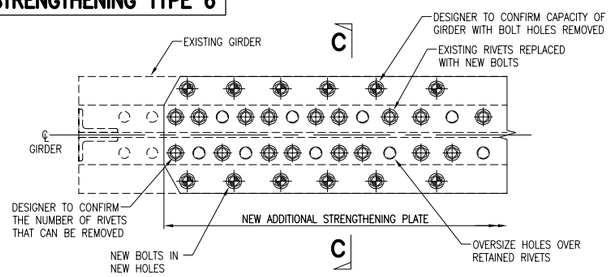
SCALE 1:10



SECTION B–B

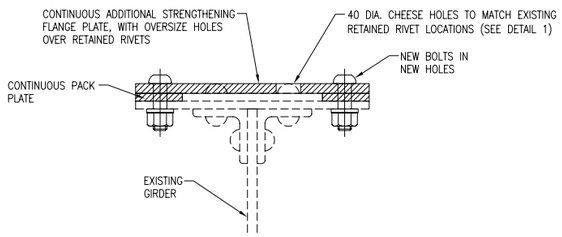
SCALE 1:5

STRENGTHENING TYPE 6



PLAN ON TOP FLANGE

SCALE 1:10



SECTION C–C

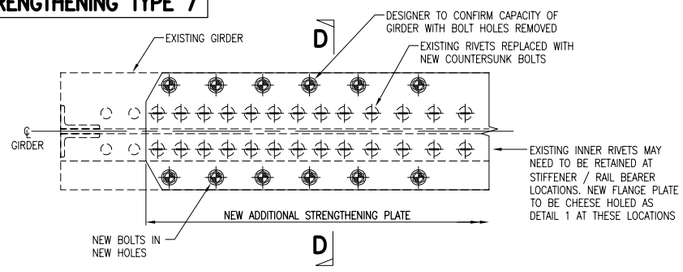
SCALE 1:5

STRENGTHENING TYPE 6
PROPOSED SEQUENCE OF WORKS (INDICATIVE)

1. EXISTING INNER RIVETS TO BE REMOVED ONE AT A TIME AND REPLACED WITH A TEMPORARY BOLT.
2. REMOVE EXISTING PROTECTIVE PAINT FROM FLANGE TO RECEIVE NEW PLATES TO MEET REQUIRED FAYING SURFACE.
3. HOLES TO BE DRILLED IN THE REQUIRED PATTERN ON THE OUTER ROW AND LEFT BLANK.
4. CONTINUOUS ADDITIONAL STRENGTHENING PLATES AND PACK PLATES TO BE INSTALLED AND BOLTED WITH PERMANENT BOLTS DURING A POSSESSION.

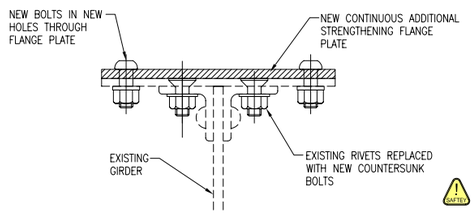
SAFTEY THE DESIGNER IS TO CONFIRM THE INSTALLATION SEQUENCE AND THE NUMBER AND ARRANGEMENT OF RETAINED RIVETS TO BE CAPABLE OF SUPPORTING PERMANENT LOAD CONDITIONS.

STRENGTHENING TYPE 7



VIEW ON UNDERSIDE OF BOTTOM FLANGE

SCALE 1:10



SECTION D–D

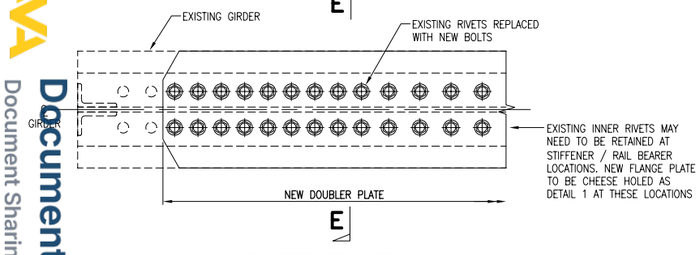
SCALE 1:5

STRENGTHENING TYPE 7
PROPOSED SEQUENCE OF WORKS (INDICATIVE)

1. INNER ROW OF RIVETS TO BE REMOVED ONE AT A TIME AND FLANGE PLATE PREPARED AND REPLACED WITH NEW PERMANENT COUNTERSUNK BOLTS.
2. REMOVE EXISTING PROTECTIVE PAINT FROM FLANGE TO RECEIVE NEW PLATES TO MEET REQUIRED FAYING SURFACE.
3. NEW HOLES DRILLED IN THE REQUIRED PATTERN ON THE THE OUTER ROW AND LEFT BLANK.
4. CONTINUOUS ADDITIONAL STRENGTHENING PLATE INSTALLED AND BOLTED WITH PERMANENT BOLTS.

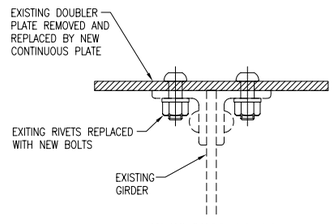
SAFTEY THE DESIGNER IS TO CONFIRM THE INSTALLATION SEQUENCE AND THE NUMBER AND ARRANGEMENT OF RETAINED RIVETS TO BE CAPABLE OF SUPPORTING PERMANENT LOAD CONDITIONS.

STRENGTHENING TYPE 8



PLAN ON TOP FLANGE

SCALE 1:10



SECTION E–E

SCALE 1:5

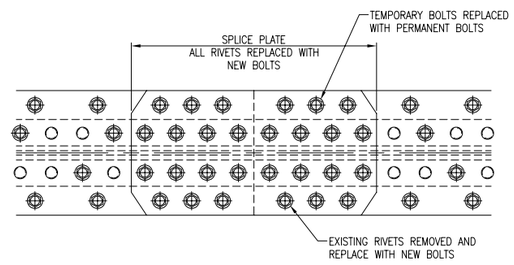
THIS DETAIL IS ONLY SUITED WHERE SIGNIFICANT STRENGTHENING IS REQUIRED AND CAN BE ACHIEVED BY A SINGLE PLATE AND WHERE DEAD LOAD IS TO BE INTRODUCED INTO THE STRENGTHENING PLATE.

STRENGTHENING TYPE 8
PROPOSED SEQUENCE OF WORKS (INDICATIVE)

1. EXISTING RIVETS REMOVED ONE AT A TIME AND REPLACED WITH TEMPORARY BOLTS.
2. REMOVE EXISTING PROTECTIVE PAINT FROM FLANGE TO RECEIVE NEW PLATES TO MEET REQUIRED FAYING SURFACE.
3. EXISTING GIRDER TO BE PROPPED OR SUFFICIENT LOAD REMOVED TO ENABLE ONLY THE BOTTOM FLANGE ANGLES TO CARRY THE LOAD.
4. REMOVE TEMPORARY BOLTS AND INSTALL NEW STRENGTHENING PLATE AND PERMANENT BOLTS.

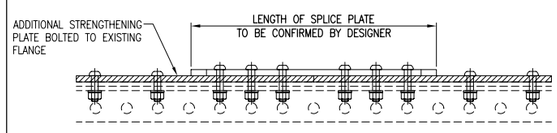
SAFTEY THE DESIGNER IS TO CONFIRM THE INSTALLATION SEQUENCE AND CHECK THE PROPPING ARRANGEMENT DURING THE REMOVAL OF THE BOTTOM FLANGE.

SPLICE DETAIL



PLAN ON SPLICE PLATE DETAIL

SCALE 1:10



ELEVATION ON SPLICE PLATE DETAIL

SCALE 1:10

DRAWING No. NR/CIV/SD/821

NOTES

GENERAL NOTES

1. THIS DRAWING SHOWS A TYPICAL EXAMPLE OF TOP FLANGE STRENGTHENING USED TO GENERATE ADDITIONAL CAPACITY TO EXISTING METALLIC LONGITUDINAL GIRDERS.
2. THE SIZES AND DIMENSIONS SHOWN ON THIS DRAWING RELATE TO EITHER A TYPICAL EDGE OR CENTRE LONGITUDINAL GIRDER. THE CONFIGURATION OF STRENGTHENING PLATE IS THE RESPONSIBILITY OF THE DESIGNER.
3. ALL EXISTING PLATES, STIFFENERS AND CONFIGURATION OF THE GIRDER ARE TO BE CONFIRMED ON SITE BY THE DESIGNER.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH NR/CIV/SD/820.

SPECIFICATION

1. FOR SPECIFICATION REFER TO DRG. NR/CIV/SD/801.

DESIGN ASSUMPTIONS

1. THE DESIGNER SHALL BE RESPONSIBLE FOR THE DESIGN OF THE FLANGE STRENGTHENING SYSTEM WHICH SHALL ADDRESS AS A MINIMUM THE FOLLOWING.
   - A) CLEARANCES FOR ACCESS TO THE WORKS
   - B) 'LOCKED IN' PERMANENT LOAD STRESSES
   - C) CONDITION OF EXISTING FLANGES
   - D) CLEARANCES BETWEEN BOLTS
   - E) EXTENT AND SEQUENCE OF RIVET REPLACEMENT IF REQUIRED
   - F) INTEGRITY OF FLOOR CONNECTIONS
2. SAFTEY THE DESIGNER SHALL CHECK THE VARIOUS STAGES IN THE CONSTRUCTION SEQUENCE TO ENSURE THE INTEGRITY OF THE GIRDER AND OTHER CONNECTING PARTS ARE MAINTAINED THROUGHOUT THE WORKS.
3. THE DESIGNER SHALL SPECIFY THE SLIP FACTOR (μ) REQUIRED FOR FAYING SURFACES TO SATISFY THE DESIGN.
4. SAFTEY THE DESIGNER SHALL CHECK THE NUMBER OF RIVETS OR BOLTS THAT CAN BE REMOVED AT ANY ONE TIME UNDER THE LOADING REGIME FOR THE GIVEN WORK ITEM.

NOTE

- DENOTES NEW BOLT IN EXISTING HOLE REAMED TO SUIT.
- DENOTES NEW BOLT IN PRE DRILLED HOLE.
- DENOTES EXISTING RIVET TO BE LEFT IN PLACE.

Rev	Date	Description of revision	Design'd	C'kd
A	22.06.12	FIRST ISSUE	MK	AGW
P3	01.07.11	DRAFT PUBLICATION ISSUE	MK	AGW
P2	24.02.11	ISSUED FOR COMMENT	MK	AGW
P1	24.01.11	DRAFT ISSUE	MK	AGW

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	Name	Position	Signature	Date
Approved	Paul Clark	Head of Engineering Infrastructure Projects Central Region	P.C.	June 12

Master copy with original signatures held by Network Rail HQ
CIVIL ENGINEERING STANDARD DESIGN

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METALLIC STRUCTURE REPAIRS STANDARD DRAWINGS

TOP FLANGE STRENGTHENING DETAILS

2 OF 3

Scale	AS SHOWN	
Drawing Number	NR/CIV/SD/821	A

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