Supplementary Information

The following information is associated with Network Rail Standard:
NR CIV/SD/109 Rev A

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CAD Drawing

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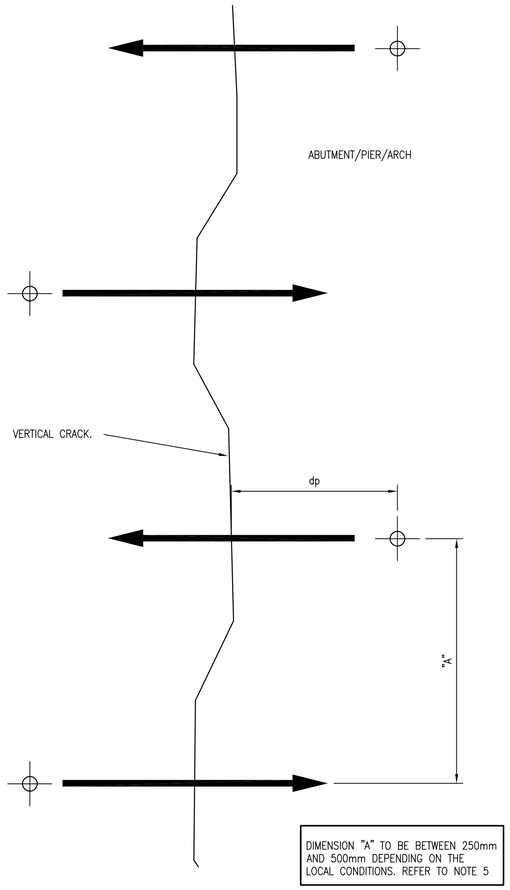
DRAWING No. NR/CIV/SD/109

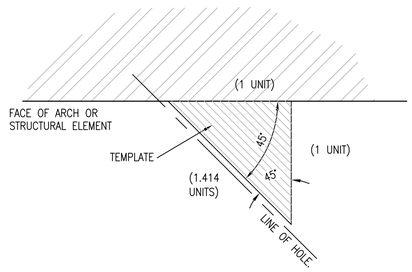


DIMENSION "A" TO BE BETWEEN 250mm AND 500mm DEPENDING ON THE LOCAL CONDITIONS. REFER TO NOTE 5

SPACING OF STITCHING BARS ALONG LENGTH OF TYPICAL CRACK

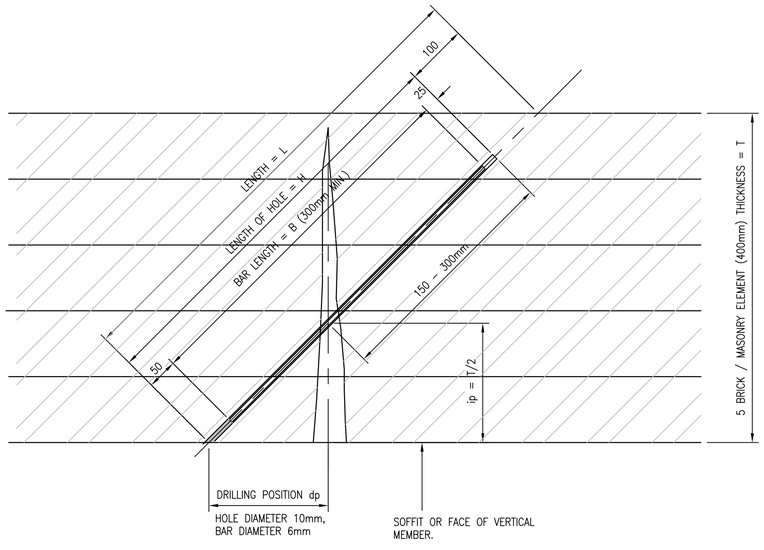
SCALE 1 : 5

NOTE : TO ENSURE THE CORRECT DRILLING ANGLE IS MAINTAINED DURING INSTALLATION OF THE BARS A TEMPLATE SHOULD BE USED. THIS SHOULD BE CUT TO GIVE THE REQUIRED DRILLING ANGLE.



TYPICAL 45° TEMPLATE

SCALE 1 : 10



TYPICAL SECTION AT 45° CROSS STITCHING OF SHEAR CRACK IN ARCH STRUCTURAL ELEMENT

SCALE 1 : 5

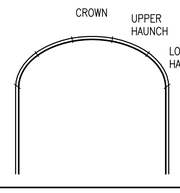
TABLE 1

THICKNESS OF ELEMENT T	DRILLED LENGTH OF HOLES AND BARS INCLUDING POSITION AND INTERSECTION POINT.		
	45°		
RINGS	HOLE H mm	BAR B mm	dp T/2 mm
210 (2)	*197*	*122*	*105*
320 (3)	353	*278*	*160*
430 (4)	508	433	215
540 (5)	664	589	270
650 (6)	819	744	325

(SEE NOTE 3)

THE FIGURES IN ITALICS FAIL TO REACH DESIRED VALUES BUT MAY BE USED WITH EMPLOYERS REPRESENTATIVE'S AGREEMENT.

ADVISED AREA OF REPAIR :



AREA APPROPRIATE FOR DETAILED REPAIR IS SHOWN BY HEAVY LINE.

DESIGN ASSUMPTIONS

a) TO DETERMINE THE FRACTURE STITCHING ARRANGEMENT A NUMBER OF FACTORS NEED TO BE ESTABLISHED.

b) LOCATION
TYPE OF FRACTURE, SHEAR (LONGITUDINAL / STEPPED).
THICKNESS OF STRUCTURAL ELEMENT TO BE DRILLED AND STITCHED.
DRILLING ANGLE OF 45° FROM THE FACE.
THICKNESS ('T') TO BE STITCHED .

c) THE PRESENCE OF WATERPROOFING TO ARCH BACKING THROUGH WHICH PENETRATION MUST BE AVOIDED WHERE POSSIBLE UNLESS DIRECTED BY THE EMPLOYERS REPRESENTATIVE. DRILLING ANGLE OF 45° FROM THE FACE. THICKNESS TO BE STITCHED; CHECK THAT WHEN THE BAR IS IN POSITION THAT IT EXTENDS A MINIMUM 150mm BEYOND THE FRACTURE, THE OPTIMUM LENGTH BEING 300mm. THIS DOES NOT PREVENT GREATER LENGTHS BEING INSTALLED IF REQUIRED AS DIRECTED BY THE EMPLOYERS REPRESENTATIVE. THE MINIMUM LENGTH IS 300mm.

d) LOCATION: REFER TO CONTRACT DRAWING OR INSPECTION REPORT.
TYPE: REFER TO INSPECTION REPORT. DRILLING ANGLE IS DEPENDANT ON THE LOCATION.

e) THICKNESS ('T') OF VERTICAL MEMBERS MUST BE ESTABLISHED BY TRIAL DRILLING. ARCH THICKNESS MUST BE ASSUMED BY MEASURING AGAINST THE NUMBER OF FACE RINGS TO AVOID DAMAGING ANY WATERPROOFING PRESENT. TRIAL DRILLING CAN ONLY BE USED IF DIRECTED BY THE EMPLOYERS REPRESENTATIVE.

f) CALCULATION OF BAR LENGTHS, HOLE DEPTHS AND DRILLING POSITIONS

DEPENDING ON THE TYPE OF FRACTURE UNDER REPAIR THE POSITION OF THE INTERSECTION POINT (IP) MUST BE CONSIDERED. FOR SHEAR FRACTURES THE MOST DESIRABLE POSITION FOR INTERSECTING THE CRACK IS MIDWAY THROUGH THE BREAK. THEREFORE THE ANGLE OF ENTRY MUST BE 45°.

g) SHEAR CRACKS = T/2; DESIRED REPAIR AT MIDWAY IN BREAK.

h) TO ENSURE THAT THE (IP) IS NO LESS THAN 125mm FROM THE FACE OF THE INTRADOS OR FACE OF A VERTICAL MEMBER IT MUST ANCHOR INTO AT LEAST THE SECOND RING OR COURSE.
HAVING DETERMINED THE DRILLING POSITION, THE MINIMUM BAR LENGTH MUST BE 300mm.

i) THE SPACING OR HALF PITCH OF BARS MEASURED LONGITUDINALLY ALONG THE CRACK SHALL BE UNIFORM THROUGHOUT THE LENGTH. THIS WILL BE PROPORTIONAL TO THE DISTANCE FROM (IP) NOMINALLY BETWEEN 250mm AND 500mm.

j) FOR BOTH BRICK & MASONRY APPROXIMATELY 500mm EACH SIDE OF THE CRACK MUST BE CLEANED USING A HIGH PRESSURE WATERJET.

k) THE CRACK AND ANY POOR MORTAR JOINTS WITHIN THE CLEANED AREA TO BE RAKED OUT TO A MIN DEPTH OF 25mm/SOUND MATERIAL AND RE–POINTED BY HAND OR AN APPROVED MECHANICAL METHOD. JOINTS TO BE FULLY MORTARED UP AND STRUCK FLUSH.

l) POINTING TO BE ALLOWED TO OBTAIN SUFFICIENT STRENGTH PRIOR TO THE GROUTING. THIS BEING CARRIED OUT AFTER THE STITCHING PROCESS.

INSTALLATION GUIDANCE

a) HOLES SHALL BE DRILLED, FLUSHED CLEAR OF ALL DUST AND DEBRIS AND WHEREVER REASONABLY PRACTICABLE, BE FORMED THROUGH BRICKS OR MASONRY UNITS AS APPLICABLE AND NOT THROUGH JOINTS.

b) DETAILS OF TOLERANCES WITH RESPECT TO HOLE DIAMETER, LENGTH AND DEVIATION, THE METHOD OF MONITORING HOLE ACCURACY AND ANY CORRECTIVE ACTION SHALL BE INCLUDED IN THE METHOD STATEMENT.

c) THE GROUT TO BE INJECTED AT A PRESSURE AND CONSISTENCY THAT WILL ENSURE THE GROUT TRAVELS AND PERMEATES INTO THE BRICKWORK WITHOUT IMMEDIATELY RUNNING OUT. MINIMISE EXCESSIVE LEAKAGE. GIVE DUE CONSIDERATION TO THE CONDITION OF THE BRICKWORK AND NOT CAUSE 'BLOW–OUT'. CLOSELY MONITOR GROUT 'TAKE' TO MINIMISE LEAKAGE.

d) WHILST GROUT IS STILL 'GREEN' RE–DRILL THE HOLES. INJECT THE ANCHOR GROUT INTO THE HOLE, INSERT THE STITCHING BARS IN THE SAME HOLES. SECURE WITH A TEMPORARY TIMBER BUNG TO PREVENT GROUT LOSS. REMOVE BUNG AFTER SET PERIOD AND POINT UP WITH MORTAR.

NOTES

GENERAL

1. THIS DRAWING SHALL BE USED WHERE CROSS STITCHING & GROUTING IS TO BE UNDERTAKEN FOR SHEAR CRACKS THAT EXIST IN ALL ELEMENTS OF BRICKWORK.

2. WHERE BRICKWORK IN THE VICINITY OF THE CRACK REQUIRES REPLACING REFER TO DRAWING NR/CIV/SD/111.

3. TABLE 1 AT THE FOOT OF THE DRAWING IS A GUIDE FOR THE REQUIRED DEPTHS NEEDED TO ENSURE AN ADEQUATE REPAIR. ALTHOUGH THE VALUES IN ITALICS FOR 2 & 3 COURSES DEEP OR FOR BARREL RINGS, INDICATE INSUFFICIENT ANCHORAGE LENGTH. GENERALLY SUCH SMALL BARRELS WOULD NOT BE FOUND OTHER THAN IN CULVERTS AND DUE TO RESTRICTED ACCESS IT WOULD BE IMPRACTICABLE TO CARRY OUT SUCH REPAIRS.

4. ALL TERMINOLOGY IS BASED ON THAT TYPICALLY USED TO DESCRIBE BRIDGE DEFECTS NOT TUNNEL DEFECTS.

5. THE DIMENSION BETWEEN BAR CENTRES SHALL BE SPECIFIED IN THE PROJECT SPECIFIC FORM B AND /OR AGREED WORK SCOPE.

SPECIFICATION

REFER TO DESIGN ASSUMPTIONS AND SPECIFICATION ON DRAWING NR/CIV/SD/101.

RISK ASSESSMENT

REFER TO DRAWING NR/CIV/SD/101.

Rev	Date	Description of revision	Design'd	C'kd
A	22.06.06	FIRST ISSUE –NR APPROVED	RMA	NGAY
P3	17.03.06	REVISED FORM B.	RMA	NGAY
P2	31.01.06	FORM B ISSUE.	RMA	NGAY
P1	13.01.06	PRELIMINARY DRAFT	RMA	NGAY

Network Rail
40 Melton Street
London NW1 2EE
Tel: 020–7557–8000

	Name	Position	Signature	Date
Approved	P. CLARK	Programme Eng. Manager Civils, MP & I	PC	25.05.06
Authorised	K. TEAGER	Director of Civil Engineering	KT	08.06.06

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CIVIL ENGINEERING STANDARD DESIGN

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BRICK AND MASONRY REPAIR STANDARD DRAWINGS

STITCHING OF SHEAR CRACKS

Scale	AS SHOWN	
Drawing Number	NR/CIV/SD/109	REV. A

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