CONTENTS PAGE BRIDGE REFERENCE CKP/87

REPORT 1

OTHER DOCUMENTS

DRAWINGS

BRITISH RAIL PROPERTY BOARD

BRIDGE ASSESSMENT TO BD21/97

U3129 HILL COTTAGE RAILWAY BRIDGE NO 87



CUMBRIA COUNTY COUNCIL - CONSTRUCTION SERVICES

BD 21/97 LOAD ASSESSMENT REPORT FOR BRITISH RAIL PROPERTY BOARD STRUCTURES

FOR:

U3129

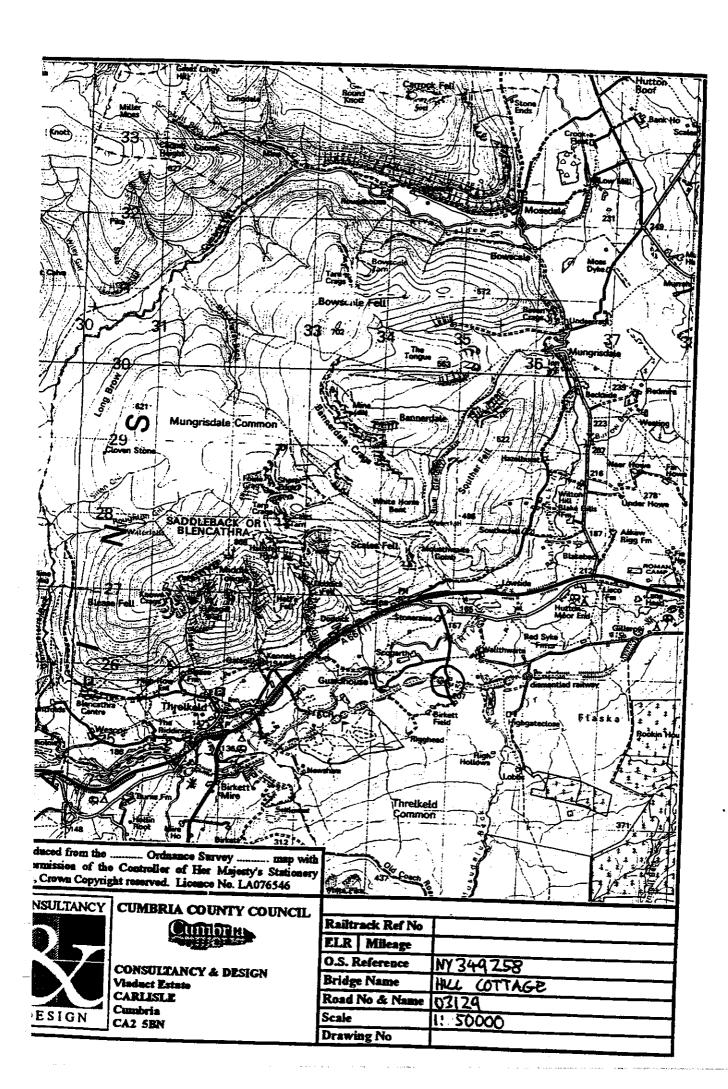
HILL COTTAGE RAILWAY BRIDGE

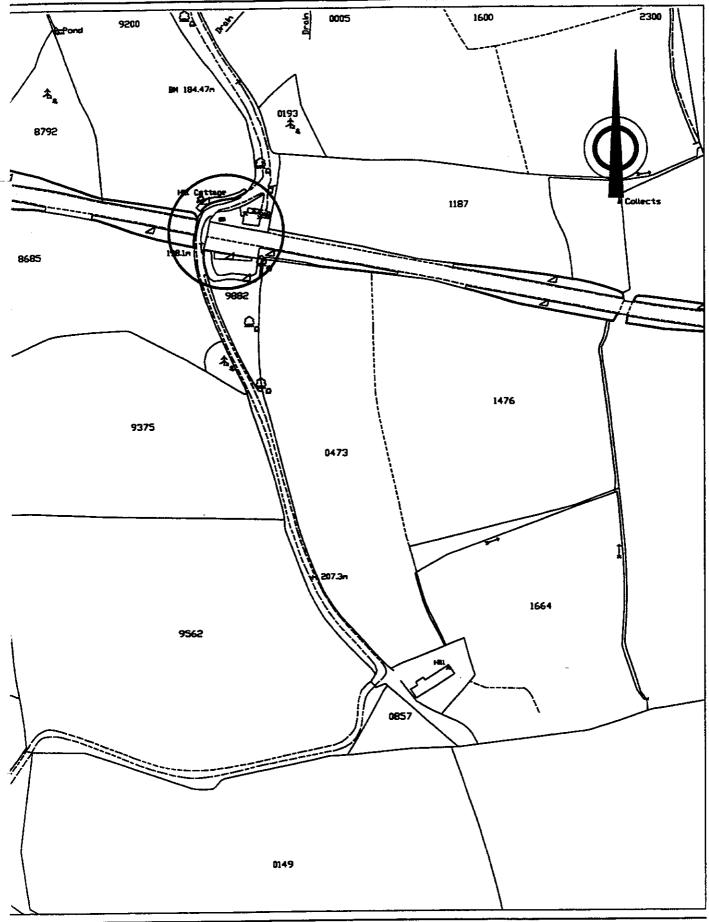
DATE:. Oct 1999

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L.ENT: BRITISH RAI	L PROPERTY BOARD				
CTEME No.: As Quali	ty Plan				
SSESSMENT LIST AP	PENDIX No.: 28		DATE	E D: 25/10/96	
C EQUALITY PLAN R	REF: BG/97/98 (Note: Work is cover	ed by Scheme	e Specific Inst	ruction)	
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		<u>.</u>		CATEG	ORY B
E NED:			Date:	3 NOU	99
(Asses					
F. ROVED:			Date:	3 NOV 9	9
(Team Lead	er)				
A 1E SUBMITTED TO	CLIENT: 3, 1	11-99	•••••		•••••

LOCATION PLAN







CUMBRIA COUNTY COUNCIL



CONSULTANCY & DESIGN Vioduct Estate CARLISLE Cumbrio CA2 58N Reproduced from, or based on, Ordnance Survey map material with the permission of the Controller of Her Mojesty's Stationery Office. Crown Copyright Reserved. Licence No. LA076546

Drawn By JCG	Dote 18/8/99
O.S. Reference	NY 349 258
Structure Name	HILL COTTAGE RAILWAY BRIDGE
Road No. & Name	U3129
Scole	1:2500
Drawing No.	

Explanatory Notes on Completion of Inspection Report Form

everity.

- . No significant defect.
- . Minor defects of a non-urgent nature.
- Defects which should be included for attention within the next annual maintenance programme.
- Severe defects where urgent Client action is recommended for the protection of persons and property.

xtent:

- No significant defect.
- Slight, not more than 5% of length or area affected.
- Moderate, 5% 20% affected.
-) Extensive, more than 20% affected.

loxes for all applicable elements are to be completed, i.e. Extent A Severity 1 represents a 'nil' report.

loxes for non-applicable elements are to be dashed to indicate consideration.

typical form is shown overleaf.

he comments section is to be used to list remedial works and estimated costs. The rear of the form or an arra sheet may be used for continuations.

		SPANS	SINGLE 7.48 SQUARE
SPECTION .23/7/	97		INSPECTED BY
ITEM DESCRIPTION	EXTENT	SEVERITY	COMMENTS/DESCRIPTION OF CONDITION
FOUNDATIONS	A	1	NOT INSPECTED BUT NO SIGN OF ANY MOVEMENT
INVERT OR APRONS	A)	
FENDERS		/	
PIERS/COLUMNS	/	1	
ABUTMENTS	B	3	BINT OF AND MONTHE CRACK IN NORTH AGUSTMENT
WING WALLS	C	2	PRIDINT OPEN/ WORKING 301073 MONTOR N.W JS.W WINGLAM FOR FRETORR M
RETAINING WALLS OR REVETMENTS	_		
APPROACH EMBANKMENTS			
BEARINGS			NOT INSPECTED
MAIN BEAMS	D	2	GROT BLOST AND PEXPAINT ALL VISIBLE CI
TRANSVERSE BEAMS			SIRSACE 5
DIAPHRAGMS OR BRACING		/	
CONCRETE SLAB	/	/	
METAL DECK PLATES			
JACK ARCHES	В	3	REPOINT OPEN SOLATS TO GROWN OF JAM 4
ARCH RING/ARMCO			
SPANDRELS			_
TIE RODS	D	2	CRIT ISLAST AMO REPAINT TO PREVENT FLOTHER
DRAINAGE SYSTEM			SECTION 1035
WATERPROOFING	D	2	YATBE PENGERTION BUIDES THRINGS
SURFACING	A	1	3ACL ARCHES
SERVICE DUCTS			
EXPANSION JOINTS	- 	-	
PARAPETS	D	2	REPOINT OPEN SOWTS, MONITUR FAR FURTHER
ACCESS GANTRIES			MONEMENT
OR WALKWAYS	-+		

, , _{N2} .

CUMBRIA COUNTY COUNCIL - DESIGN SERVICES

BD 21/97 LOAD ASSESSMENT REPORT - RESULTS SUMMARY SHEET

FOR:

U3129

HILL COTTAGE RAILWAY BRIDGE

PAGE No.

OF ...85...PAGES

REV No.

DATE: Oct 1999

The assessment was carried out in accordance with the standards stated in the Approval in Principle Form AA signed by the Client on 8 January 1998.

1. The results of the assessment are as follows:

Hill Cottage Railway Bridge has been assessed in accordance with BD 21/97 and BA16/97 using simple distribution methods for the cast iron beams and the modified MEXE method of assessment for the jack arches.

<u>Element</u>			<u>CASES</u>				Remarks
	1 Gross/enha	nced	2 Gross	3 Nett/enhanced	4 Nett		
Inner beams	Group 1FE		7.5 tonnes	Group 1FE	7.5 tonnes		Stress in bottom flange critical.
Edge beams (Vertical Loading)	7.5tonnes Accidental Vehicle		7.5 tonnes Accidental Vehicle	3 tonnes Accidental Vehicle	3 tonnes Accidental Vehicle	l	Stress in bottom flange critical.
Edge beams		Asse	ssment capacity				Remarks
Horizontal stability Governed by 3 No. 19mm dia wrought iron tie-rods. 3.0 t Vehi		onnes Accidental cle			19m 25m mate asses	acement of 3 No. m dia tie-rods by m dia of similar crial would give ssment capacity of Accidental Vehicle.	

Jack arch

The capacity of the jack arches is 40 tonnes GVW – this is not a governing factor in the Bridge Assessment Capacity.

The weight restriction on the bridge is 3 tonnes gross vehicle weight.

The foundations, abutments, spandrel walls, wing walls, and parapets have all been assessed by visual inspection only, and have been found to be adequate for the current imposed loads.

The parapets do not comply to BD 52/93.

2. Recommendations to increase the assessed capacity are as follows:

(i) Further increase in capacity is possible by use of carbon fibre plate bonding to the bottom flange of all girders. Additional tie-rods would be required to provide adequate stability of the edge girders.

CERTIFICATE OF ASSESSMENT AND CHECKING FORM BA & BAA

APPROVAL IN PRINCIPLE FORM AA

₹ British Railways Board

Group Standard

FORM 'AA' (BRIDGES)

GC/ТР0356

Appendix: 4 Issue: 1 Revision: A

Date: FEB 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

STRUCTURE/LINE NAME HILL COTTAGE RLY N	87
STRUCTURE/LINE NAME	
ELRISTRUCTURE NO. CKP 87	
BRIEF DESCRIPTION OF EXISTING BRIDGE:	

- SINCILE SQUITEE SPAN (APPROX SPAN 7450, APPROX WIDTH 740 Span Arrangement (a)
- 6 NO C. I MAIN BEAMS AT APPROX. 1470 CIS WITH Superstructure Type (b) PRANSVERSE SPANNING BRICK JACK PROHES AND THE BARS.
- Substructure Type (c)

MASS MASONRY ABUTMENTS.

Details of any Special Features (d)

INTERMEDIATE AND EDGE BEAMS ARE OF DIFFERENT SECTION.

ASSESSMENT CRITERIA

Loadings and Speed (a)

NA

Codes to be used (b)

SEE LIST IN APPENDIX B

- Proposed Method of Structural Analysis

 BEAMS 81 BEAN STEPP & SIMPLE ANALYSIS JACK AFOLES BY INCOMES METE METHOD (NOTE: - EXTRAPOLATION FOR SPAN)
- Details of any Special Requirements (d)

STRUCTURAL ASSESSMENT ENGINEER'S COMMENTS

SEE APPENDIX A ATTACHED FOR METE ANALAYSIS OF JACK FROMES DEGUARS LADERDI RESTRAINT 10 PIE EDGE BEAM IS ASSUMED TO BE PRUIDED BY THE THE ROS. WHERE THESE ARE FOUND IN HAVE A SECTION LOST OF 10% OF GREATER OF ASSE MISSING THEY SUBLE BE REPLACED UNDER MAINTENANCE & MAKE THIS INVALYSIS RELEVANT. SPECIAL CARE & NOTE TO BE TAKEN OF ANY HOPIZONIAL DEFLECTION OR CRACKING IN THE ED STE BEAM

FORM 'AA' (BRIDGES)

GC/TP0356

Appendix: 4 Issue: 1 Revision: A Date: FEB 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

CIVIL ENGINEER'S COMMENTS

BRB WORKS GROUP COMMENTS - IF APPL	LICABLE
PROPOSED CATEGORY FOR INDEPENDENT SUPERSTRUCTURE CAT 2 SUBSTRUCTURE VISUAL FOR CURRENT NAME OF CHECKER SUGGESTED IF CAT 2 CATEGORY 1- THE ABOVE ASSESSMENT, WITH AMENDME	NT LAADING OR3
	SIGNED TITLE DATE
CATEGORY 2 AND 3 THE ABOVE ASSESSMENT, WITH AMENDME	NTS SHOWN, IS APPROVED IN PRINCIPLE:
THE ABOVE ASSESSIVELY, WITTH AMERICAN	SIGNED TITLE 16 JANUAR 1997
•	SIGNED

FORM 'AA/1' (BRIDGES)

GC/TP0356

Appendix: 4 Issue: 1 Revision: A

APPROVAL IN PRINCIPLE FOR ASSESSMENT

A f	DDITIONAL INFORMATION REQUIRED FOR BRB OWNED PUBLIC ROAD OVERBRIDGES
AS	SSESSED AS PART OF BRIDGEGUARD III
ST	RUCTURE/LINE NAME HILL COTTAGE RLY Nº 87
	RISTRUCTURE NO. CKP 8.7
SC B	DECK INSPECTION FOR CURRENT LADING, SIMPLE STEIP BURLYSIS FOR DECK INSPECTION FOR CURRENT LADING, SIMPLE STEIP BURLYSIS FOR ZAME IN MUDIFIED MEHE FOR JACK ARCHES TO GIVE CALCULATED CAPACITY
	REMAINDER OF STEUCTURE INSPECTIONS FOR CURRENT LAPONIC
AS	SESSMENT CRITERIA
a)	Standards and Codes of Practice to be used in assessment
	SEE LIST IN APPENDIX B.
b)	Proposed method of structural analysis BEAMS BY BEAM STEIP & SIMPLE ANALYSIS JACK AROHES BY MUDIFIED THEFE METHOD (NOTE: - EXTRAPOLATICA FOR SPAN)
c)	Planned Highway works/modifications at this site
·	TRIAL HOLES WILL BE REQUIRED.
d)	Road designation/class and whether classed as a heavy load route
	U3129 HOT A HEAVY GAD ROUTE.
e)	Any other requirement
The	above is agreed subject to the amendments and comments shown below.
•-	*SIGNED.
	TITLE SPECIANCE MENTERS DATE SPECIANCE MENTERS 9(1(98)
	81:(98
	DATE

^{*}A team leader or chief officer employed by an Agent Authority may sign for and on behalf of ARECOR OF ECONOMY & FORDIRAN MEN. where authorised to do so.

BRPB ASSESSMENTS

APPENDIX A

The use of modified MEXE method for assessment of single span masonry arch bridges with angle of skew 0° up to 20°.

1 FACTORS

BARREL FACTOR Fb as table 3/1 except that:-	
Large coursed sandstone - Good quality workmanship	1.2
Uncoursed masonry (sandstone, limestone, slate) and non-engineering brickwork.	1.0
	0.7
FILL FACTOR Ff as table 3/2. If no settlement or tracking of surfacing.	
JOINT FACTOR Fj Fw, Fmo, Fd as tables 3/3, 3/4, 3/5 respectively.	
CONDITION FACTOR FC	• •
BASIC FACTOR TAKEN AS	0.9
deduct if verge less than approx 0.75m thus allowing wheel load near edge.	-0.1
Earther deductions where appropriate (eg flaking or exfoliating masonry, isolated area of	

2 DIMENSIONS

open joints).

SPAN. Use skew span for L.

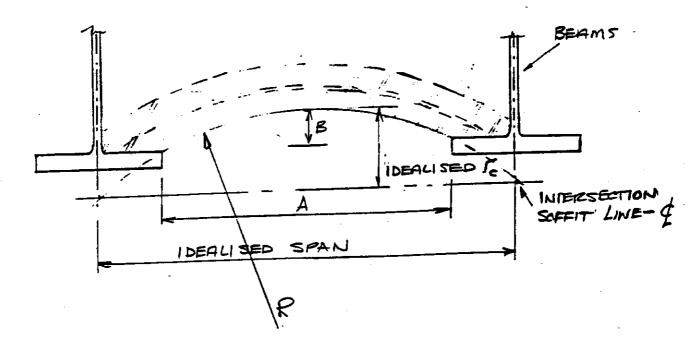
BARREL AND DEPTH OF COVER. In the absence of definite information from BR regarding 'd' the barrel thickness a figure of 2/3 of the depth of the edge voussoirs is taken, and the depth of fill limited to a maximum of the voussoir depth. If the structure passes the 40t assessment, no further investigation is deemed necessary. If fails (but would pass with d = voussoir thickness) then trial holes would be made over the crown of the arch to determine the actual barrel thickness.

3 CALCULATIONS

The the modified MEXE calculation is mounted on CASIO FX-730P personal computers which are monitored under the County Council's quality assurance scheme.

ANALYSIS OF JACK HECHES

ANALYSIS BY MODIFIED METHOD



THE DIMENSIONS A & B to BE TAKEN ON SITE AND USED TO CALCULATE R.

THE IDEALISED [AND [DECLULATED USING R AND THE IDEALISED SPAN.

THE JACK APCH THICKNESS TO BE DETERMINED BY REFERENCE TO PREJIOUS ASSESSMENT TRIAL HOLES OR OTHER SUITABLE METHODS

CUMBRIA COUNTY COUNCIL-CONSTRUCTION SERVICES LOAD ASSESSMENT PROGRAMME FOR STRUCTURES DESIGN BASIS STATEMENT - APPENDIX DBSC 1

STANDARD CODE	OF PRA	CTICE ANI	<u> REFERENCE</u>
DOCUMENT	IS USED	FOR ASSES	SMENT

Λ	nto.

Erase references not applicable)

APP.DBSC I
PAGEof
REV No
DATE:

	(IVOIE.	Elime rejerences not approactor	
A.	MANDAT	ORY DOCUMENTS	<u>Dated</u>
	BD 16/82	Design of Composite Bridges - Use of BS 5400 Pt 5:1979	Nov 1982
	DD 10,02	Amendment No. 1	Dec 1987
	BD 24/92	The Design of Concrete Bridges - Use of BS 5400: Pt 4: 1990	Nov 1992
	BD 37/88	Loads for Highway Bridges	Aug 1989
	BD 2/89	Technical Approval of Highway Structures on Motorways and	li di
	رن ب ند رون -	Other Trunk Roads. Part 1 - General Procedures	Oct 1989
	BS 5400	Steel, Concrete and Composite Bridges	1000
		Part 3: 1982 - CP for Design of Steel Bridges (see BD 13/90)	1982
		Part 4: 1990 - CP for Design of Concrete Bridges (see BD 24/92)	1990
		Part 5: 1979 - CP for Design of Composite Bridges (see BD16/82)	1979
	BD 13/90	The Design of Steel Bridges - Use of BS 5400: Part 3: 1982	Feb 1991
	BD 34/90	Technical Requirements for the Assessment and Strengthening	
		Programme for Highway Structures - Stage 1 - Older, Short Span	
	•	Bridges and Retaining Structures	Sept 1990
	BD 44/95	The Assessment of Concrete Highway Bridges and Structures	Jan 1995
	BD 52/93	The Design of Highway Bridge Parapets	April 1993
	BD 48/93	The Assessment and Strengthening of Highway Bridge Supports	June 1993
	BD 21/97	The Assessment of Highways Bridges and Structures	Feb 1997
	~ -	Amendment No. 1	Aug 1987
	BD 63/94	The Inspection of Highway Structures	Oct 1994
	BD 31/87	Buried Concrete Box Type Structures	Jan 1988
B.	ADVICE N	NOTES AND OTHER REFERENCE DOCUMENTS	
2.		references as appropriate)	
	BA 39/93	Assessment of Reinforced Concrete Half Joints	April 1993
	BA 32/89	Technical Approval of Highway structures on Motorways and	
		other Trunk Roads. Part 1 - General Procedures	Oct 1989
	BA 16/97	The Assessment of Highway Bridges and Structures	May 1997
		Amendment No. 1	Nov 1997
	BA 55/94	The Assessment of Bridge Substructures and Foundations,	1004
		Retaining Walls and Buried Structures	1994 Nov 1997
		Amendment No. 1	
		61/8 Assessment of Buried Concrete Box Structures - HA Letter	29 May 1997 Oct 1994
	BA 63/94	The Inspection of Highway Structures	OCI 1994
	BA 44/96	The Use of BD 44/95 - The Assessment of Concrete Highway	Nov 1996
		Bridges and Structures	1107 1770
	BS 8110	Structural Use of Concrete	March 1997
		Part 1: Code of Practice for Design and Construction	1984
	Bridge Insp	ection Guide (HMSO ISBN 0 11 550638 1)	1704

C. <u>LIST ANY DEPARTURES FROM STANDARDS</u>

(Note: To be fully documented in the Report)

Group Standard

FORM 'BA' (BRIDGES)

Appendix: 5 Issue: 1 Revision: A Date: FEB 93

CERTIFICATION FOR ASSESSMENT CHECK

I certify that reasonable professional skill and care have been used in the assessment of the above structure with a view to securing that:

- It has been assessed in accordance with the Approval in Principle (where appropriate) as recorded on Form AA approved on ..8./.1/8..... (DATE).
- It has been checked for compliance with the following principal British Standards, Codes of (2)Practice, BR Technical notes and Assessment standards.

List any departures from the above, and additional methods or criteria adopted, with reference and justification for their acceptance (commenting on the results if appropriate).

CATEGORY 1

SIGNATURE NAME

(ASSESSOR)

5/10/99 (DATE)

(ASSESSMENT CHECKER) 3 1 99 (DATE)

PARTNER OF THE FIRM OF CONSULTING ENGINEERS TO WHOM ASSESSOR/ CHECKER IS RESPONSIBLE 3/11/14 (DATE)

CATEGORY 2 AND 3 (NOTE: CATEGORY 1 CHECK MUST ALSO BE SIGNED)

ASSESSMENT (a)

NAME **SIGNATURE**



(ASSESSOR)

slie 99 (DATE)

BRB SECTION ENGINEER OR THE PARTNER IN FIRM OF CONSULTING ENGINEERS TO WHOM ASSESSOR IS RESPONSIBLE (DATE) 3 | 11 | 49

CHECK (b)

> SIGNATURE NAME

> 11/97 (ASSESSMENT CHECKER)

BRB SECTION ENGINEER OR THE PARTNER IN FIRM OF CONSULTING ENGINEERS TO WHOM CHECKER IS RESPONSIBLE

THE CERTIFICATE IS ACCEPTED BY

FORM 'BAA' (BRIDGES)

GC/TP0356

Appendix: 6
Issue: 1
Revision: A

Date: FEB 93

CERTIFICATION FOR ASSESSMENT CHECK

NOTIFIC.	<u>ATION OF</u>	<u>ASSESSMENT</u>	<u> CHECK</u>

The above bridge has been assessed and checked in accordance with Standards which are listed on the appended Form BA. A summary of the results of the assessment in terms of capacity and restrictions is as follows:

STATEMENT OF CAPACITY

..... 3..... tonnes

Critical member/s:

ETGE BEAMS + ME ACOS

RECOMMENDED LOADING RESTRICTIONS

3T GUW

DESCRIPTION OF STRUCTURAL DEFICIENCIES AND RECOMMENDED STRENGTHENING

Name:

Structural Assessment Engineer

Name:

Civil Engineer

FOR: U3129 HELL COTTAGE RAILWAY BRIDGE No 87
INSPECTION AND SURVEY INFORMATION (WRITTEN REPORT)

ASSESSMENT TO BD 21/97 INSPECTION AND SURVEY INFORMATION



PAGE No. 15

OF&PAGES

REV No. 0

DATE: Aug 1997

FOR U3129 (ROUTE) HILL COTTAGE RAILWAY BRIDGE (STRUCTURE)

SPECTION AND SURVEY INFORMATION

ACTION

ENERAL

ill Cottage Railway Bridge comprises of a 7.48m single span, cast iron beam and brick jack ch deck supported on stone masonry abutments, carrying the U3129 over a disused railway to 2.75km east of the village of Threlkeld.

1e structure can be located at Ordnance Survey Reference NY 349 258.

spection of the structure was carried out on 23 July 1997 using a 7.5m aluminium extension dder. The weather was warm and sunny on the day of the inspection.

OUNDATIONS (Item No 1)

spection of the bridge did not reveal any undue signs of movement or settlement that would dicate any inadequacies in the foundations. It can therefore be assumed that the foundations e sound and that they are adequate to support the present imposed loading.

IVERT/TRACKBED (Item No 2)

ne original railway line and ballast had been recovered and the trackbed returned to ricultural use.

BUTMENTS (Item No 5)

ne abutments were constructed from random coursed rockfaced sandstone masonry. Both of hich followed a satisfactory alignment. 5% of the mortar joints to both abutments were open inted or cracked randomly over the abutment area, no significant deterioration of the ndstone elements was noted (See Photo Nos 3 and 4). A 3mm wide vertical crack was present nning the full height of the north abutment (See Photo No 5) mainly in the mortar joints.

Repoint open/ cracked joints Repoint cracked joints monitor for further movement

ONGITUDINAL CAST IRON BEAMS (Item No 10)

was only possible to inspect the outside face of the edge beams and the underside of the ternal beams due to the nature of this type of jack arch construction.

the paint protection to all the visible faces of the cast iron beams was at the end of its life, owing surface corrosion to develop which was particularly heavy to the bottom flanges of the arms, no significant section loss was noted (See Photo No 6). Water staining and leachate posits were evident at random to varying extents to the underside of all the beams (See Photo 7).

Grit blast Repaint beams

No tie rods were present to each of the end bays, all of which were intact but heavily corroded th a minimum section of 19mm\$\phi\$ (See Photo No 8).

Grit blast Repaint ties



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OFEPAGES

REV No. 0

DATE: Aug 1997

FOR U3129 (ROUTE) HILL COTTAGE RAILWAY BRIDGE (STRUCTURE)

UCK JACK ARCHES (Item No 15)

e 5 No common brick jack arches spanning between the main longitudinal beams were all the ne construction and followed a good uniform profile.

avy leachate staining was evident to the two edge jack arches that were below the soft verge as of the bridge (See Photo No 6). Apart from the occasional random isolated open or cked joint the first, second, third and fifth jack arches from the west were satisfactorily inted. The crown joint on the fourth jack arch from the west was largely unpointed and heavy chate deposits were emitting from the joint (See Photo No 9).

Repoint open joints

INGWALLS (Item No 6)

ndom coursed rockfaced sandstone masonry wingwalls were provided to each corner of the acture.

ndom cracked and open joints were present throughout the S.W. wingwall, in particular in the ne of influence of the edge beam (See Photo No 10). The coping bed and perp joints were en or cracked for the majority of the wingwall length. The south end of the wingwall over a length was being displaced by up to 50mm (See Photo No 11) probably due to a nbination of passive earth pressure and the trees present behind the wall.

cracked joints.
Rebuild displaced
section of
wingwall

Repoint open/

e N.W. wingwall followed a good alignment and was satisfactorily pointed apart from the assional isolated open or cracked joint. The copings to this wingwall were being displaced by to 100mm outwards (See Photo No 12).

Repoint open/ cracked joints. Rebed displaced copings Repoint open/ cracked joints Remove tree

e S.E. wingwall followed a good alignment and was satisfactorily pointed apart from the casional isolated open or cracked joint. A small tree was becoming established within the ngwall construction 1.5m from the abutment face, 1.8m above ground level (See Photo No).

Rebed copings
Remove vegetation
Repoint cracked
masonry/joints
Monitor for further
movement

e N.E. wingwall followed a good alignment and was satisfactorily pointed. The copings were coming dislodged and vegetation was starting to become established in the joints (See Photo 14). Cracking up to 4mm wide was evident to the two courses of masonry below the north 1 of the west edge beam and in the mortar joints for two courses below this level (See Photo 15).



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REV No. 0

DATE: Aug 1997

ACTION

FOR U3129 (ROUTE) HILL COTTAGE RAILWAY BRIDGE (STRUCTURE)

INSPECTION AND SURVEY INFORMATION

PARAPETS (Item No 24)

Random coursed rockfaced sandstone parapets with flat topped copings were provided to both ides of the structure.

The east parapet was leaning outwards by up to 75mm at mid span. Random cracked mortar oints were present throughout the parapet length with the occasional isolated open joint (See _'hoto No 16). Slippage down the curved edge of the beam has resulted in the mortar joints becoming cracked up to 4mm wide at the north end of the parapet (See Photo No 17).

Repoint open/ cracked joints Monitor for further movement

The west parapet was leaning outwards by up to 100mm at mid span (See Photo No 18). The parapet was generally well pointed apart from the occasional random cracked or open joint.

Repoint open/ cracked joints

CARRIAGEWAY (Item No 21)

The surface dressed carriageway was found to be in a satisfactory condition over the bridge.

Cumbria County Council
CONSTRUCTION SERVICES Sheet No. 18 ULTANCY 85 Sheets Consultancy & Design Work Sheet Rev. No. O Scheme Ref. Date Prepared Prepared by An 6 97
Date Checked
Oct 99 BRTISH RAIL PROPERTY BOARD C1461 437 T.0 Joblog No. Element / Item 23342 HILL COTTAGE RALWAY BRIDGE Output / **CALCULATIONS / WORK** Remarks INFORMATION HOUSE 7-400 AMMENT 1.067 0-978 7-067 0.997 1-060 30ch ARCH SACH SACK BACK 11 Raps ARCH ARCH SALK 21 ARCH ARCH ENO CAST TRON BEAMS P.L.4 RL= 9 RL = 9" RL=9" R.L= 9' ADVINENT 7.450 DECK PLAN 200 ADMINENT FACE

Cumbria County Council
CONSTRUCTION SERVICES Sheet No. 19 JLTANCY 85 Sheets Consultancy & Design Work Sheet Rev. No. O Scheme Ref. Date Prepared Prepared by BRAISH RAIL PROPERTY BOARD C1461437
Element / Item Joblog No. AUG 97 T.0 Date Checked Oct ' 99 Checked by HILL COTTAGE RAILLY BRIDGE 23342 Output / **CALCULATIONS/WORK** Remarks 019.0

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	<u> </u>	- 508.							
					1.07-		!		
		Schancerent	foctor	- <u>D</u> =	1-270				
			foctor	- <u>D</u> =	1.270				
		Schancerent	foctor		1.270				

No. C&D C/DEST Rev A (5/96)

ASSESSMENT TO BD 21/97 CALCULATIONS



CUMBRIA COUNTY COUNCIL - CONSTRUCTION SERVICES

ROUTE No: U3129

STR NAME: HILL COTTAGE RAILWAY BRIDGE

LOAD ASSESSMENT PROGRAMME FOR BRITISH RAIL PROPERTY BOARD STRUCTURES DESIGN BASIS STATEMENT AND CALCULATIONS FIRST SHEET Date Prepared:
() t ' 29

Date Checked:

Qet '99

Checked by:

. NAME OF ASSESSOR

. NAME OF CHECKER



- . <u>CHECK CATEGORY</u> C2/I (MS-04/03)
- . PURPOSE OF CALCULATIONS

BD 21/97 ASSESSMENT FOR:-

- a) C & U VEHICULAR LOADING
- b) PROPOSED EC 40T LOADING

ASSESSMENT OF TYPE HB LOADING CAPACITY FOR A SINGLE VEHICLE ON THE BRIDGE ONLY (WITH THE EXCEPTION OF MASONRY ARCH BRIDGES AND ALL U ROAD BRIDGES)

STANDARDS, CODES OF PRACTICE AND REFERENCE DOCUMENTS USED

FOR ASSESSMENT (Erase as appropriate)

SEE APPENDIX DBSC1 OVERLEAF

SEE APPROVAL IN PRINCIPLE FORM TAT AA

. SOURCES OF INPUT DATA

SITE SURVEY AND INSPECTION DATA

RECORD DRAWINGS - C37/87 & C37/94 IN APPENDIX.

. <u>DESCRIPTION OF METHODS OF ANALYSIS AND DETAILS OF COMPUTER PROGRAMS USED</u>

SCALE PROGRAM 650 (SECTIONAL PROPERTIES)

SIMPLE DISTRIBUTION HETHODS TO BA 16/97.

"THE STRENGTH OF CAST IRON RRIDGES" - REF 6 80 21/97.

REVIEW AND VERIFICATION OF ASSESSMENT BY TEAM LEADER

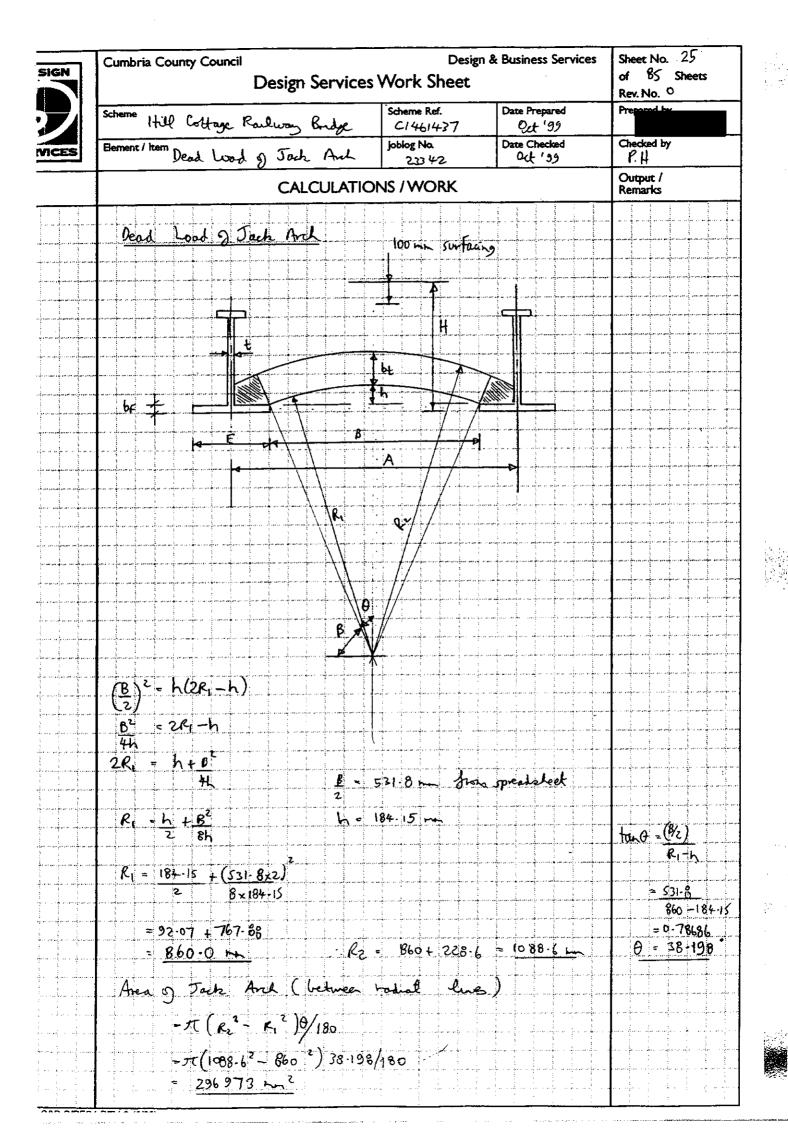
The assessment output meets above requirements

Signed		Date	e 3 Nov 99
Name	•••••		
Comme	nts	Sally Leky	

	A DD DDCC
CUMBRIA COUNTY COUNCIL - CONSTRUCTION SERVICES	APP.DBSC 1
LOAD ASSESSMENT PROGRAMME FOR STRUCTURES DESIGN BASIS STATEMENT - APPENDIX DBSC 1	PAGE 23 of 85
STANDARD CODE OF PRACTICE AND REFERENCE	REV No. 0
DOCUMENTS USED FOR ASSESSMENT	DATE:Oct 99
(Note: Strike out references not applicable)	
	_
MANDATORY DOCUMENTS	<u>Dated</u>
BD-16/82 Design of Composite Bridges - Use of BS 5400 Pt 5:1979	Nov 1982
Amendment No. 1	Dec 1987
BD 24/92 The Design of Concrete Bridges Use of BS 5400: Pt 4: 1990	Nov 1992
BD 37/88 Loads for Highway Bridges	Aug 1989
BD 2/89 Technical Approval of Highway Structures on Motorways and	
Other Trunk Roads. Part 1 General Procedures	Oct 1989
BS 5400 Steel, Concrete and Composite Bridges	
Part 3: 1982 - CP for Design of Steel Bridges (see BD 13/90)	1982
Part 4: 1990 - CP for Design of Concrete Bridges (see BD 24/92)	1990
Part 5: 1979 CP for Design of Composite Bridges (see BD16/82)	1979
BD 13/90 The Design of Steel Bridges Use of BS 5400: Part 3: 1982	Feb 1991
BD 34/90 Technical Requirements for the Assessment and Strengthening	
Programme for Highway Structures - Stage 1 - Older, Short Span	
Bridges and Retaining Structures	Sept 1990
BD 44/95 The Assessment of Concrete Highway Bridges and Structures	Jan 1995
BD 52/93 The Design of Highway Bridge Parapets	April 1993
BD 48/93 The Assessment and Strengthening of Highway Bridge Supports	June 1993
BD 21/97 The Assessment of Highways Bridges and Structures	Feb 1997
Amendment No. 1	Aug 1997
BD 63/94 The Inspection of Highway Structures	Oct 1994
	Jan 1988
BD 31/87 Buried Concrete Box Type Structures	344 1700
ADVICE NOTES AND OTHER REFERENCE DOCUMENTS	
(Note: Add references as appropriate)	
BA 39/93 Assessment of Reinforced Concrete Half Joints	April 1993
BA 32/89 Technical Approval of Highway structures on Motorways and	
other Trunk Roads. Part 1 General Procedures	Oct 1989
BA 16/97 The Assessment of Highway Bridges and Structures	_ May 1997
Amendment No. 1	Nov 1997
BA 55/94 The Assessment of Bridge Substructures and Foundations,	
Retaining Walls and Buried Structures	1994
Amendment No. 1	Nov 1997
NNMD 34/61/8 Assessment of Buried Concrete Box Structures - HA Letter	29 May-1997
BA 63/94 The Inspection of Highway Structures	Oct 1994
BA 44/96 The Use of BD 44/95 The Assessment of Concrete Highway	
Bridges and Structures	Nov 1996
BS 8110 Structural Use of Concrete	
Part 1: Code of Practice for Design and Construction	March 1997
Bridge Inspection Guide (HMSO ISBN 0 11 550638 1)	1984
Dide imposion data (mino inpri o il socco i)	

LIST ANY DEPARTURES FROM STANDARDS (Note: To be fully documented in the Report)

1 1	Cumbria County Council				
	Design Services	Design Services Work Sheet			
	Scheme Hill Cottage Roulway Bridge	Scheme Ref. C1461 437	Date Prepared Oct 199	Prepared by	
	Element / Item Index	Joblog No. 23342	Date Checked Oct 199	P. 14	
_	CALCULATIO			Output / Remarks	
	Idex of Calculations				
	Index 9 calculations		Seet		
	Contents		ret		
<u>.</u>	Dead Load of Jack arch		25 to 27		
	Section Properties of Cast Iron - Internal Gross Section:	Beam	28 to 30		
	- Internal Gross Section:		20 40 30		
	Cui Palli oritta	R.L.	31 +0 33		
	Section Properties of Cast Iron -Internal Nett section				
	Live Loading using lumple		34 to 35		
	Perhation Methodo				
	Special of the internal bear		36 to 41		
	specialization for internal ceal	٠			
	Single weel ade loading		42		
	surey details for edge	beam	43		
. .	Couling Proposition of East Iron	Bean	44 + 46		
	Section Proporties of East Iron - Edge, Gross Section				
			1.2		
	Section Proportion of Cart Iron Edge, Nett section	Bern	47 3 49		
. 	tage, Nett section				
	Aurdental Loading for Edge	Beam Itch dead	1 loads 50 to 60		
	No.		61 +0 62		
	MEXE for Josh Arch				
	and for wrought won tie -	rolo to end bo	y 67 to 66		
	Result Summony I reet		67		
	leone amount and				
					
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* .					
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GN	Cumbria County Council Design Services	Sheet No. 246 of 85 Sheets Rev. No. 0		
	Scheme II i) Cotto Co Radiona Roda	Scheme Ref.	Date Prepared Oct '99	Proposed by
	Bernent / Item lead Load of Jack Arch	C1461437 joblog No.	Date Checked	Checked by
		533.45	Oct '99	CH Output /
	CALCULATIO	ONS / WORK		Remarks
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	[e v / /ie			
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d bt	a.e. U = (be cosp x be as px0.3)	, , , , , , , , , , , , , , , , , , , ,		
L	area 0 = ce/2			
<u> </u>				
	- C*			
. <u> </u>	24. F			
	area 0 = (E-1 - bt co B) · 1			
	area 0 = (F-4 - bt cop) 1 2 Jun 8			
	area 3 = (b-e)c = (b+sin B =	<u>د</u>) C		$\beta = 90^{\circ} - \theta$,
	*	2ηβ/		=95°-38-198°
	Area (1) = 0.5 x 228.6 x 0.61838,	a 785 82		<u>₹ 51 -802</u> °
	Mar 10 = 0.2 x 558.6 x 0.81339			C=8 = 0.61838
	= 12698, }			S-B = 0-78588
		, 2		tan B= 1-27086
	Area (2) = (406 4 - 38-1) - 228-6 ×	0.61838)		
	2	J 2	d-27086	.
	(10.15-141) 212			
	= (184-15 - 141-36)			
	2.5472 = 720.4 m			
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	Cumbria County Council		_	& Business Services	Sheet No. 27
SIGN		Design Services	Work Sheet		of gs Sheets
				Date Prepared	Rev. No. 0
	Scheme Hill Cottage Row	Iway Bridge	Scheme Ref. Cl461 437	0 + 132	
ICES	Bernent / Item Read Load		joblog No. 23342	Date Checked Oct 199	Checked by
	FEMA COURT	CALCULATIO	<u> </u>		Output / Remarks
		CAECOLITIO			
	- /c /	1.6-6			
	$C = \left(\frac{E-t}{2}\right) - \frac{1}{2}$				
	= 406.4-3	81) -228-6 × 0.6	838		
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,	= 184.15 -				
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			21000		
<u> </u>	-(170.10	- 33-67) 42.79			
	= 17:03	- 33-617 76 7	and the second s		
ļ <u> </u>	+ 6247				
<u> </u>					
	· Area of tout	arch over blas	e - 2 (Areas O	+ (0+(0)	
			-2/12698+	720 +6247)	
			- 39330?		
ļ ļļ	- Total Area	of Jack And	- 296973+		
			336363 ·		
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Andreas American					1
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	and the second s		ه ، مؤسسه ، به ، ساس .		
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				and the common of the contract of the	and the control of the second

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ESIGN	Cumbria County Council Design & Business Services Design & Business Services Design & Business Services			Sheet No. 28 of 85 Sheets Rev. No. 0			
27	Scheme Hill Cortage	Railway Bridge	Scheme Ref. C 146 1437	Date Prepared Oct 199	Prepared by		
RVICES	Element / Item Section Pro	nestes of Beam.	Joblog No. 23342	Date Checked Out '99	Checked by P. H.		
_de		CALCULATIO			Output / Remarks		
	Section Property	as g Cost	Iron Bean C.	Internal)	GROSS -SECTION		
		101.6					
	38-1						
		8 9					
	4	9 10 5 6 6 6 6 6 6 6 6 6					
	425-45						
		28-11-		508	(20")		
	(e)	•	⊣				
	#45 M] \(\)				
	#4-45 MB	406-4					
]		4				
	Sale program 6	50 (Sectional	Propertie)				
		$C \perp T R$	A A A =	38145 _ 2			
		Cart Iron B					
	Neutral axis	above bose, Y	L = 169·43	H			
	Cara I Ma	eut 9 Area , I	- 1-1594	V109 m 4			
	Second I (on	aa y Alea , s					
				–			
	Details of Bears	- rejer to	No C3118	1 in ve			
	Armendix - th	en relens to	Dry No C37	194 (also in			
	De Appendix)						
en e							
- 1							
No. C&D C/DES	1 REV C (6/99)		<u> </u>	<u> </u>			

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k to ex

29 OF 85

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES INTERNAL BEAM (GROSS-SECTION)

Page: 1 Made by: PH

Date: 01.10.99

Ref No:

Office: 5598

Location: INTERNAL BEAM @Midspan=508mm

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

	Coordi	nate	S	of points in	order:	
	Point			X-coordinate		x(1) = 0 mm
		_	•	Y-coordinate		y(1)=0 mm
	Point	2	:	X-coordinate		x(2) = 406.4 mm
				Y-coordinate		y(2)=0 mm
	Point	3	:	X-coordinate		x(3) = 406.4 mm
. س				Y-coordinate		y(3) = 44.45 mm
	Point	4	:	X-coordinate		x(4) = 222.25 mm
				Y-coordinate		y(4) = 44.45 mm
	Point	5	:	X-coordinate		x(5) = 222.25 mm
				Y-coordinate		y(5) = 469.9 mm
	Point	6	:	X-coordinate		x(6) = 254 mm
				Y-coordinate		y(6) = 469.9 mm
	Point	7	:	X-coordinate		x(7) = 254 mm
				Y-coordinate		y(7) = 508 mm
	Point	8 .	:	X-coordinate		x(8) = 152.4 mm
				Y-coordinate		y(8) = 508 mm
	Point	9	:	X-coordinate		x(9) = 152.4 mm
				Y-coordinate		y(9) = 469.9 mm
	Point	10	:	X-coordinate		x(10) = 184.15 mm
				Y-coordinate		y(10) = 469.9 mm
	Point	11	:	X-coordinate		x(11) = 184.15 mm
				Y-coordinate		y(11) = 44.45 mm
_	Point	12	:	X-coordinate		x(12) = 0 mm
				Y-coordinate		y(12) = 44.45 mm
	Point	13		X-coordinate		x(13) = 0 mm
				Y-coordinate		y(13)=0 mm

Sectional properties

Cross-sectional area

38145 mm²

30 OF 85

2

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87

LONGITUDINAL BEAMS (CI) SECTION PROPERTIES

INTERNAL BEAM (GROSS - SECTION)

Page:

Made by: PH

Date:

01.10.99

Ref No:

Office: 5598

Second moments of area (inertias) Ixx=1.1594E+9 mm4

Iyy=253919597 mm4

Product of inertia dA.xy

Ixy=0.71526E-6 mm4

Distance of centroid from origin X=203.2 mm

Y=169.43 mm

~X and Y are principal axes.

No650

3000

$$\frac{7}{169.43} = \frac{1.1594 \times 10^9}{169.43} = 6842944 \text{ mm}^3$$

$$\frac{7}{2c} = \frac{1 \times x}{(508 - 169.43)}$$

$$= \frac{1.1594 \times 10^9}{338.57}$$

$$= 3424403 \text{ mm}^3$$

ESIGN	Cumbria County Cou	Design Services	•	k Business Services	Sheet No. 31' of 85 Sheets Rev. No. 9
2/	Scheme Hul Cottag	e Roulway Bondge	Scheme Ref. C1461437	Date Prepared Qt '99	Prepared by
RVICES	M	- Properties of Bean	Johlan Nia	Date Checked Oct '99	Checked by
_ le		CALCULATIO		<u> </u>	Output / Remarks
	Section Property	un of Cost Iron	Bean I her		NETT -
		CA: 1 4 1 1			
-		Chart that N			
	toke of 2	5 in anough peri	aler of hosto	- Hays	
	from Gross !	section :			
	38. Lm	0			
		ש			
	4	9 9 0 6			
				S05-5 has	
	427 95,			303.3 111	
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	39.45.	%	©		
_		401.4			
-					
	Jeale Progra	in 650 (Sextimal	Propostie)		
		, Got Tron Bear		- e	
	Neutral ax	is above boose .Y	. 175.7	l ha	
	Second Mome	t of Alea, Inc	+ 1.1089 x1	09 mm *	
-					
-					
lo. C&D C/DES1	REV C (6/99)	<u>. — · · · · · · · · · · · · · · · · · · </u>			· · · · · · · · · · · · · · · · · · ·

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pE 1

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES INTERNAL BEAM (NETT SECTION) Page: 1 Made by: PH

Date: 01.10.99

Ref No:

Office: 5598

Location: INTERNAL BEAM @ Midspan=505.5mm

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordinates	οf	points	in	order:

COOL a.		or bornes in order.	
Point	1 :	X-coordinate	x(1) = 0 mm
***		Y-coordinate	y(1)=0 mm
Point	2 :	X-coordinate	x(2) = 401.4 mm
		Y-coordinate	y(2)=0 mm
Point	3 :	X-coordinate	x(3) = 401.4 mm
<i>~</i> .		Y-coordinate	y(3)=39.45 mm
Point	4 :	X-coordinate	x(4) = 219.75 mm
		Y-coordinate	y(4) = 39.45 mm
_Point	5 :	X-coordinate	x(5) = 219.75 mm
		Y-coordinate	y(5)=467.4 mm
Point	6 :	X-coordinate	x(6) = 251.5 mm
		Y-coordinate	y(6)=467.4 mm
Point	7:	X-coordinate	x(7) = 251.5 mm
		Y-coordinate	y(7) = 505.5 mm
Point	8 :	X-coordinate	x(8) = 149.9 mm
		Y-coordinate	y(8) = 505.5 mm
Point	9:	X-coordinate	x(9) = 149.9 mm
		Y-coordinate	y(9) = 467.4 mm
Point	10 :	X-coordinate	x(10) = 181.65 mm
		Y-coordinate	y(10)=467.4 mm
Point	11 :	X-coordinate	x(11) = 181.65 mm
		Y-coordinate	y(11)=39.45 mm
-Point	12 :	X-coordinate	x(12) = 0 mm
		Y-coordinate	y(12)=39.45 mm
Point	13 :	X-coordinate	x(13) = 0 mm
_		Y-coordinate	y(13) = 0 mm

Sectional properties

Cross-sectional area

36011 mm²

33 OF 85

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87

LONGITUDINAL BEAMS (CI) SECTION PROPERTIES
INTERNAL BEAM (NETT SECTION)

Page: Made by:

PН

2

Date: 01

Ref No:

01.10.99

Office:

5598

Second moments of area (inertias) Ixx=1.1089E+9 mm4

Iyy=217919155 mm4

Product of inertia dA.xy

Ixy=-0.47684E-6 mm4

Distance of centroid from origin X=200.7 mm

X = 200.7 mmY = 175.71 mm

-X and Y are principal axes.

No650

.

 $Z_{t} = I_{xx}/_{175.71}$

= 1.1089 × 109

= 6310967 hum

Zc = Ixx/(505.5-175.71)

= 1-1089 x102

= 3362443 mm³

ESIGN	Cumbria County Council Design Se	Sheet No. 34 of 85 Sheets Rev. No. 0		
2/	Scheme U3129 Hill GHage	Scheme Ref. C1461437	Date Prepared Oct 195	Prepared by
RVICES	Element / Item Live Loading	Joblog No. 2 33 42	Date Checked Oct 199	Checked by
-le		LATIONS / WORK		Output / Remarks
-	Crear Span = 7.480m			
	BD 44/95 Clause 5.3.1.1.	Effective span		
_	(c) the distance between	the centraria of the		
	bearing beaute diagra			
	-depth & bean lin	kind) at mid-s	pan is 508	
	effecture span = 2×50	8 + 7480		
	3			
	÷7.82 m			
	Conceaseway with	2-80 m		
-	No. of notional lana	F (No .		
	Non HA W	= 336(1)		
		- 84 70 Holm		
	Non KEL lone	- 120HV		
	Adjustment factor for loaded lands	= 1:46		
	< 20 ⊾			
	Alguses UDL =	84-70 - 58-01 t 1-46	Nh per lone	(g 2.5m width)
	"	120 ± 82.19	kw lano	(_
		1.44		
	Mu = wil + wil			
	- 60 01 - 60	22 10 7 82		
	= 58.01 ×7.82 +	6C-15×1.0C		
	= 443 43 + 160	.08		
ر د بلسمان برساند د . معالف سال بالمان با				
	= 604-11 km m	2.5 m lane		
No. C&D C/DES	1 REV C (6/99)			

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ESIGN	Cumbria County Council Design Services		Business Services	Sheet No. 35 of 85 Sheets Rev. No. 0
2	Scheme U3129 Hill Cottage	Scheme Ref. C1461437	Date Prepared Oct '99.	Precared by
RVICES	Simple Distribution Methods to BA 16/37	Joblog No. 233 42	Date Checked Oct '95	Checked by
1e	CALCULATIO			Output / Remarks
	F	= 226-82 km/z	0 2	
- ause 2.8 A 16/97	$S_U = \omega I = 58.01 \times 7.62$	- 556-05 KINTS-) to ya-9	
	SK = 82-19 m 2.5 _ lone			
	2k ns.121441 3.7 2 2026			
7 16/97	Surple Ristribution' Method			
Χ.Ζ.6.				
		(see sheet 18	= 1067 + 16 hh jhdes	- 1473)
	Gledwe span = 7.82m			
	Grand a) Surgle lave I	loalina		
	KL = 0-32			
	Mu = 604 - 11 KNL			
, h.,	ML = 604-11 × 0.32 = 193.	32 Wm (He	mest due to	193.32 km input
		***************************************	dl HA (ording)	into sprewbakeet
			Andrew Control of the	
£ 2.6	Normal stear on longitudem	d heave	7 2m	
	SL = KLSU+ 0.5 SK			
	where Si = shear on long	Anderal mend	rs (M)	
	KL = appropried propor	tion factor	for	
	50 = 3000 Jean gone	2.5 m. notion	el lone	
	g upit (m)			
	Sk = Value of KEL for	one 2.5m not	woral lave (bu	X
	■ the state of th	comprehensive and are a configuration of the control of the contro		.
	SL = (W/) Ki + 0.5 x 82.1			
-	$= \left(\frac{58.01 \times 7.82}{2}\right) \times 0.32 - + \frac{4}{2}$	41,10		113.68 KN 12 mit
	= 113.68 PM			into spread sheet
No. C&D C/DES	1 REV C (6/99)	<u> </u>		

1.

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

BRIDGE: HILL COTTAGE RAILWAY

Assessor :PH

Bridge No: 87

Ref: 23342

internal Beam

Structure File

BD 21/97

Table 4.2

P. 1

Clear Span Effective span

Overall Section Depth H Depth less 100 surfacing

Section Depth

Girder Spacing Top Flange Width Top Flange Thickness **Bottom Flange Width**

Web thickness Web Depth Beam Depth

B/2

Soffit lower flange to crown Bottom Flange thickness bf

> h R₁

C = R1 - h

Barrel thickness b,

 R_2

Tan Q₁

 Q_4

Area of Internal Beam

Ρi

Area of Jack arch

(between radial lines)

Area of Jack arch over flange

Total area of Jack arch

Area of Segment

Area of filling (concrete)

Area of surfacing

UNIT WEIGHTS

Concrete

Surfacing

Engineering Brick



720.00 mm 620.00 mm



531.80 mm



184.15 mm 859.96 mm

675.81 mm

mm Edition 1088.56 mm

0.786910109

0.038145 m²

296972.27 mm²

39330.00 mm²

0.336302 m²

0.133654 m²

0.356021 m²

0.147000 m²



Cast Iron

Conversion Factor



ka/m³ kg/m³

0.009807

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

BRIDGE : HILL COTTAGE RAILWAY

Bridge No : 87

Assessor :PH

Ref: 23342

ASSESSMENT PERMANENT LOAD EFFECTS

BD 21/97	Assessment Loads	Area	Density (KN/m ³⁾	UDL (KN/m)
	* Surfacing	0.147000	23.54	5.19
	S/W Beam	0.038145	70.61	2.69
	Jack Arch	0.336302	23.54	7.92
	Fill (Concrete)	0.356021	23.54	8.38
	·		W =	24.18

^{*} For surfacing, mutiply udl by 1.5

Maximum BM

DL+SDL =

184.77 KN.m

Maximum SF

DL+ SDL=

94.53 KN

GROSS CROSS SECTION PROPERTIES

	Cast Iron Beam Area Overall Beam Depth	Α	mm ² mm
Scale Output	Neutral axis above base	Y _ь Y₊	338.57
Scale Output	Second Moment of Area	l _{xx}	336.07 mm ⁴
	Section Modulus Top	Z _c	3424402.63 mm³
	Section Modulus Bottom	Z_{t}	6842943.99 mm ³
BD 21/97	Enhancement Factor (D/o	d)	1.27
Cl 7.13	Section Modulus Top	Z' c	4347912.794 mm ³
	Section Modulus Bottom	Z_t	8688383.608 mm ³

STRESSES DUE TO PERMANENT LOADS

Tensile	f_d	27.00	N/mm ²
Compressive	f_d	53.96	N/mm²
Shear	q_{d}	5.83	N/mm²

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

BRIDGE: HILL COTTAGE RAILWAY BRIDGE

Bridge No: 87

Assessor :PH

Ref: 23342

STRESSES AVAILABLE FOR LIVE LOADING

BD21/97		Permissible Working Stresses		
	Tensile		19.00	N/mm²
	Compressive		100.04	N/mm²
	Shear		40.17	N/mm²

However, these available stresses are subject to Clauses 4.10 and 4.11 as shown below

PERMISSIBLE LIVE LOAD STRESSES

BD21/97 Cl. 4.10	24.6 - 0.44f _d 19.6 - 0.76f _d	Tensile	f,	12.72 -0.92	N/mm² N/mm²
Cl 4.10	0.79f _d - 43.9 3.15f _d - 81.3	Compressive	f_I	-86.53 -251.26	N/mm² N/mm²
Cl. 4.11	24.6 - 0.44 <i>q</i> _d	Shear	q ₁	22.03	N/mm²

LIVE LOAD BM & SHEAR FORCE (HA kel + udi)

BA16/97	Bending Moment	KN.m
Sheet 31	Shear Force	KN

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

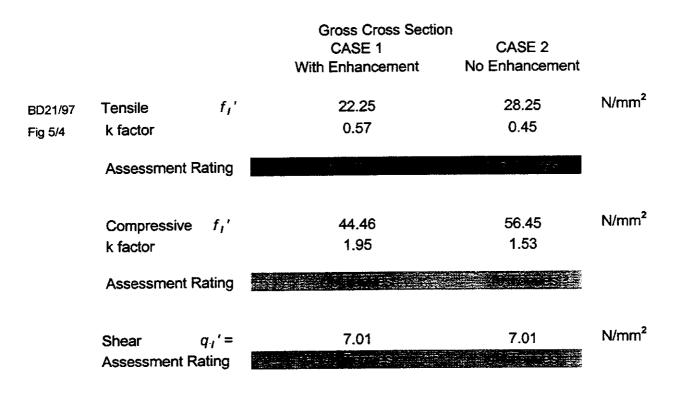
BRIDGE: HILL COTTAGE RAILWAY BRIDGE

Bridge No : 87

Assessor :PH

Ref: 23342

STRESSES DUE TO LIVE LOAD



NETT (CORRODED) CROSS SECTION PROPETIES

Scale	Nett Cross Section Area	Α	mm ²
Scale	Overall Beam Depth		mm
Scale	Neutral axis above base	Y _b Y _t	329.79 mm
	Second Moment of Area	l _{xx}	mm ⁴
	Section Modulus Top	Z_{c}	3362442.77 mm ³
	Section Modulus Bottom	Z_{t}	6310966.93 mm³
BD 21/97	Enhancement Factor (D/c	l)	1.27
CI 7.13	Section Modulus Top	Z'c	4269243.277 mm ³
	Section Modulus Bottom	Z't	8012940.3 mm ³

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

BRIDGE : HILL COTTAGE RAILWAY BRIDGE

Bridge No: 87

Assessor :PH

Ref : 23342

STRESSES DUE TO PERMANENT LOADS

Tensile

 f_d

29.28 N/mm²

Compressive

 f_d

54,95 N/mm²

Shear

 q_d

5.83 N/mm²

STRESSES AVAILABLE FOR LIVE LOADING

BD 21/97

Tensile

Permissible Working Stresses

16.72 N/mm²

Compressive

Shear

99.05 N/mm²

40.17 N/mm²

However, these available stresses are subject to Clauses 4.10 and 4.11 as shown below

PERMISSIBLE LIVE LOAD STRESSES

BD 21/97	Tensile	f,'	24.6 - 0.44*f _d	11.72 N/mm²
CI 4.10	rensile	'1	19.6 - 0.76*f _d	6.72 N/mm ²
Cl 4,10	Compressive	f,'	0.79f _d - 43.9	-87.31 N/mm²
	·	·	3.15*f _d - 81.3	-254.39 N/mm²
CI 4.11	Shear	q,'	24.6 - 0.44*q _d	22.03 N/mm²

PROJECT: BRITISH RAIL PROPERTY BOARD ASSESSMENTS 99/00

: HILL COTTAGE RAILWAY BRIDGE

Bridge No: 87 Ref: 23342

Assessor :PH

STRESSES DUE TO LIVE LOAD ($HA_{kei+udi}$)



Case 3

Case 4

With Enhancement

No Enhancement

fl Tensile K factor

24.13 0.49

30.63 0.38

N/mm²

Assessment Rating

Compressive fI 45.28 1.93

57.49

N/mm²

k factor Assessment Rating

1.52

Shear

q'I

7.01

7.01

N/mm²

Assessment Rating

Cumbria County Council Design Service	Design es Work Sheet	& Business Services	Sheet No. 42 of 85 Sheets Rev. No. 0
Scheme Hill Cottage Railway Bridge		Date Prepared Oct 199	Proceed by
Element / Item Sugle wheel forte bods	joblog Na. 23342	Date Checked Oct '95	Checked by
			Output /
CALCULATI	ONS / WORK		Remarks
Consider single axle wheel la	ub l		
distance between wheels on en	A	برويدي برواند مرج	
distance between where on su	gie azie Tum	- grown spaces	
: consider single Led los	d orly.		
Table 5/3/2 BD 21/97 40+ Lp	calegory.		
Namural single wheel load =	9060		
Proportion Juston KL = 0.32			
N = 60 ~ 7.92	= 17cas ha		
$M_{u} = 90 \times 7.93$	1/392 \		
Mu' = 175.95 x 0-3	·		
= 56.3 km/in	(at mid-	Stan)	
Consider Case 3 No	ett cross-sect	102 with	
and the second s	hancerest		
Ja = 29.28 N/mm (she.	et 40)		
Jt = 56.30×10 =	7.67.1		
2t = 51.30×10 = 51.30×	7.07 10121		
J = 24.6 - 0.44 Ja			
= 24.6 - (0.44, 29.28)			
Allowable Ju = 11-72 N/mm >	7.03 1/20-1		
: OK for 40 tours (Le) rildo i	loof load	
Compressive stress	Host Cutical		

SIGN	Cumbria County Council	esign Services \	-	k Business Services	Sheet No. 43 of 95 Sheets Rev. No. 0
	Scheme Hill Cottage R		Scheme Ref. C1461437	Date Prepared Oct 199.	Prenared by
VICES	Bernent/Item Survey details	, Jor edge bean	joblog No. 23342	Date Checked Oct 199	Checked by
		CALCULATION	IS /WORK		Output / Remarks
	For EASE GLEDGES	, FIND MINI	yun overall	SECTION DEPTH	
	By inspection,	Jee skeet	20		
	H = 9.574-	8.736			
	- 0.81Bm	(Overall 1	echor depth)		
	D = H+751				
	D = H - 150	me in this	case for ver	ge (soft	
				malerial)	
	D = 668m				
	Jeo sheet 19,				
			410		
taling gas ganger gan taring and garing	doubt of edge	gurden at hud	- span = 010	<u> </u>	
	· Exhanceman	t Judor - D			
		d			
		- 66	8		
		61	Free contraction of the fact that the fact that the first that the fact that the first that the		
		= 1 · 1 ·	2		
ļ					
Artika (September 1997) Tanahari					

1 ::

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ESIGN	Cumbria County Council Design Services	-	Business Services	Sheet No. 444 of 85 Sheets Rev. No. 0
	Scheme Hill Gottage Raulway Bridge Element / Item	Scheme Ref. C1461437 Joblog No.	Date Prepared Dct '95' Date Checked	Prepared by Checked by
KVICES	Section Properties of Beam	23342	Oct '99 .	Cutput /
<u></u>	CALCULATION	NS / WORK		Remarks
	Section Properties of Cast Iron	Bean (Edge		12091)
				ZECTION
	Details of Beam - rejer to the Appe	log No C37/9	* 14	
	0	70 × 38.1 n	anue od)	
	P P P P			
	70.3			
	602.6	_taken os 38·1 +	(IE)	web thuknas
	100/000 1	14701 05 30.1 L		not shan a ling
				-ossumed:
ļļ		1 44mm (Seo Se	to A-A	
		J	veet 13)	
	38.1.			
	0/30	<u>ම</u>		
	304 - B m/m			
<u> </u>	Scale Program 650 (Sectional P			
	see output, Gost Iron Bean	Area , A = 37	742	
	Newford my s above base, Yb			
	Second Moment of Area, Ixx	= 1.8333 ×10	men 4	
ļ., ļ., ļ.,				
		and a second design of the second		
				and a comment for the control of the

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES EDGE BEAM (GROSS SECTION) Page: 1 Made by: PSH

Date: 05.10.99

Ref No:

Office: 5598

Location: Edge Beam @ Midspan =610mm

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordinates	of points in order:	
	X-coordinate	x(1) = 0 mm
	Y-coordinate	y(1) = 0 mm
Point 2 :	X-coordinate	x(2) = 304.8 mm
	Y-coordinate	y(2)=0 mm
Point 3 :	X-coordinate	x(3) = 304.8 mm
	Y-coordinate	y(3) = 38.1 mm
Point 4 :	<u> </u>	x(4) = 260.8 mm
	Y-coordinate	y(4) = 38.1 mm
Point 5 :	X-coordinate	x(5) = 260.8 mm
	Y-coordinate	y(5) = 571.5 mm
Point 6 :	X-coordinate	x(6) = 304.8 mm
	Y-coordinate	y(6) = 571.5 mm
Point 7 :	X-coordinate	x(7) = 304.8 mm
	Y-coordinate	y(7) = 609.6 mm
Point 8 :	X-coordinate	x(8) = 152.4 mm
	Y-coordinate	y(8) = 609.6 mm
Point 9 :	X-coordinate	x(9) = 152.4 mm
	Y-coordinate	y(9) = 571.5 mm
Point 10 :	X-coordinate	x(10) = 222.7 mm
	Y-coordinate	y(10) = 571.5 mm
Point 11 :	X-coordinate	x(11) = 222.7 mm
	Y-coordinate	y(11) = 38.1 mm
Point 12 :	X-coordinate	x(12) = 0 mm
	Y-coordinate	y(12) = 38.1 mm
Point 13 :	X-coordinate	$\mathbf{x}(13) = 0 mm$
	Y-coordinate	y(13) = 0 mm

Sectional properties

Cross-sectional area	37742 mm²
----------------------	-----------

Second	moments	of	area	(inertias)	Ixx=1.8333E+9	mm^4
					Iyy=164438074	

Distance of centroid from origin
$$X=212.23$$
 mm $Y=260.84$ mm

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U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES EDGE BEAM (GROSS SECTION)

2 Page: PSH Made by:

Date: 05.10.99

Ref No:

Office:

5598

Angle of principal U counter-clockwise from XX-axis -7.5677 degrees

No650

$$\frac{2}{260.84} = \frac{1.8333 \times 10^{9}}{260.84} = \frac{1028447 \text{ mm}^{3}}{260.84} \quad (\text{Care 2})$$

$$\frac{Z_{c}}{(609.6 - 260.84)}$$

$$= \frac{1.8733 \times 10^{9}}{348.76}$$

$$= 5256624 \text{ hm}^{3} \quad (6022)$$

Case 1 (with enhancement)

Factor -1.1

ESIGN	Cumbria County Council Design Service	•	& Business Services	Sheet No. 47 of % Sheets
	Scheme Hill Cottage Roulway Endge	Scheme Ref. C1461437	Date Prepared Out '99	Rev. No. O
ERVICES	Bement/hem Section Properties g Bean	Jobiog No. 23342	Date Checked Oct 199	Checked by P. H
 de		ONS / WORK	<u></u>	Output / Remarks
		(-1		NETT-JECTION
	Section Properties of Cost Inon Agreed with Client that Ne			
	take of 2.5mm around Remo			
	I grow Snow Section			
	(572	-4- 1	, , , , , , , , , , , , , , , , , , ,	-
		(a (d	38-1-	
		b b 7 /1		
	70.3 / _		500	
	607-1	38-1~~	535.9	
		4 4 5		
		0	* 33-1~	
	0/3	<u>o</u>	1	
	299-8			
-	Scale Program 650 (Sec)	honal Property	<u>.</u>	
	see output, Cost Inon	R. A. A	= 36148 m	
	Nontral axis above base,	γ ₆ - 269.	05 hm	
	Second Monerat of Area, In	1 · 73 <i>4</i> -7	×109	
No. C&D C/E	DES1 REV C (6/99)			

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES

EDGE BEAM (NETT SECTION)

Page: 1 Made by: PH

Date: 05.10.99

Ref No:

Office: 5598

Location: Edge Beam @ Midspan =610mm

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordinates of points in order: : X-coordinate x(1) = 0 mm Point 1 Y-coordinate y(1)=0 mm : X-coordinate x(2) = 299.8 mmPoint 2 y(2)=0 mm Y-coordinate x(3) = 299.8 mm: X-coordinate Point 3 y(3) = 33.1 mmY-coordinate x(4) = 258.3 mm : X-coordinate Point 4 $y(4)=33.1 \text{ mm}^{-1}$ Y-coordinate x(5) = 258.3 mm : X-coordinate Point 5 y(5) = 569 mmY-coordinate : X-coordinate x(6) = 302.3 mmPoint 6 y(6) = 569 mmY-coordinate : X-coordinate x(7) = 302.3 mm Point 7 y(7) = 607.1 mmY-coordinate x(8) = 149.9 mm: X-coordinate Point 8 y(8) = 607.1 mm Y-coordinate : X-coordinate x(9) = 149.9 mmPoint 9 y(9) = 569 mmY-coordinate x(10) = 220.2 mm: X-coordinate Point 10 y(10) = 569 mmY-coordinate : X-coordinate x(11) = 220.2 mmPoint 11 Y-coordinate y(11) = 33.1 mmx(12)=0 mm : X-coordinate Point 12 y(12) = 33.1 mmY-coordinate x(13)=0 mm : X-coordinate Point 13

Sectional properties

Y-coordinate

Cross-sectional area

36148 mm²

y(13) = 0 mm

49 of 85

U3129 HILL COTTAGE RAILWAY BRIDGE No. 87 LONGITUDINAL BEAMS (CI) SECTION PROPERTIES EDGE BEAM (NETT SECTION)

2 Page: Made by: PH

> 05.10.99 Date:

Ref No:

Office: 5598

Second moments of area (inertias) Ixx=1.7347E+9 mm4

Iyy=142605366 mm4

Product of inertia dA.xy

Ixy=199522197 mm4

Distance of centroid from origin X=212.61 mm

Y=269.05 mm

Principal second moments of area Iu=1.7593E+9 mm4

Iv=117982102 mm4

Angle of principal U counter-clockwise from XX-axis -7.0354 degrees

No650

....

$$\frac{7}{269.05} = \frac{1.7347 \times 10^{2}}{269.05}$$

$$\frac{7}{269.05} = \frac{1.7347 \times 10^{2}}{269.05}$$

$$\frac{7}{26} = \frac{1}{100} \times \frac{1}{100$$

$$(607.1 - 269.05)$$
= $\frac{1.7347 \times 10^{9}}{338.05}$
= $\frac{5131490 \text{ mm}^{3}}{338.05}$

Case 3 (with enhancement)

Futor =1.1

ESIGN	Cumbria County Council	Cumbria County Council Design & Business Services Design Services Work Sheet				
	Scheme Hil Cottage 1	adway Bridge	Scheme Ref. C1461 437	Date Prepared Oct '99 -	Rev. No. 0	
RVICES		ordus - edge bear	Jobiog Na. 23342	Date Checked	Checked by P. H	
2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	CALCULATION	1	1	Output / Remarks	
				10 : cl-a		
	see eures deta		has hegus	we skew		
and and any or any or any or any or any	e' is a nyht	Span.				
	Ce 2-7 BA 16/97	check Wether	there is a bo	ean letwea		
	herside wheels o					
	Se steet 20					
	popultinate beau	at east side	, distance to	on east		
	side of pormet H	o & bean =	60 + 305 + 3	978 + 203		
			1546			
	edge) comagena	y = 2.550+ 0.4	O ha parape	t east face		
		= 2-950h	/ 01	<u>C</u>		
	penultimate been ,	it west side,	distance fr	a ust		
	side of percept to		متاحر والمتاريخ والمتاريخ والمتاريخ والمتاريخ والمتاريخ والمتاريخ والمتاريخ			
		= 1565	<u>m</u>			
	edge of consagency	- 0.4+1 120				
		=1.820m	كالموسأت بلوسياني بالاستاب			
	Thee is a beau	1 1 2 2	ه ولعظما ط	al ade mode		
				化基化二基化二基化二基化二基化		
	: The edge bean			mued for		
	live load on	the corna	genry			
	CQ S .35 BD 21/97	M. lander	han hen-	antalevered		
	1					
<u> </u>	menhes sele	of sungle o	ecutentul ve	hude Inst		
	Appendix D					
	-Ab the aut	real case (CASE 2.) = 7	7.5 +	Case 2 = Gross Section	
	I AD VE AM				-No subsect	

75.0

Scheme Hill Collage Railway Bridge	Scheme Ref. C1461437	Date Prepared Oct 199	of % Sheets Rev. No. 0 Prepared by
Element/Item Accidental Loadin, - Edge Beam	Johlag Ma	Date Checked Qcf 199	Checked by
	23342 IONS/WORK	1 40())	Output /
CALCULATI	IONS / WORK		Remarks
-choose 7.5t acade Ind la	ading		
C.46 ·			
1-8×6t 1-5t			
201			
1			
single vehicle - aprily une	early fautor	9 1.8 40	
most control oxle (as chosen)			
	20		
Find Outre of growthy of bor	7.0		
1-8 x6 t = 13x6500 x 9.81 M			
-105.95 pt			
7 10.338			
11.56 = 1.7.1 = 17.1			
- 14:715 kg			
n/(A)			
(105-95 + 14-715) = 14-715	×2-0		
x = 29.43 120.46			
a and a second consideration of the conference o			
x = 0.244 h			
May By orans where & M	on buseds	Co Go bogne	
& It whe ie 1.8x4t	% 1-st		
0.1225-	0-122-		
1	1:7562		
4	\$ 4	•	Live body
T T			
Sim	4		
PA 702	R	B	
7-82m			
	والأراب والإراض الأسلال	Carried Company of the Company	and the state of t

Scheme Hill Cottage Rouling Bridge C1461437 Oct 199	cked by
Lables No. Date Checked Check	
Element / Item Accidental Loading - Edge Bean 23742 Oct '95 . P.	?H
de CALCULATIONS / WORK Rema	
Hox Bri under leading axle 1.8x6t	
A(B)/	
7.82 RA = 105.95 (0.122+3.91) + 14.715 x (3.91+0.122-1.756)	
= 427.19 + 29.9	
K4 = 58·45 kV	
(\$51.0_16.E) ×54.85 = (***) MB	
3 6M (M -) = 30, 75x (3.71 - 0.60)	
- 221-41 ML	
ue he enseponde foit tra F15 2/3 BA 16/97	
graph a) Jourday sparing = 1.45m (at edge)	
5pan = 7-82in	
F0-41	
Chrox live Isadu, on due 70 7.5 accidental booking	
₹0.41×221-41	
= 90-78 love	
1 No. C&D C/DES1 REV C (6/99)	

NSULTANCY	Cumbria County Council Consultancy & Des	Cumbria County Council Construction Services Consultancy & Design Work Sheet			
	Scheme BRITISH RAIL PROPERTY BOARD	Scheme Ref. C1461437	Date Prepared JUNE (949 Date Checked	Prepared by	
ESIGN	HILL COTTAGE RAILWAY BRIDGE	Jobiog No. 23342	Oct 199		
ie	CALCULATIO	NS / WORK		Output / Remarks	
	EDGE BEANA / DL 1SDL				
	EDGE BEAM (DL +SDL	2			
	450 1120 ,	Levels	[West]		
		and the second	8.750 = 1.74		
	1 1 Jani				
	259-54-2	Paintel ht = 1.7	13		
200 Mar and Ar a	1740 ± 192 m	* East 411	rder		
	610	10,665 - 8.	756 = 1-729 1.724-0.610		
		FAAR C M	1.12m		
	1474:2				
	72 = (1454·Z - [406·4+3048])	$_{9} = 549.3 \text{mm}$			
	<u> </u>				
	<u> </u>				
	= (549.3°+ 193.4°) /2	= 579,17mm			
	$Cav \theta = 1836/549.3 = 0.3342$	= 18.48			
	$0A = 579 \cdot i\eta/2 = 281.59$				
	$\frac{715.472}{7400} = 281.37$	= 000-7MM			
	Y = (866.5 ² +28				
	R = 913.61 + 221				
	Area of Bruck Jack Arch [an Carn	ried by Edge Bean			
				0.3030 m²	
	$ \overline{\Pi}(R^2-Y^2) \times \frac{4\theta}{360} = \overline{\Pi}(1142.11^3-11) $	360	= 18361114-041 MW.	0.3031. M-	
	7.57				
			= 0·1515m²		
	Ara of segment = Tir x 40 - 5	4 9.24 B30.0k 12			
	= Tix 913.612x Tj	92 - 400994.698 0 =	7 # C \$		
	_ A.5261.21	0.490994 =	0.137438 42		
		¥ ₹₩	<u> </u>		
No. C&D C/DES	1 REV B (3/98)	-			

ONSULTANCY	Cumbria County Council Construction Services Consultancy & Design Work Sheet			of 85 Sheets Rev. No. 0		
	Scheme BRITISH RAIL PROPERTY BUARD	Scheme Ref. C1461 437	Date Prepared JUNE 1444	Prepared by		
ESIGN	Element / Item HILL COTTAGE RAILWAY BRIDGE	Jobiog No. 233 42	Date Checked Oct 195	CI		
•de	CALCULATIO		·········	Output / Remarks		
	Area of Filling = (1.4542 x 0.610) -0.044x1.0486	Ard kg	med D.			
	Area of Fillian = (1.4542 x 0.610)	- 0-3030 - 0-13744+	[0.04376+0.01ge]			
	~ 0.044×1.048P		0 04219			
	= 0:336142 10					
	load mes por Edge = 0.11841 m² grader.					
	LOADING.					
	Jack Arch = 0.1515 x 23.5	= 3	.56 KN/m			
	All = 0.1681 x 21.6	= 3.	63 Kr/m			
		23.5 = 1.	467 Kolm			
	Fell (From heavy) = (0.259 +0.192) . 0.277 x		.09 Karlan			
	Sfur Cost Trou = 70.56 x 0.043768 Bean	= 3	VY KAYA			
		, , , , , , , , , , , , , , , , , , ,				
	Pariapet = 1-130 x 8. 450 x 23.8	= 12	10 W/m			
			1.85 Kilm	SOL+ 6L W = 27.85 KW for		
			-			
	BM bue to Permanene Loads					
		7 02 2				
	BM = W = 23.85 7	1.86				
	= 167.84					
	SE = WL = 23.85 + 7.	,92				
	SF = wl = 23.85.17.					
	= 93.25 K	A .				
	Tenule Stresses due to dear	d bods				
257 No	M = 189.99 vin6 9	6-01 M-2		Fd = 26.01 mm²		
hancement	$\frac{M}{Z_{t}} = \frac{182.82 \times 10^{6}}{702.8447} = 2$	Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y				
value			<u> </u>			

ESIGN	Cumbria County Council Design Services	•	& Business Services	Sheet No. 55 of 85 Sheets Rev. No. O	
	Scheme Hill Cobbase Pauluras Bridge	Scheme Ref. C/46/1 437	Date Prepared Oct 199.	Proposed by	
RVICES	Element / Item Check etrosses	Joblog Na. 23742	Date Checked Qct 129	¢	٠,
_	CALCULATIO	NS/WORK		Output / Remarks	
	Cose 1 (check 7.5t in 1				
-e1 355/With	Case I Casek 1.37 in	<u> </u>			
axout	Jt = 90-78 ×10		er ger ger ger ger ger gemanne ger ger ger generale en de ger ger ger ger ger ger ger ger ger ge	See Sheet 48	
an and a second and	773 291.7				
_	, II.74 N				
	1d = 26-01 N/2 (Dele	et 50)			
) 4. 10	JL - 24.6 - 0.44 Ja				
	$= 24.6 - (0.44 \times 26.01) = 13.$	· 16 kl/. 3			
	= 24.6 - (6.44 x 28.01) = 13				·
	19.6-0.76 1d				
	= 19.6 - (0.76 × 26.01)0-	4) NICH			
-	Tensele stors due to LL				
	= 11.74N/1 < 13.16 N/L				
	-: Ok for 7.5t. aindent	al vehide			
	Je' = 90.78 x10 = 15	· 70 N m			4, 2
	r 5782286				
	14 = M = 182.82 x 10 = 3 7c 5256624	4.78 N LL 2	(corperae)		
hect the	Ze 5256624				
herconat					
_ <dood)< td=""><td>J_ = _43-9 + 0-79-ja</td><td></td><td></td><td></td><td>* ()</td></dood)<>	J_ = _43-9 + 0-79-ja				* ()
	=-43:9+ (0.79x34-78) = -7	11-38 N 2			
_	or y = -81.3 + (3.15 x-34.78) =	190 - 86 NIL	<u> </u>		
	Compressive abas due to LL	15 70 M	< 71.3841 2		
_					127.02
	34-78+71-38 -106.16N/2 <		lunding stress)		
	O.K for 7.5t audutal	vehile]

DESIGN	Cumbria County Council Design Servic	Sheet No. 56 of 65 Sheets Rev. No. 0		
27	Scheme Hill Cottage Raduray Endgo	Scheme Ref. C1461437 Joblog No.	Date Prepared Oct 199 Date Checked	Checked by
RVICES	Element / Item deck stresses	533.45	Oct 195	P1
_de 	CALCULAT	IONS / WORK		Output / Remarks
	Cace 2 Court 7:5t you	herding)		
	$\int_{L} \frac{1}{4} = \frac{90.78 \times 10^6}{702.8447} = 12.92$	N		
	3t = 26.01 N/m			
_	1_= 24.6 - 0.44.14			
	= 24-6 - (0.44 × 26-01) =	13-16-17 2		
	Terante etres due to LL	Ilm.		
-	-= OK for 7.5t acciden	tal vehule		
-	$\int_{12}^{2} = \frac{90.78 \times 10^{6}}{5256624} = 17.27$	/NI		
-	Je = 34.78 N/m2			
	1 - 71.38 N/-			
	Composine abos due to 1			
	-: OK to 7: t amide			
	Check limbury Press < 154 N/m²	r 71-38 = 106.		
	34.76	r 11:30 = 120.1		
No C&D C/DES	S1 REV C (6/00)			

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SIGN	Cumbria County Council Design Service: Scheme	Scheme Ref. Date Prepared		Sheet No. 57 of 65 Sheets Rev. No. 0 Prepared by
	Scheme Hui Cottage Ranhvan Bondge Bernent/Itam	C1461437	Oct '95' Date Checked	Checked by
RVICES	check stresses	23342	Oct 35	C-#
	CALCULATIO	ONS / WORK		Remarks
	Cose 3 Colect 7.5t you	bedus)		
	7t = 90.78×106			
	709 2251			
	= 12-80 N L			
	Jt = 182-82 x10° 04-501 6447501			
	- 56.39 N F	and the state of t		
	1-24-6-0-44/3			
	- 2k.6 - (0-kx-28.36) = 1	2-1210/		
	Toronte afres due to be			NOT OK for 7.5t
				acc vehicle
	: OK for 3t acude	Ial Vehicl	و	
	Je' = 90.78 × 10 = 16.08	7.1		
	M _ /82-62_1	0		
eet 45	Jc = M - 182-82 x 1 01-1502 Zc 5 13 145	20		
		1 = Jd	-	
	1, = -47.9 + 0.79 14			
	$= -43.9 + (0.79 \times -35.$	63 /		
	= + 72 05 NI			
	Compressive abos due to	LL		
		i. I I I I I I I		
	= 16 08 N/mm? < 72.05 N	• • • • • • • • • • • • • • • • • • • 		
	COX for 7-St am d	ental vehile	in Compression	
	Cho, b lambu.			
	Stess < 154N/m² 35:63+	72.05 = 10	1.68 N(== 2	

ing State

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IGN	Cumbria County Council Design Services	Design & Business S Work Sheet	of 85 Sheets Rev. No. O	
/ICES	Scheme Hill Cottage Railway Bridge Element / Item cherk stresses	Scheme Ref. Date Prepare C1461 437 Oct 199 Joblog No. Date Chiefe	Precared by	-
	CALCULATIO		Output / Remarks	
				-
	Case 4. Colum 7.5t you be	dung)		_
		1		
	J = 90.78 ×10 - 14.08 N			
	4 644 801			_
	1 = 28.36 N == 2			
	1 = - 28/36 N/4m			
	1 c = 24-6 - 0.44 da			
	= 24.6 - (0.44 × 28.36) =	IZ-12 N JSI		_
	Tensile stras due to LL =	14 08 N/ - 2 > 12.12	N/m2. NOT OK Jo	
			7.5t Arc veh	
	OK Jr 3t Audental V	ehide alis		
ar yang yang dari dari dari dari dari dari dari dari				
	10 = 90.78×10 = 17.69 N			
	5131490			
	Jc - 35.63 N - 1 - Ja			
	MHSDL			
	3, = -72.05 NL			- 1
				_
	Compressive stress due to LL			
	= 17.60 N/L2 < 72.05N			
				,
	- OK for 7-stornes accord	e to Vehile		
	Olech lunder 35.63 Ares < 154 North	+ 72.05 = 107-681	Y 4*	
	Stress & 15 t Mari			
ļ., .lļ	· North 프로그 프로그램 이 아니 아름다가 다 생각하다 이 왕이다. 그 왕이 하지만 바다리 트웨이 이 기를 하게 하는데 이 말이 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 다 되었다.			(6.2)

SIGN	Cumbria County Council Design Services	Sheet No. 59 of 85 Sheets Rev. No. 0 Prepared by			
	Scheme Hell Cottage Railway Bridge	Scheme Ref. C1461437	Date Prepared Oct ' 25		
VICES	Stement / trem Steers Stress (7-5+ Acadestal)	Jobiog No. 23342	Date Checked out 193	Checker by	
	CALCULATIO	<u></u>		Output / Remarks	
_	Shear stres shock at sur	yout for	7.5 tomas		
	acadental bodes				
_					
	Dead load in on edge bear	- 23:85 kV/i			,
_	(Theor force at support	= 93-25 kN	(alat 54)		
_	0.15 V = 92.25 × 10				
	$q_{1} = V = 92.25 \times 10^{\circ}$ $q_{W} = 92.25 \times 10^{\circ}$ $q_{W} = 535.9 \times 38.1$				
	= 4.57 N L 2				·
= 535.9 hm					
-section	7.5t amountel looding po	had an dello	ws for		
址 约)	1.5¢ accesses 550 5				6.04
_	Max: Moor :-				
	105.95 (00) 14-71564				
_e	3.0,				
et 51					
-		4			
	<u> </u>	de .			
- 1	7.82~				
_	n(6)/ 7.82 RA = 105.55 x 7.82 +	14.715 (5.82)			
	- 828-5 + 85				
	Bo = 116:9 KN				
-	& Sham force Su = Ku x 116	9			
		بغد بغديف بالمساف والمساف			N. S.
=0.44	= 0.41 x1(6	-3			
iet \$2	- 47.93 W				y
,	" lue shor stess = 47-03	x10 + 2 - 35 N	2		
	533-9 x	38-1			
	1 Carl A carl	z			
	Total Shoor Stress - 6.92 Num				
_	31 REV C (6/99)				

-SIGN	Cumbria County Council Design Servi	Design 8 ces Work Sheet	& Business Services	Sheet No. 6° of 85 Sheets Rev. No. °	
	Scheme it will College Ruleray Bridge	Scheme Ref C1461437	Date Prepared Oct 199	P	
VICES	Element / Item Shear Strong (7.5t Atuals	Joblog Na.	Date Checked 化ナッカ・	Checked by	
		TIONS / WORK		Output / Remarks	
11.49	9,6 < 24.6 - 0.449.4	whee qd = 4.33	N N		
	g, ≤ 22.59 √ m				
	q_				
	VOK 9L - 2.35 N/m				
		- 1 5 1 2 7	W 3		
_	dalso Hotal Now These	203221-	T9.71.5		
	-: OK for 7.5t Aruide	LO valed in	Slear		
	- 07 09 130 1000				
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_					
_					. •
					:
					May 12 mgg
and the same of th					
-]
o. CaD C/Di	S1 REV C (6/99)				*** ***

	Cumbria County Council Design Services	Work Sheet		of 85 Sheets Rev. No. 0
	Scheme U3129 Ail Cottage Rolling Ruly	Scheme Ref.	Date Prepared Oct 135	Prepared by
	Element / Item Maxe details	Joblog Na. 23 542	Date Checked しょ ' 95	Checked by
	CALCULATION	NS / WORK		Output / Remarks
		2. 1.1.2.2		
,	Jack arch assessment to a	3/4 16/ 9 /		
	Span L = 1470m, 15 on	bide the low	er boundary	L=groder
				spacing (sheet 36)
	limit of 1.5m for Mexe			
	beam soffet to corner good			
	for I tend bear, flage (lace) Pruchies	>1 78	Barrel thickness
	: ve - (9-198)" = 0.197 L			-9" (Ref ©7/87
	vy met heasured , taken .	3 k ~ re	osorable as	
ļ	and appear to be perpeted			
	and agreen to be peopled	ve ratre, tran		
	Jount will			
	In large 6-12.5 : Fwo	6-2		
	Hord mortan Fre=1.0			and an early and an annual section of the section o
	Fi =0.9 - all bego w	rell pouled es	cent for	
		ach from the i		
ļ				
ļ	Jour			
	Condition Fector, Form			
ļ.				
د	Old structure , Fig = 0.9			
	- 0.1	open joint at	Jours John	
		and wown		
	Fay = 0.8			
	Axle lyt 80 - regligible	curvature +	o vertical	
	alignment . not applice	ble		
į				

CUMBRIA COUNTY COUNCIL - CONSULTANCY & DESIGN ARCH ASSESSMENT DESIGN SHEET - MODIFIED MEXE METHOD FO	Page No. 6	2.	
9 No: 87 Bridge Name: U3(29 HILL COTTAGE RAILWA	ay bridge	of S Pages	
D ASSESSMENT OF ARCHES IN ACCORDANCE WITH	DATE PREPARED:	Rev No: D	
ASSESSMENT OF HIGHWAY BRIDGES AND STRUCTURES"	Oct 199	FREFARED BI	
RTMENTAL STANDARD BD 21/97			.
ADVICE NOTE BA 16/97 -RENCES ARE TO BA 16/97 UNLESS NOTED OTHERWISE)	DATE CHECKED:	CHECKED BY	
	2ct '55	PH &	الح
CTURAL DIMENSIONS			
SPAN (square/skew) RISE OF ARCH BARREL AT CROWN RISE OF ARCH BARREL AT I/4 POINT EFFECTIVE THICKNESS OF ARCH BARREL L= PFECTIVE DEPTH OF FILL AT CROWN (=0.72 h) d + h=	1.476 0.187 0.140 0.220 0.500	0 · 220 6 · 440	E E E E E
ISIONAL ASSESSMENT (CI 3.10)			
= 740 $(d + h)^2/L^{13}$ but \Rightarrow 70T AN (L) = 1-473)TAL CROWN THICKNESS $(d + h) = 0.440$ PAL = PAL = 70 (70T max)	h modified to d	70	Э
/RISE FACTOR (Fsr) (CI 3.11)			
I = 7.877 Fsr=		0-622	
.3) =		-	
ILE FACTOR (Fp) (CI 3.12)			
$23 [(rc - rq)/rc]^{0.6}$ rq = 0.749 Fp=		t-0c	
rc =		, 55	
RIAL FACTOR (Fm) (CI 3.13) RREL FACTOR (Fb) (TABLE 3/1) L FACTOR (Ff) (TABLE 3/2) MATERIAL FACTOR (Fm) = $\frac{(\text{fb} \times \text{d}) + (\text{ff} \times \text{h})}{\text{d} + \text{h}}$ Fm = $\frac{\text{FACTOR}(\text{Fi})}{\text{CI 3.16}}$		0-85	
DTH FACTOR (Fw) (TABLE 3/3) Fw = $\frac{0.9}{1.0}$ PTH FACTOR (Fd) (TABLE 3/5) Fm = $\frac{0.9}{1.0}$ PTH FACTOR (Fd) (TABLE 3/5) Fd = $\frac{0.9}{1.0}$ JOINT FACTOR (Fj) = Fw x Fmo x Fd Fj =		0-81	
DITION FACTOR (Fc_) (Cl 3.17 To 3.23 Inclusive) Fc =		0.80	1
1 SPAN FACTOR	_		
gle Span or Massive Piers i span normally Msf = 1.0 Msf = 0.9 Msf = 0.8		(·c	:
IFIED AXLE LOAD (MAL) (CI 3.24)			
L = Msf x Fsr x Fp x Fm x Fj x Fc _H x PAL MAL =		23.990	
RIFUGAL EFFECT (Fa) (CI 3.29)			
Centrifugal Effect considered applicable? XESINO Radius (r) = Fa =		1.0	
WABLE AXLE LOAD (AAL) (CI 3.25) vde Lift-Off applicable? XES NO (Fig 3/5b) (Fig 3/5a)		;	
LE FACTORS (Af) SINGLE AXLE = 1.0 AAL = 2 AXLE BOGIE = 1.0 AAL = AAL =		24 24 24	(T)
OSS VEHICLE WEIGHT RESTRICTION (Table 3/6)		40/44t GVW	(F)

Hongo tel	the commise RAWAY BRIDGE LE THE - rods CALCULATIO Force(H) due to kenn Ul? 8f.		Date Prepared Oct 199 Date Checked Oct 199	Prepared by Checkso by (H) Output / Remarks
Honyon tel	CALCULATIO	23342 NS/WORK		PH Output /
Honyon tel	CALCULATIO			
H	12 2 8£	ast load		
H	12 2 8£	ast low		
w.				- ne tagrang die megene grade augene bereiten ber eine angeben ber bereiten ber ber ber ber ber ber ber ber ber
w.				
	a l-spa a and			
	Contraction of the contraction o	= 1-470 m		
1 1 1 1 1	u = val due to de		edse on den)	see shoot 54
				the of paramet
	f = use of and	(-re) = 0	·30/m (to mid .	
			vere ij me	-11.27 W
H	= 14/1×1.470	W = 17.32	X1-2 = 14-11141	
	8 ×0.301	1470	10314	
14	= 12.71 km/m			
7.5+ ou	idental Yeal Louding	; on edge	buy (unright	
use the c	h the boys aly			
- 6	sex to p dexe	uport		
		and a second of the second of the second		
At ULS,	P = 6000 x 9-81 x 1 8	ما ×۱۶		
	1000	(334)		
	P = 158:914J			
Horyote	of searchen (H) due	to part ilou	4	
	H = 25PL			
		0		
(8 Jul 1-5	t oxle) P = 1.5 x 9. 81	×1-5 = 2	2-164	
	H'. 25×22.1× 1470	= 21-1 kd		
	128 x 0-301	<u> </u>		
	7.5t or	H = 14-11x1-1570 8 x 0.301 H = 12-71: ky m 7: St oundaried Used boulders: the in the bogs oly) - start 9 6t x 1-8 + 1 St At ULS P = 6000 x 9-81 x 18 1000 P = 158-9 ky H = 25PL +23 y H - 25 x 158-9 x 1-47 128 x 0.301 H = 151.8 Ky (& Jo 1.5t oxle) P = 1:5 x 9-81	H = 14/11x1 + 10 ² 8 x 0.301 H = 12.71 Kr3 m 7.5t outdouted Just bouling on edge 4 to 15t no of 1000 11x1 H = 258.9 Kr3 H = 25PL 123 \$ 128 x 0.301 H = 151.8 Kr3 (2 for 1.5t axle) P = 1.5 x 9.81 x 1.5 = 21 H = 25 x 221x 1.70 = 21.1 Kr3	8 . e 301 1470 (94) H = 12.71 101 / m 7 St outdouted Used bouding on edge boug Consight Loon her in these biography - Cosand 9 bt x 1 8 uncent + 1 St hand At ULS P = 6000 x 9.81 x 18 km x 1.5 1000 (932) P = 158.9 (201) H = 25PL 123 / 224 x 1.70 = 21.1 km 128 x 0.301

ESIGN	Cumbria County Council Design Services		Business Services	Sheet No. 64 of '65 Sheets Rev. No. 0
	Scheme U3129 Hill Cottage Rulus Emby	Scheme Ref.	Date Prepared Oct 199	Prepared by
TVICES	Element / Itam Check hie - rodo	533 ks	Date Checked Oct 195	Checked by
	CALCULATION	NS / WORK		Output / Remarks
			0	
	Total force are to 7.5t or			
	(over span of ladge) + T51.8 +	21-1 + 12-71	× 7-82	
	- 272.3 kg			
		gare en engele en		
	Capacity of ourstup he rods			
	son shutue ble, pho	- 19 mg (con	odel Iran 25m)	
	For wrought man, ory = 220 N/L			
	Allowable stes = Ty			
	\$\frac{1}{4}\times \frac{1}{4}\times \frac{1}{4}			
	= 2700			
	1-124-1			
	e 166-7 Mm			
	& Force pre 10th = 17(19)2 ×	166.7 VIO EN		
	A time ye with = 20(19) x			
	t/17 3 1 1 1			
	+49.3 KV			
	orly 3 he roso pe ad bay	, total cae	outs = 3x47.3	
			= 141 ·9kN	< 272.3 €
	:3 No 19 p fie - rob	A D ILANO.	male to	
			4	
	De 7.5t Aradental vehi	ab		

SIGN	Cumbria County Council Design Services	_	Business Services	Sheet No. 65 of 65 Sheets Rev. No. 0	
2	Scheme Hi Cottage Ruhran Budge	Scheme Ref. C1461 1/37 Joblog No.	Date Prepared Oct 150 Date Checked	Prepared by Checked by	
MICES	tie-10to	53375	Q0'55	Output /	. •
· •	CALCULATION	VS / WORK		Remarks	
	Check 75t Accidental vehi			tie-root are	
	the rods are replaced with: 3	No 25 m. p	he 4ds		
	Total honesotal thrust a eage !	عد - 272-7 R	181		
slet64	Force Re 100d = 11(25) x 166.7	x10-1 W			
	= 01:8 k2				
	3 No 600 = 245.5 KU				
	i frutural force at ensigh				
	legenied for loveral State				1 14
		⇒ 13-4			
	Calculate the Suctional resiste	pare at end	reseat		
1 (1	due to dead working:	15 150			
wet 54 v=23.85 pollm	W = 23 - 83 × 1 : 2 = 1 = 60 - 1	62 871			
	Support Jeashon - myl = 131	<u>-9 62</u>			
	Frehnal Ressance				
	$0 \Rightarrow 0 \Rightarrow M(=F/R) = 0 \Rightarrow 5$	111.9×0¾			
		39·26J: >	18.4 60	ok .	<i></i>
	. 3 No 25 mm & replace of	ment the - r	ob would		(fileda)
	le asequale for 7.5t 1				

Trick by David Charlest by	Design & Business Services Design Services Work Sheet Scheme Ref. Date Prepared				Sheet No. 64 of 65 Sheets Rev. No. 5	
CALCULATIONS/WORK Church Oxisting 19 mp the roots dow 3t Accounted Church Oxisting 19 mp the roots dow 3t Accounted We also so s	Gernent/Item tic-rods		c1461437	Oct 193	Checked by	
Check 9x18th, 19 mp the 10th gos 3t Accidental White a 1.8x21x381 = 37.1 km Wherebe 1			1 -			
Vehicle	CAL	CULATIO	NS /WORK		Remarks	
Vehicle	Check existing !	9 m p +	و د رمه ع م	3t Accidental		
W						
	1.0 2.	5-8	27.161			
1/2 -0.2 × 3.81 -8 8 8 3 Hz	de entrar prije trantradige est straite vertratige type par accure adjust for an personal accuration at the comment	1 × 2 01	37 170			
ULS Assessment Don't him bound at ULS = (37-1×1-5) + (8-63×1-5) - 68-9 kN - 68-9 kN Tokul homographic H = 25 PL - 28 × 68-9 × 1-470 - 128 × 6-307 - 128 × 6-307 - 68-9 kN - 12-71 kN/m (Sheet 63) - 16-3 kN - 18-1 kN - 16-3 kN		a 81	- 8-9-71-1			
Live book stULS = (37.1x1.5) + (8.83x1.5)	W2 - U-3X	ره ر	- 0 0 3 88			
- 68:2 kV Total hongolal H = 25 PL Thurk Robertal H = 25 PL Tesp = -25 × 68.9 × 1.470 128 × 0.307 = 65:9 kc H = 12-71 kV) (Sheet 63) Jor DL & SDL Sheet 63) - 165:3 kV L 3N 19 (exists) & the rob capant = 141.9 kV Frictional Houstine due to 0.4 SDL = 23.2 kV 181:1 kd > 165.3 kV	ULS Assessment bood					
- 68:2 kV Total hongolal H = 25 PL Thurk Robertal H = 25 PL Tesp = -25 × 68.9 × 1.470 128 × 0.307 = 65:9 kc H = 12-71 kV) (Sheet 63) Jor DL & SDL Sheet 63) - 165:3 kV L 3N 19 (exists) & the rob capant = 141.9 kV Frictional Houstine due to 0.4 SDL = 23.2 kV 181:1 kd > 165.3 kV	hive local at ULS =	(37-1x1-	5)+(8.83x1-5	s)		
Total homistal H = 25 PL Munit roduced H = 25 PL 128 pt -25 × 68.9 x 1.470 128 x 0.307 -65.9 kg H = 12-71 km/lin (Sheet 63)				A STATE OF THE STA		
= 25 × 68.9 × 1.470 128 × 0.307 = 65.9 km 12-71 km/m (Sheet 63) for PL & SDL Sheet 63		68.9 KN			and distance of distance and advantage of the state of th	
= 25 × 68.9 × 1.470 128 × 0.307 = 65.9 km 12-71 km/m (Sheet 63) for PL & SDL Sheet 63						
= 25 × 68.9 × 1.470 128 × 0.307 = 65.9 km 12-71 km/m (Sheet 63) for PL & SDL Sheet 63	Total homzakal	- 25PI				
- 25 × 68.9 × 1.470 128 × 0.307 -65.9 kol -65.9	Thrush Rodried IT	2312 1282				
128x 0.307			8.0		the latest the section of the sectio	
-65:9 km H = 12-71 km/2m (Sheet 63) Total horizontal throat a = (12:71 x 7.82)+65:9 edge bear = 165:3 km - Inchard produce due to 013 M2 = 23:2 km 181:1 km > 165:3 km		mag upo men penga <u>n-adr pen Sun penupu dan pen p</u>				
H = 12-71 kN/m (Sheet 63) Jiv DL & SDL Total hongorbol throot a (12-71 x 7-82)+ 65-9 edge bean = 165:3 kN + Truchonal transmice due to 013 spl = 29-2 kN 181:1 kN > 165-3 kN						
# 3N 19 (existing) of the rood capacity = 141.9 km * Thickwall particle due to OLA SDL = 33.2 kV 181.1 bit > 165.3 kV						
# 3N 19 (existing) of the rood capacity = 141.9 km * Thickwall particle due to OLA SDL = 33.2 kV 181.1 bit > 165.3 kV	H = 12-71 KN/L	(Shee	F 63)			
: Tistul hongarhol thought a - (12.71 x 7.82)+65.9 edge beam = 165:3 kN + Trickwal pointage did to 013.582 = 23.2 kN 18:1 pt > 165.3 kN						
elge bean = 165:3 kN & 3N 19 (existing) & the roots capacity = 141.9 km & Finicharal bankance due to OLA SDL = 33.2 kN 181.1 kN > 165.3 kN	700 100 100					
elge bean = 165:3 kN & 3N 19 (existing) & the roots capacity = 141.9 km & Finicharal bankance due to OLA SDL = 33.2 kN 181.1 kN > 165.3 kN						
elge bean = 165:3 kN & 3N 19 (existing) & the roots capacity = 141.9 km & Finicharal bankance due to OLA SDL = 33.2 kN 181.1 kN > 165.3 kN						
elge bean = 165:3 kN & 3N 19 (existing) & the roots capacity = 141.9 km & Finicharal bankance due to OLA SDL = 33.2 kN 181.1 kN > 165.3 kN		41 1	(12.71 .	7.27 4 60 0		
\$ 300 19 m (existing) of the roods capacity = 141.9 km + Frictional positioned due to QL& 502 = 33-2 km 181.1 km > 165-3 km	. 1 stal hongatal	innust				
+ Frictional positionee due to OCE SAC = 39-2 KN 181-1 KN > 165-3 KN	eog -		=16s:3 k	<u>ω</u>		
+ Frictional positionee due to OCE SAC = 39-2 KN 181-1 KN > 165-3 KN						
+ Frictional positionee due to OCE SAC = 39-2 KN 181-1 KN > 165-3 KN	& 306 19 m (existing)	of the -r	od cepants	= 141.0 km		
18 1-1 kd > 163-3 kd						
	t michigal la	ustance dr	w 70 UC4 3AC		المراجعة الم	
1 A A A A A A A A A A A A A A A A A A A				19 1-1 194	7163-3KB	
UIX YOU DI HUMBERTEE TO TOT HOW	01K dor 74 A7	er dantal	Vehille do			

SIGN	Cumbria County Council Design Services V	Design & Business Services Vork Sheet	Sheet No. 67 of 85 Sheets Rev. No. 0
	Scheme Hill Cottage Radiony Bridge	Scheme Ref. Date Prepared 0.± 199	Preceded by
VICES	Element / Item Result Summary Sheet	Joblog No. Date Checked 2,734.2 Date Checked Oct 199	Checked by
	CALCULATION	IS / WORK	Output / Remarks
	<u> </u>	<u>39E</u> 1	
	1 12	3 1 4	
	Gross exhausal Gro	ss Nottlemed Nett	
	Ina Bean Group IFE 7:51	ares Group IFE 75 Tonies	
	Fig. Rem 7.5t 7.5t	3t 3t	
		ental acadental accidental	
			.
	- height vestmetran on	loudge 15 Stones	
	(as image is in nott	(corrorled) and stron)	
	ES1 REV C (6/99)		<u> </u>

PHOTOGRAPHS



PHOTO NO. 1 - EAST ELEVATION

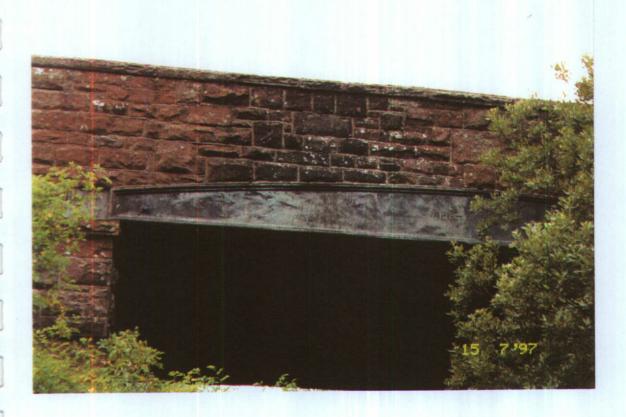


PHOTO NO. 2 - WEST ELEVATION

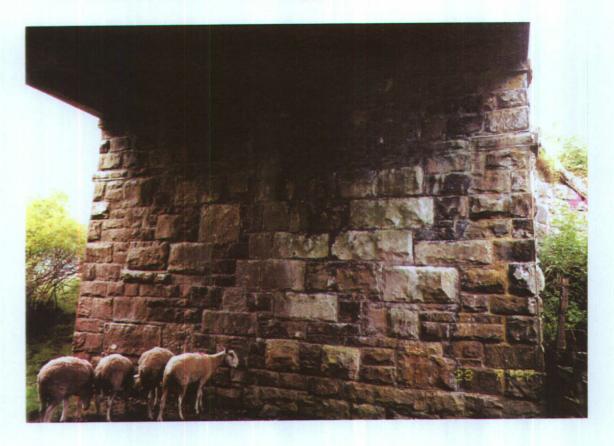


PHOTO NO. 3 - NORTH ABUTMENT



PHOTO NO. 4 - SOUTH ABUTMENT

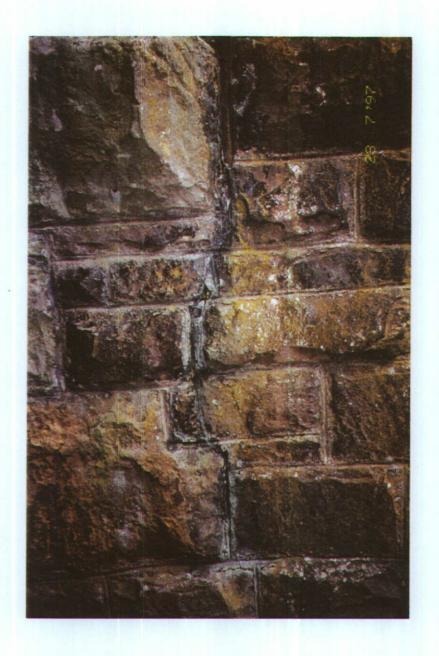


PHOTO NO. 5 - VERTICAL CRACK TO NORTH ABUTMENT



PHOTO NO. 6 - GENERAL DECK SOFFIT



PHOTO NO. 7 - SURFACE CORROSION TO UNDERSIDE OF CAST IRON BEAM



PHOTO NO. 8 - HEAVY CORROSION TO TRANSVERSE TIE ROD

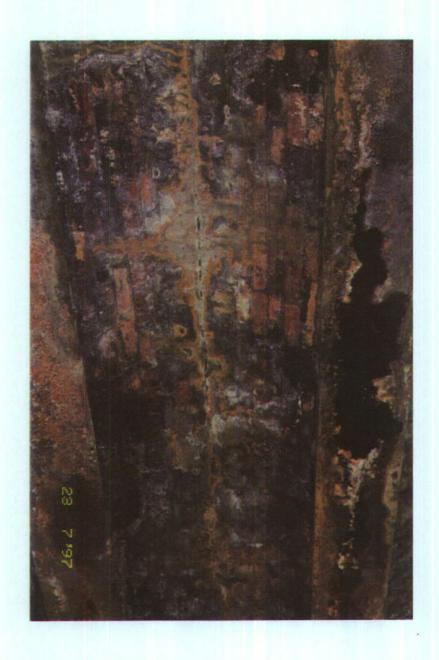


PHOTO NO. 9 - OPEN JOINT AT JACK ARCH CROWN WITH LEACHATE EMITTING FROM JOINT



PHOTO NO. 10 - RANDOM CRACKED JOINTS BELOW EDGE BEAM ON S.W. WINGWALL

U3129 - HILL COTTAGE RAILWAY BRIDGE



PHOTO NO. 11 - DISPLACEMENT OF SOUTH END OF S.W. WINGWALL



PHOTO NO. 12 - DISPLACED COPINGS TO N.W. WINGWALL

U3129 - HILL COTTAGE RAILWAY BRIDGE



PHOTO NO. 13 - SMALL TREE BECOMING ESTABLISHED IN S.E. WINGWALL



PHOTO NO. 14 - DISPLACED COPINGS AND VEGETATION BECOMING ESTABLISHED TO N.E. WINGWALL COPINGS



PHOTO NO. 15 - CRACKED SANDSTONE MASONRY BELOW WEST EDGE BEAM ON N.E. WINGWALL

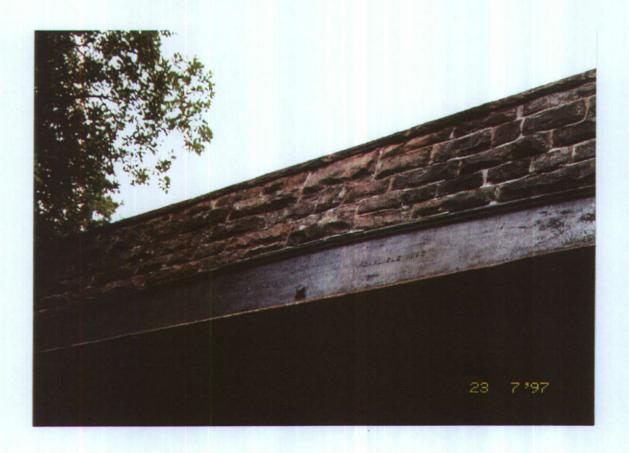


PHOTO NO. 16 - OUTSIDE FACE OF EAST PARAPET

U3129 - HILL COTTAGE RAILWAY BRIDGE



PHOTO NO. 17 - MOVEMENT TO NORTH END OF EAST PARAPET



PHOTO NO. 18 - WEST PARAPET LEANING OUTWARDS BY 100MM AT MID SPAN

U3129 - HILL COTTAGE RAILWAY BRIDGE

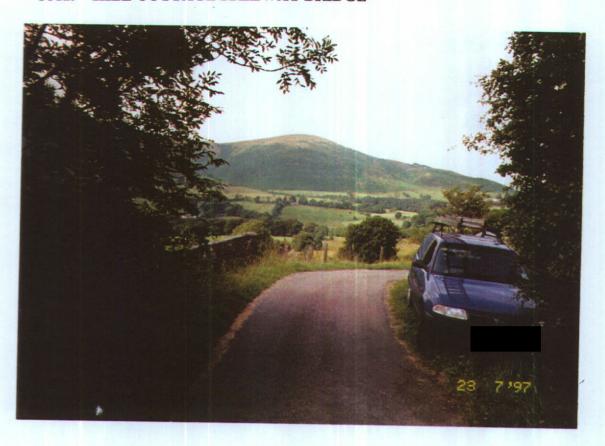


PHOTO NO. 19 - VIEW OVER LOOKING NORTH



PHOTO NO. 20 - VIEW OVER LOOKING SOUTH

APPENDIX

INDEPENDENT CHECK CALCULATIONS

GN	Cumbria Co	ounty Council Design Service	Design es Work Sheet	& Business Services	Sheet No. I /I of Sheets Rev. No.
	Scheme	-	Scheme Ref.	Date Prepared	Prepared by
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Sheet No. 1/3 Design & Business Services Cumbria County Council DESIGN Sheets Design Services Work Sheet Rev. No. Prepared by Scheme Ref. Date Prepared Scheme 28 /9 /99 C1461437 BRPB Checked by Date Checked jobiog No. Element / Item 4/10/99 ERVICES Hill bottage Railway Bridge 23342

CALCULATIONS/WORK Output / Remarks Index to balculations (cont'd) Description Section Edge Beam C1/1 C1/1/1 bases considered DL + SAL (mom) - moment at mid-span " shear at support gross cross-section c/2/122 section properties M2 son stresses nett cross-section c/3/1 & 2 rection properties ALS stresses c/5 0/6 accidental Vehicle Loading Max. BM due to 7.5 Jon des AWL C/7 C/7/1 Fig 2/3 (a) Proportion Factor for Single Land Leading trax SF due to 7.5 Jonnes Aul C/8 Max Bm due to 17.0 Jonnes AWL Max SF due to 17.0 Jonnes AWL C/11 base 1 black 7.5 Tonnes AWL wit bending c/12 hase 2 c/13 base 3 c/14 base 4 C/15 base I black 17.0 Tomes AWL wit bending c/16 base 3 Shear stress check at support for 7.5 Jannes AWL 71/ع Stability of Edge Beams 111-61nz Jack arches - not critical to this assessment home.

(assessor's results agreed) n No. C&D C/DES1 REV C (6/99)

Sheet No. A/ Design & Business Services Cumbria County Council ESIGN Sheets Design Services Work Sheet Rev. No. Prepared by Scheme Ref. Date Prepared / 8 /99 SK British Rail Property C1461437 Date Checked 16 / 8 / 99 Checked by Joblog No. Element / item 8K 23342 Hill bottage Railway Bridge Output / **CALCULATIONS / WORK** Remarks Longitudinal bast From Internal Beam. 208.00 406.4 blear span 7.48 m. 11 0.34m Effective span 7:82 m barriageway 2.80 m Yarges 1.42 m & 2.55 m. Z values. bonsider the following cases 1) gross cross-section with enhancement 4485967 mm 8964257 2) gross cross-section without enhancement 3424402 6842944 3) helf cross-section with lukancement ₹. 4404800 " Z_{k} 8267367 4) helt cross-section without enhancement 3362443 6310967 6 For enhancement see 80 21/97 bl. 7.13. Ref. Drg C37/87 States that girder details are for c37/94 1 Gills Railway Bridge.

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(5/96)

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	and a standard of the second
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ESIGN	Cumbria County Council Design Serv	Design ices Work Sheet	& Business Services	Sheet No. A/I/3 of Sheets Rev. No.	
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RVICES	Flement / Item	loblog No.	Date Checked	Checked by	
le	Hill bottage Railway Bridge CALCULA	1 77	Output / Remarks	-	
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area of jack arch	latines -	1.0	
Lines .	secures jas		
$lines$ $= (\pi R_2^2 - \pi R_1^2) \times$	20		
[/Β <u> </u>)		
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till Bottage Railway Bridge	ONS/WORK	10, 7.07 77	Output /
	JINS / WORK		Remarks
Internal Beam. Bead loading			
$k = 9^{2} - 1^{3} = 74^{2} = 184$			
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b = 228.6			
0 82 0 1067	. 104.1 97	6	
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2R, 2×865			
∴ θ = 38·08 °			
205 0 = 0.787/ = Siny			
y = 90-0 = 51.92°			
x05,8 = 0.6.168 = sin 8			
area 0 = 0.56 cosps	in B		
	and the second s	-0-1	
= 0.5 x 228.6 x	U.6/68× 0.7	8//	
= <u>12685 mm</u>			
E = 1470 - 1067 = 403			
t = 38./			
tan B = 1:276			
	coss)2. 1		
area	1 2 ta	-7,B	
$= \int \frac{364.9}{2} - \left(228.00\right)$	s.6×0.6/68	· _/ 2×1·276	
= 673 mm			
		and the second s	
			The second second

#ill Bothage Railway Bridge 23342 21/0/99 CALCULATIONS/WORK C = E - t	Scheme BRPB Element / Item	Scheme Ref. C. 14 61 4 3 7 Joblog No.	Date Prepared 20 /10/99 Date Checked	Prepared by Checked by
EALCULATIONS/WORK Remarks $C = E - t$	Hill bottage Railway Bridg	23342	21/10/99	Output /
e = c = 41.4 = 32.4 $tamp = 1/276$ Area $\mathfrak{I} = (b - e) c$ = $(b \sin b - e) c$ = $(b \sin b - e) c$ = $(b \sin b - e) c$ = $([228.6 \times 0.7871) - 32.4] + 1.4$ = $6108 mm$ [$2 = 108 mm$ [ÉALCULATION DE LA COLLATION DE	ONS / WORK		
$\begin{array}{c} e = c = 4i + 32 \cdot 4 \\ \hline damp = 1276 \\ \hline area 9 = (b - e) c \\ = (b \sin b - e) c \\ = [(228 \cdot 6 \times 0.7871) - 32 \cdot 4] \cdot 4i \cdot 4 \\ = \frac{6108 \text{ mm}}{2} \\ \hline = \frac{6108 \text{ mm}}{2} \\$	F.F. L			
e = c = $4i.4$ = 32.4 tam, β = 1276 Area ① = $(b-e)c$ = $(ssin \beta - e)c$ = $(ssin \beta - e)c$ = $([228.6x0.7871) - 32.4] + 4.4$ = $6108 mm$ [Eareas ① ② \times ②] 2 • $([2685 + 673 + 6108) 2$ = $38932 mm^2 = 0.038932m^2$ Area of jack arch between radial lines [R, +b _c) ² - R, $\boxed{110}$ [80 = $[(865 + 229)^2 - 865^2] \times 11 \times 38.08$ = $[(865 + 229)^2 - 865^2] \times 11 \times 38.08$ = $(865 + 229)^2 - 865^2 \times 11 \times 38.08$ = $(865 + 229)^2 - 865^2 \times 11 \times 38.08$ = $(865 + 229)^2 - 865^2 \times 11 \times 38.08$ Total area of jack arch = $(865 + 229)^2 - 865^2 \times 11 \times 38.08$ Total area of jack arch = $(865 + 229)^2 - 865^2 \times 11 \times 38.08$ $(86$				
e = C = 41.4 = 32.4 Imm B	- 364-9 - (228-6	×0.6168)		
e = c = 41.4 = 32.4 tam B				
area $\mathfrak{J} = (b - e)c$ $= (228.6 \times 0.7871) - 32.4 + 4.4$ $= 6108 mm$ $[E areas \mathfrak{O} \oplus \times \mathfrak{J}] 2 = (12685 + 673 + 6108) 2 = 38932 mm^{2} = 0.038932m area of jack arch between radial lines [R, + b_{1})^{2} - R,] \frac{\pi}{180} = (865 + 229)^{2} - 865^{2} \times \pi \times 38.08 = 298156 mm^{2} = 0.298156 m = 0.298156 + 0.038932 = 0.337088 m = 0.298156 + 0.038932 = 0.337088 m = 0.036011 m area of segment = 0.036011 m area of segment = 0.3808 \times \pi \times 865^{2} - (1067 \times 6809) = (38.08 \times \pi \times 865^{2}) - (1067 \times 6809)$				
area 3 = $(b - e)c$ = $(228.6 \times 0.7871) - 32.4 + 4.4$ = 6108 mm [E areas 0 0 × 3] 2 = $(12685 + 673 + 6108) 2$ = $(12685 + 673 + 6108) 2$ = $38932 \text{ mm}^2 = 0.038932 \text{ m}$ area of jack arch between radial lines $(R_1 + b_1)^2 - R_1^2 \frac{\pi}{180}$ = $(865 + 229)^2 - 865^2 \times \text{ if } \times 38.08 = 180$ = $298156 \text{ mm}^2 = 0.298156 \text{ m}^2$ Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2 Total area of jack arch = 0.298156 m^2				
area $3 = (b - e) c$ $= (b \sin b - e) c$ $= [(228.6 \times 0.7871) - 32.4] 41.4$ $= 6108 mm$ $[£ areas 0 \oplus 2 \oplus 2 = (12685 + 673 + 6108) 2 = (12685 + 673 + 6108) 2 = 38932 mm^{2} = 0.038932m area of jack arch between tadial lines [(R_{1} + b_{1})^{2} - R^{2}] \frac{T}{180} = [(R_{1} + b_{1})^{2} - R^{2}] \frac{T}{180} = [(865 + 229)^{2} - 865^{2}] \times \text{if } \times 38.08 = [(865 + 229)^{2} - 865^{2}] \times \text{if } \times 38.08 = 0.298156 mm^{2} = 0.298156 m Total area of jack arch = 0.298156 + 0.038932 = 0.337088 m = 0.036011 m^{2} = 0.036011 m^{2} = 0.036011 m^{2} = \frac{0}{180} \times 17 R^{2} - B(R_{1} - R_{2}) = \frac{38.08}{180} \times 17 \times 865^{2} - (1067 \times 680.9)$	e = c = 4/.4	_ = 32.4		
$= (k\sin \beta - e) c$ $= [(228.6 \times 0.7871) - 32.4] + 4.4$ $= 6108 mm$ $[£ arros ① ② \times ③] 2 $ $= (12685 + 673 + 6108) 2$ $= 38932 mm^{2} = 0.038932m$ area of jack arch between radial lines $[(R_{1} + b_{1})^{2} - R_{1}^{2}] \frac{T}{180}$ $= [(865 + 229)^{2} - 865^{2}] \times 11 \times 38.08$ $= (865 + 229)^{2} - 865^{2}] \times 11 \times 38.08$ $= (298156 mm^{2}) = 0.298156 m$ Total area of jack arch $= 0.298156 + 0.038932 = 0.337088 m$ bross-sectional area of leam $= 0.036011 m$ area of segment $= 0 \times 11 R_{1}^{2} - B(R_{1} - R_{2})$ $= (38.08 \times 11 \times 865^{2}) - (1067 \times 680.9)$ $= (38.08 \times 11 \times 865^{2}) - (1067 \times 680.9)$	tan 3 1:276			
$ = (x in \beta - e) c $ $ = [(228.6 \times 0.7871) - 32.4] 41.4 $ $ = 6108 mm $ $ [E arros ① ② \times ③] 2 $ $ = (12685 + 673 + 6108) 2 $ $ = 38932 mm^{2} = 0.038932m $ $ area of jack arch between radial lines [R, +b_{1})^{2} - R^{2}] \frac{T}{180} = (865 + 229)^{2} - 865^{2}] \times 11 \times 38.08 = (865 + 229)^{2} - 865^{2}] \times 11 \times 38.08 = 298156 mm^{2} = 0.298156 m 3011 area of jack arch = 0.298156 m 3028156 + 0.038932 = 0.337088 m 80055558ctional area of learn = 0.036011 m area of segment = 0.298156 m $	area 3) = (b-e)c			
$= \left[\left(228.6 \times 0.7871 \right) - 32.4 \right] 41.4$ $= \frac{6108 \text{ mm}}{1}$ $= \frac{60038932 \text{ mm}}{1}$ $= \frac{6108 \text{ mm}}{180}$ $= \frac{6108 \text{ mm}}{10$				
	= (\$ sin \$ - @	<i>)_</i>		
$= \frac{6108 \text{ mm}}{180}$ $= \frac{6108 \text{ mm}}{1}$ $= \frac{60038932 \text{ mm}}{1}$ $= \frac{60036011 \text{ mm}}{1}$	= [/228.6×0:71	971)- 32.414	1.4	
[\(\text{ins } \text{0} \text{0} \text{1} \text{3} \text{1} \text{9} \] = \((12685 + 673 + 6108) \text{2} \) = \(38932 \) mm \(^2 = 0.038932 \) area \(of \) jack \(\text{arch} \) between \(\text{modial} \) \(\text{lines} \) = \((R_1 + b_1)^2 - R_1^2 \) \(\frac{1}{180} \) = \((R_1 + b_1)^2 - R_1^2 \) \(\frac{1}{180} \) = \((865 + 229)^2 - 865^2 \) \(\text{in} \times \) 38.08 = \((865 + 229)^2 - 865^2 \) \(\text{in} \times \) 38.08 = \((865 + 229)^2 - 865^2 \) \(\text{in} \times \) 38.08 = \((298156 \) \(\text{min} \) \(= 0.298156 \) \(\text{min} \) \(\text{3008} \) \(\text{3008} \) \(\text{500} \) \(\text{3009} \) = \(\left(\frac{38.08}{180} \) \(\text{1} \times \) 865^2 \) - \(\left(\frac{1067}{2} \) \(680.9 \) \)	<u> </u>			
. (12685 + 673 + 6108) 2 = 38932 mm ² = 0.038932 m area of jack arch between radial lines [R, +b ₁) ² -R, Th 180 = [(865+229) ² -865 ²] × II × 38.08 180 = 298156 mm ² = 0.298156 m ² 70tal area of jack arch = 0.2981561 + 0.038932 = 0.337088 m bress-sectional area of learn = 0.036011 m ² area of segment = 0 × II R, B R, L 180 = \(\frac{38.08}{28.08} \times \trac{11}{28.08} \times \trace{11}{28.08} \trace{11}{28.08	= 6108 mm			
. (12685 + 673 + 6108) 2 = 38932 mm ² = 0.038932 m area of jack arch between radial lines [R, +b ₁) ² -R, Th 180 = [(865+229) ² -865 ²] × II × 38.08 180 = 298156 mm ² = 0.298156 m ² 70tal area of jack arch = 0.2981561 + 0.038932 = 0.337088 m bress-sectional area of learn = 0.036011 m ² area of segment = 0 × II R, B R, L 180 = \(\frac{38.08}{28.08} \times \trac{11}{28.08} \times \trace{11}{28.08} \trace{11}{28.08				
. (12685 + 673 + 6108) 2 = 38932 mm ² = 0.038932 m area of jack arch between radial lines [R, +b ₁) ² -R, Th 180 = [(865+229) ² -865 ²] × II × 38.08 180 = 298156 mm ² = 0.298156 m ² 70tal area of jack arch = 0.2981561 + 0.038932 = 0.337088 m bress-sectional area of learn = 0.036011 m ² area of segment = 0 × II R, B R, L 180 = \(\frac{38.08}{28.08} \times \trac{11}{28.08} \times \trace{11}{28.08} \trace{11}{28.08	[E areas U @ x @]	4		
= 38932 mm = 0.038932m area of jack arch between modal lines [R, +b_1]^2 - R, Th	. (12685 + 673 + 61C	08)2		
area of jack arch between radial lines $(R, +b_1)^2 - R$, T			2	
$ \begin{bmatrix} (R, +b_{E})^{2} - R, & TB \\ 180 \end{bmatrix} $ $ \begin{bmatrix} (865+229)^{2} - 865^{2} \\ \end{bmatrix} \times \text{if } \times 38.08 $ $ \begin{bmatrix} 180 \end{bmatrix} $ $ 298156 \text{ mm}^{2} = 0.298156 \text{ m} $ $ 201298156 + 0.038932 = 0.337088 \text{ m} $ $ 60055-5ectional area of beam \underbrace{0.036011 \text{ m}^{2}} 2012817 + 20128 $				
$ \begin{bmatrix} (R, +b_{E})^{2} - R, & TB \\ 180 \end{bmatrix} $ $ \begin{bmatrix} (865+229)^{2} - 865^{2} \\ \end{bmatrix} \times \text{iff} \times 38.08 $ $ \begin{bmatrix} 180 \end{bmatrix} $ $ 298156 \text{ mm}^{2} = 0.298156 \text{ m} $ $ 201298156 + 0.038932 = 0.337088 \text{ m} $ $ 60555-5806 \text{ mal area of beam} $ $ 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $	area of jack arch	between	radial	
$ \begin{bmatrix} (R, +b_{E})^{2} - R, & TB \\ 180 \end{bmatrix} $ $ \begin{bmatrix} (865+229)^{2} - 865^{2} \\ \end{bmatrix} \times \text{iff} \times 38.08 $ $ \begin{bmatrix} 180 \end{bmatrix} $ $ 298156 \text{ mm}^{2} = 0.298156 \text{ m} $ $ 201298156 + 0.038932 = 0.337088 \text{ m} $ $ 60555-5806 \text{ mal area of beam} $ $ 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $ $ 20128 + 2012 + 2012 $ $ = 0.036011 \text{ m} $	lines			
$ = [(865+229)^2 - 865] \times 11 \times 38.08 $ $ = [(865+229)^2 - 865] \times 11 \times 38.08 $ $ = 298156 \text{ mm}^2 = 0.298156 \text{ m}^2 $ $ = 0.298156 + 0.038932 = 0.337088 \text{ m}^2 $ $ = 0.298156 + 0.038932 = 0.337088 \text{ m}^2 $ $ = 0.036011 \text{ m}^2 $	$= (R_1 + b_1)^2 - R_1 = \frac{T}{10}$	<u>B</u>		
298156 mm = 0298156 m Sotal area of jack arch = 0.2981561 + 0.038932 = 0.337088 m bross-sectional area of beam = 0.036011 m area of segment = 0/x T/R; - B/R,-h 180 = (38.08 x T/x 865²) - (1067 x 680.9)				
298156 mm = 0298156 m Total area of jack arch = 0.2981561 + 0.038932 = 0.337088 m bross-sectional area of beam = 0.036011 m area of segment = 0 x TR = B(R-h) 180 = (38.08 x T x 865²) - (1067 x 680.9)	= (865+229) - 865	× # × 38.08		
Fortal area of jack arch = 0.298/56/ + 0.038932 = 0.337088 m bross-sectional area of beam = 0.0360// m area of segment = 0/x πR - $B(R, -R)$ - $(80 \times 17 \times 865^2)$ - (1067×680.9)		180	2	
Jotal area of jack arch = 0.298/56/ + 0.038932 = 0.337088 m 60055-sectional area of beam = 0.0360// m area of segment = 0/x T/R - B/R,-h - 180 - 2/38.08 x T x 8652) - (1067 x 680.9)	= 298/56 mm = 0	298 156 m		
bross-sectional area of beam = 0.036011 m area of segment = 0 / x $\pi R^2 - B(R, -h)$ = $(38.08 \times 17 \times 865^2) - (1067 \times 680.9)$	and the second of the second o	and the second of the control of the		
bross-sectional area of beam = 0.036011 m area of segment = 0 / x $\pi R^2 - B(R, -h)$ = $(38.08 \times 17 \times 865^2) - (1067 \times 680.9)$	= 0.298/56/ + 0.0	38932 = 0	·337088 m	
area of segment = $\frac{0}{1} \times \pi R^2 - \frac{B}{1} (R, -R)$ = $\frac{38.08}{180} \times \pi \times 865^2 - \frac{1067}{2} \times 680.9$				
area of segment = $\frac{0}{1} \times \pi R^{2} - \frac{B(R, -k)}{2}$ = $\frac{38.08}{180} \times \pi \times 865^{2} - \frac{1067}{2} \times 680.9$	bross-sectional are	a of be	247	
$= \left(\frac{38.08}{180} \times 17 \times 865^{2}\right) - \left(\frac{1067}{2} \times 680.9\right)$	= <u>G: U360// M</u>			
$= \left(\frac{38.08}{180} \times 17 \times 865^{2}\right) - \left(\frac{1067}{2} \times 680.9\right)$	area of segment			
$= \frac{38.08 \times 17 \times 865^2}{180} = \frac{1067 \times 680.9}{2}$	$= \underbrace{\partial I}_{\times} \pi^{\mu} R_{\mu}^{2} - \underline{B}$	(R,-R)		
$ = \frac{38.08 \times 17 \times 865}{180} \times \frac{17 \times 865}{2} = \frac{1007 \times 10007}{2} $	/80 2 2	11067 1000	a)	
The control of the co	- ・ ・ /ンを!ひるこ /T こ さんり ニー/	/ · · · · · · · · · · · · · · · · · · ·	M. Programment of the Contract	The second secon

ESIGN	Cumbria County Council Design Services V		Sheet No. A /2 /2 of Sheets Rev. No.			
	Scheme BRPB	Scheme Ref. c 1461437	Date Prepared 20/10/99	Prepared by		
TVICES	C	iobios No	Date Checked	Checked by		
	Hill bottage Railway Bridge CALCULATION	23342	21/10/99	Output /		
	CALCULATION	IS / WORK		Remarks		
	Onea of Lilling					
	area of filling = (DxA) - arka of	segment				
	total area of jack	_ arca				
	- bress-sectional area		n .			
	-(B×\$)					
	= (0.638 × 1.470) - 0.13	4026				
	- 0·337088 - 0· 0360	//				
	- (1.067 × 0.03945)					
	= 0.388642m ²					
	area of surfacing					
	area of surfacing	0.1470 m				
to. C&D C/DES⁴	1 DEV.C. (6/00)	<u> </u>				

3-2,5

 $|\psi_{i,j}^{(r)}| = \tilde{S}$

Scheme BRP	 B	D€	sign S ———	ervices '	Scheme Ref.		Date Prepared	of Sheets Rev. No. Prepared by
Element /	tem	5	Ъ.	·	Joblog Na.		Date Checked 2/ /10 /99	Checked by
<i>#; &</i>	oHage	<u>Kailwa</u>	y Br	LAGE	<u>233+2</u> NS/WORK	· — ·		Output /
			CALC	OLATIO	NS / WORK			Remarks
	L C A /							
DZ	+ SDL							
Jac	karch	23	5 4 >	× 0-33	7088	•	7.935	
				0.70	0017		0.140	
				4 1			9-149	
F/. L	lacino	23	.54	× 0·14	70	=	3.460	
1 7	T							
ಿ ಶಿ	an	70	-6/	× 0.03	36011	=	2-543	
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1-1-								
20.53	essme	nt le	<u>ads</u>			ļ	0 8 8	
-	, ,	,	<i>y,</i>	043	Q 7.935		Q & Y X f, 33 7 9 3 5	
Jac	k arch		.0	1.0		i e e e i e i e i e i e i e i e i e i e	7.733	
	(cone)			1.0	9.149		9 149	
		-					5-190	
San	facing	- /	٠5	1:0	3.460		3.770	
Rec	znz		10	1.0	2·543		2 543	
					an (1889) and an are first to the second of the second			
							24.817	
		<u> </u>						
	M = + SAZ	. wl	<u> </u>	4.817×	7.82 -	18	9.70 km	
54	+ 58 2	8		8				
	V	= wl	ر ر	4·8 /7 ×	7.82 -	9	7.03 kn	
Δ 4	V :	2		4·8 <i>17</i> × 2				
						-		+
			l -			4		
			in seret La Sali		A CAMPAGA AND A			
			<u>:</u>	1				

NC A/4 Made by:

24.06.99 Date: Ref No: 23342

Office: 5598

Location: INTERNAL BEAM @ Midspan d=508mm

gross bross-section.

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

			andan.	
	nates	of points in	order:	/1\-0 mm
Point	1 :	X-coordinate		x(1) = 0 mm
		Y-coordinate		y(1) = 0 mm
Point	2 :	X-coordinate		x(2) = 406.4 mm
		Y-coordinate		y(2) = 0 mm
Point	3:	X-coordinate		x(3) = 406.4 mm
		Y-coordinate		y(3) = 44.45 mm
Point	4 :	X-coordinate		x(4) = 222.25 mm
•		Y-coordinate		y(4) = 44.45 mm
Point	5 :	X-coordinate		x(5) = 222.25 mm
		Y-coordinate		y(5)=469.9 mm
Point	6 :	X-coordinate		x(6) = 254 mm
		Y-coordinate		y(6) = 469.9 mm
Point	7 :	X-coordinate		x(7) = 254 mm
• • • • • • • • • • • • • • • • • • • •		Y-coordinate		y(7) = 508 mm
Point	8 :	X-coordinate		x(8) = 152.4 mm
	_	Y-coordinate		y(8) = 508 mm
Point	9 :	X-coordinate		x(9) = 152.4 mm
101110	•	Y-coordinate		y(9) = 469.9 mm
Point	10 :	X-coordinate		x(10)=184.15 mm
		Y-coordinate		y(10) = 469.9 mm
Point	11 .	X-coordinate		x(11) = 184.15 mm
10111	'	Y-coordinate		y(11) = 44.45 mm
Point	12 .	X-coordinate		x(12) = 0 mm
		Y-coordinate		y(12) = 44.45 mm
Point	13 .	X-coordinate		x(13) = 0 mm
Lorne		Y-coordinate		y(13)=0 mm
•				•

Sectional properties

Cross-sectional area

38145 mm2 ~ Gross Section Ayes

Second moments of area (inertias) Ixx=1.1594E+9 mm4

Iyy=253919597 mm4

Product of inertia dA.xy

Ixy=0.71526E-6 mm4

Distance of centroid from origin X=203.2 mm

Y=169.43 mm

X and Y are principal axes.

No650 Z = 1-1594E9 = 3424402 mm 508-169.43 338.57

$$\frac{2}{2}$$
t 1.1594 E9 = 6842944 mm³

SIGN	Cumbria County Council	Sheet No. A /5 of Sheets			
	Scheme BRPB Element / Item	Scheme Ref. C 46 437 Joblog No.	Date Prepared 9 / 8 / 99 Date Checked	Rev. No. Prepared by Checked by	
WICES	Hill Bottage Railway Bridge	23342	21/10/99	SL	
	CALCULATIO	Output / Remarks			
	Internal Be	an			
	1) grass cross-section w	rith enhance	-ment		
	D = 6.63 = 1.31				
	<u>D</u> = 663 = 1.31 d				
	7 = 3404400 ×1.31	= 4485 967	3	A /4	
	Z = 3424402 ×1·31				
		- 2004 057	- 3	A/4	
	물. : 6842944 × I·31	- 876427/		 4 /4	
1	DL + SDL Shesses.				
	fi = 189.70×10 = 55.41 3424402	0 N/mm		A/3	
	3424402				
	1 189.70 × 10 - 277	2 N/mm			
	f _{bt} = 189.70 × 10 = 27.7				
	3	- 00 41/	2	A/3	
	∫ = V = 97.03 × 10 5 d	2 >2 y 3 / mm			
	10				
	Stresses available for L	L			
	V V				
	= 154 - 5 540 = 5	98.60 N/mm	But subjected to further restrictions		
	[= 46 - 27·72 =	8.28 N/mm	to futter		
	1 164		2 xestrictions		
	<u> </u>	10.01 H/mm			

DESIGN	Cumbria County Council Design & Business Services Design Services Work Sheet			Sheet No. A 5 1 of Sheets Rev. No.	
	Scheme	Scheme Ref.	Date Prepared	Prepared by	
	BRPB	C 1 4 G 1 4 3 7 Jobiog No.	9/8/99 Date Checked	Sill Checked by	
ERVICES	Hement / Item Hill hetene Railway Brid		21/10/99	SL .	
de	Hill bottage Railway Brid	ULATIONS / WORK		Output / Remarks	
•		<u> </u>			
	3) het cross-section	with enhancemen	t		
	1·31				
	7 - 225 2462 112	1 = 4404800 m	3	A/6/1 &A/1	
	ヹ : 336 2 44 3 ×1⋅3				
	圣 _t = 6310967 × 1:31	= 8267367 m	42	ч 4	
The second secon					
	DL + SDL shesses	The second secon			
		56.42 N/mm			
	= 189.70×10 3362443	36.4.2.13,8.8			
	3762787				
	£ = 189.70 × 10 =	30.06 N/mm			
800 N 1 1 100 P 10	$\int_{1}^{1} \frac{189.70 \times 10}{6310967} =$				
40. 14. 14. 14. 14. 14. 14. 14. 14. 14. 14		and the second s	<u> </u>		
	f = 5.99 as fo	r gross cross-sect			
	mo ku	el corrosion assum	~ e d)		
	1 .0 .0.				
	stresses available	7			
	f - 154 - 56.42 =	97.58 N/mm	7		
	f ₂ = 154 - 56:42 =		But		
	f = 46 - 30-06 =	15.94 N/mm	Subjected		
	14		to further		
	$\int_{0}^{1} = 154 - 56.42 = 154 - 30.06 = 15$	gross cross-sect	ion restriction	4	
				<u> </u>	
No. C&D C/DES	1 REV C (6/99)				

ř :

Sheet No. A/6 **Design & Business Services** Cumbria County Council ESIGN Sheets of Design Services Work Sheet Rev. No. Prepared by Scheme Ref. Date Prepared Scheme SL C1461437 8 BRPB Bement / Item jobiog No. 16 /8 /99 Hill bottage Railway 23342 Output / CALCULATIONS / WORK Remarks Internal Beam 101.6 8 38.1 9 31.75 0 508 181-65 181-65 401-4 co-ordinates 0 401.4 0 3 401.4 39.45 4 219.75 39.45 5 467.4 219.75 251.5 467.4 505.5 7 251.5 505.5 8 1499 9 457-4 149.9 181.65 467-4 Ь 11 181.65 39.45 12 39.45 0 13 0 Ö No. C&D C/DES1 REV C (6/99)

Made by: 4/5/1 Date: Ref No:

Office: 5598

Location: INTERNAL BEAM @ Midspan d = 505.50mm (Corroded Section)

Properties of any plane section

Wett bross-section.

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordi	inates	of points in order:	
Point	1 :	X-coordinate	x(1) = 0 mm
		Y-coordinate	y(1)=0 mm
Point	2 :	X-coordinate	x(2) = 401.40 mm
		Y-coordinate	y(2) = 0 mm
Point	3 :	X-coordinate	x(3) = 401.40 mm
_		Y-coordinate	y(3) = 39.45 mm
oint	4 :	X-coordinate	x(4) = 21.9.75 mm
V		Y-coordinate	y(4) = 39.45 mm
Point	5 :	X-coordinate	x(5) = 219.75 mm
		Y-coordinate	y(5)=467.4 mm
Point	6 :	X-coordinate	x(6) = 251.5 mm
		Y-coordinate	y(6)=467.4 mm
Point	7 :	X-coordinate	x(7) = 251.5 mm
		Y-coordinate	y(7) = 505.5 mm
Point	8 :	X-coordinate	x(8) = 149.9 mm
		Y-coordinate	y(8) = 505.5 mm
Point	9:	X-coordinate	x(9) = 149.9 mm
		Y-coordinate	y(9)=467.4 mm
Point	10 :	X-coordinate	x(10) = 181.65 mm
		Y-coordinate	y(10)=467.4 mm
Point	11 :	X-coordinate	x(11) = 181.65 mm
		Y-coordinate	y(11)=39.45 mm
Point	12 :	X-coordinate	x(12) = 0 mm
		Y-coordinate	y(12) = 39.45 mm
Point	13 :	X-coordinate	x(13) = 0 mm
		Y-coordinate	y(13) = 0 mm

Sectional properties

Cross-sectional area

36011 mm²

Second moments of area (inertias) Ixx=1.1089E+9 mm4

Iyy=217919155 mm4

Product of inertia dA.xy

 $Ixy = -0.47684E - 6 mm^4$

Distance of centroid from origin

X=200.7 mm Y=175.71 mm

X and Y are principal axes.

No650

$$\frac{Z}{Z} = \frac{1.1089E9}{505'5 - 175.71} = 3362443 mm$$

Scheme BRPB Bernent / Item	Scheme Ref.	Date Prepared 10 /8 /99 Date Checked	Rev. No. Prepared by Checked by
Hill bottage Railway Bridge		16/8/99	Sit
CALCL	LATIONS / WORK		Output / Remarks
Internal Beaus.			
Live Loading			
Live Loading barriageway width	2.80 ~		
no. of motional la			
Loaded length	7.82 m		
		0.67	
Mors. HA UBL :	ω = 336 (7.82)		
	= 84.70 km/s		
nom KEZ /lane =	120/10		
adjustment facts for loaded largth	r = 1:46		
for loaded largth			
1 < 20 m			
adjusted UBL =	84.70 = 58.0	1 kashan	
	1.44		
n KEZ =	120 . 82.19	kn/lane	an, a gamantagangan sa tagawa na taga sa taga s
	1.46		
these relate t	<u>- a 2.5 m 1</u>	27 d L	
lane			
M = wl + v	<u>U</u>		
4 8 4	22° + 82·19×7·2		
	$2 + \frac{82\cdot 79\times 7\cdot 3}{5}$	<u> </u>	
443.43	+ 160.68		
	1 10000		
= 604-11	kum /2.5 m	lane	
	1 7 90 20G. R	2 62	
$S = \omega l = 58.0$	1 × 7.82 _ 226.8 2	n hane	
	2 /2/5/		
Sz = 8219kN	12.5 m lane		

DESIGN	Cumbria County Council Design & Business Services Design Services Work Sheet	Sheet No. B/2 of Sheets Rev. No.
27	Scheme Scheme Ref. Date Prepared BRPB C14G1437 /o/8/99	Prepared by
RVICES	Hernent / Item Hill bottage Railway Bridge 13342 21/10/99	Checked by
de	CALCULATIONS / WORK	Output / Remarks
9 16 /97 'L Z 6	Simple distribution methods	
	The nominal live load bending moment	
	applied to an internal girder under a traffic lane can be obtained by	
	multiplying the gross moment by the	
	appropriete factor from Fig 2/2	
	Girder spacing 1:47 m Effective spand 7:82 m	
	Graph a) Single lane loading.	
	K = 0.32	
	M, = 604.11 kmm	3/1
	M = 604.11 x 0.32 = 193.32 kNm.	B/2/1
	Consider traffic/surface condition	
	$M_{42}'' = 193.32 \times 0.87 = 168.19 \text{ kNm}$	
	K for to sonnes(Lp)	
	base 1 gross section & base 3 net section.	
	(= 193.32×10 = 21.57N/mm	gross-section
	β = 193-32×10 ⁶ = 2h57N/mm be 8964257	A/5
	I = 27-72 N /mm = I	A/5
	\$\int_{\beta \in \text{35}} = \frac{27.72}{\text{N} \text{Imm}} = \int_{\delta}	
l 4.10	f = 24.6 - 0.74.f	
e es	21.6 - (0.14-27.70) - 12.40 N/2	Gross- section
	$= 24.6 - (0.44 \times 27.72) = 12.40 \text{ N/mm}^2$ $- (0.44 \times 30.06) = 11.37$ or $\int_{L} = 19.6 - 0.76 \int_{L}$	Gross section het section
	or f = 19.6 - 0.76 f	
	= 19.6, - (0.76 × 27.72) =-1.47 N/mm	Myrous - section
	Jans, le stress due to LL = 21.57 N/mm² > 12.40 N/mm² un suitable > 11.37 N/mm² of K=1 (L	gross-section
	1.27 W/m2 for K=1 (L)	net -section.
No CAD CIDES	S1 REV C (6/99)	

B/2/I

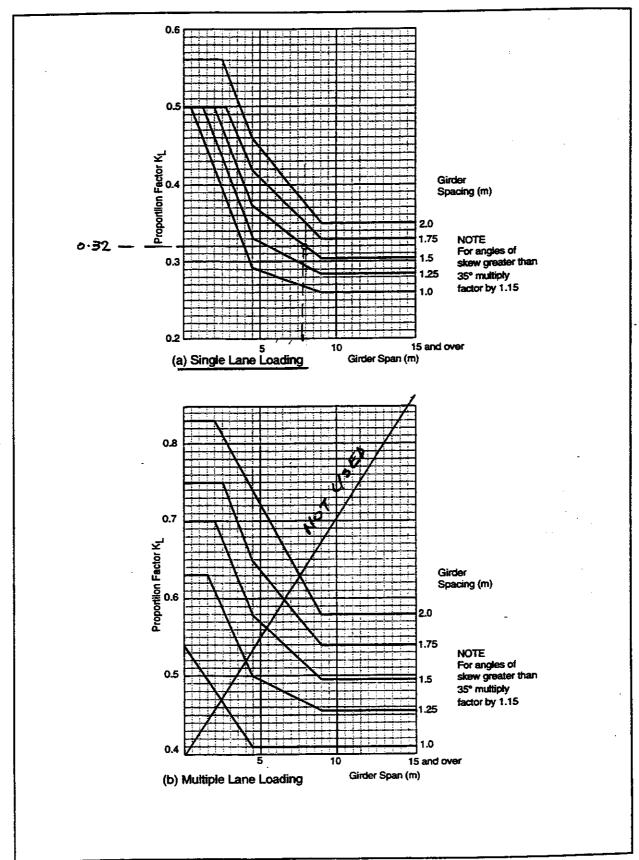


Figure 2/2 Proportion Factors for Internal Longitudinal Girders

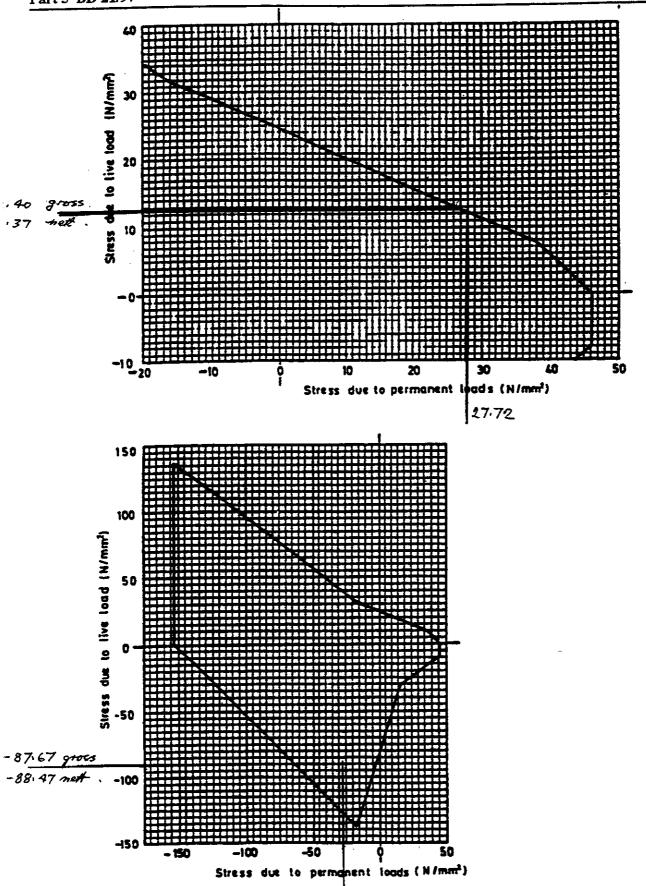


Figure 4.1 Permissible Stresses in Cast Iron

155.40

7	Design Services	Work Sheet		of Sheets Rev. No.
S	cheme	Scheme Ref.	Date Prepared	Prepared by
	BRPB	C1461437	10/8/99	Sh. Chadad by
	lement/Item	Jobiog No. 23342	Date Checked 21 10 99	Checked by
	<u>4:11 bottage Railway Bridge</u> CALCULATIO			Output / Remarks
	J = 193.32 × 106 . 43	.09 N/mm		A/5
	f = 193.32 × 10 ⁶ , 43 6c 4485967			
	14			
	be 56.42, 7	<i>=</i> ∫,		Spross section
	be 56.42			men secres
10	J = -43.9 + 0.79-f			
Y 200 200 200 200 200 200 200 200 200 20				
	= -43.9.4 (0.79.5	5.40 = -87.6	7 N/mm	goss sections
	1 + (9.79 x -5	5-20 = -256	21 N/	THE SECUSOR
	$= -43.9 + (0.79 \times -5.00)$ 0.79×-5.00	m but ignore		
	1			
	Compressive stress de	re to hh		
	= 43.09 N/mm2 < 8	7-67 N/mn	ok ok	gross-section
		8.47	T1 1 -1.0 (4)	Then section
	check 5540+87.67 = 1 Limiting 56.42+88.47 = 54256	144.89		Met section
	34246 2 2 154N/mm			
	Longitudinal Members	Shear		
8	化氯化二氯化二氯化二氯化二氯化二氯化二氯化二氯化二氯化二氯化二氯化二氯		menber	
0	hominal shear on A	Junama		
	S = K S + 0.5 S			
		0 4	A /4.1	
	S = shear on longitudio			
	K = appropriate proport	tron factor	trom	
	K = appropriate proport			
	S = gross shear of o lane of usl. []	ne 2.5 m -1	rotional	
	kane of UBS. 1 1k	~ /		
	5 = Value of KEL Lor	5me 2.5m	notional	
1	5 = value of KEL for k lane (kn)			
	$S = \frac{\omega l}{2}, k + 0.5 \times 8$	2.19		
				B/I
		+ TIVI 7	and the second control of the second control	
	= 58.01×7.82×0.32			Landa America
	2 1/3.68 km			

ESIGN	Cumbria County Council Design Services		k Business Services	Sheet No. B/4 of Sheets
	Scheme BRPB	Scheme Ref. C 1461437	Date Prepared /o / 8 / 9 9	Rev. No. Prepared by
RVICES	Element / Item	joblog No. 23342	Date Checked 21 /10 /99	Checked by
<u> </u>	Hill bettage Railway Bridge CALCULATION	<u> </u>		Output / Remarks
	$S_{2}^{"} = 1/3.68 \times 0.87 = 98$			
	f' = 113.68 × 103 = 7.0	1 N/mm		A/5
	$f' = \frac{113.68 \times 10^3}{425.95 \times 38.7} = 7.8$	both gross a ross-section) 169	A/5
	Shear stress due to (06+	50L) + LL		
	= -5.99 +7:0/ = 13·	00 N/mm² 46 N/mm²	., oK	
	but check also:	and the second s	for K = 1-0 (L)	
124.11	9 < 24.6 - 0.44.9	N/mm -		
	24·6 - (0·44×5·99)	= 21-96 N	1/mm2	
			/mn : OK for K=1-0 (L _p)	
	as corresion was on			
	the surfaces of t			
		for gross co	msideled	
	to be same.			
			_	
	Shear Resistance Y :	to do = 45	_ × 10 - 3 km	
		38.1×425.45×		
	confpact cections	430 has		
	and the second control of the second control	محاف بسيرة بالأبد والأندر عدرتمون	المنطقة المتعادية والمتعادية والم	
		113.68 len adjusted	AL TSBL	
		HA Loading		
	: Adequate shear is provided.	-resistance		

Scheme BR			Scheme C 1 4 Jobiog N	61437	Date Prepared 10 /8 /99 Date Checked	Rev. No. Prepared by Checked by
Element		ailway Bridge		342	21 /10/99	&L_
		CALCU	LATIONS / W	ORK .		Output / Remarks
\ \\ \mathcal{Y}_{n/}	arnal	Beam - 2	assessmen wrt ken	sile stru	erry esse	
			in bottom			
				1 0		
l la	se !	1 2 10 1				
	†	< 46 - July				
	12.	40 < 46 - 27.7	2=18.28 N	mm y	ross-section	A/5 % E
	A 11-	37 < 46 -30-0 = 193.32×10 8964257	6= 15.94		rell section	19mp
	gr fr	F 193.32×10	= 21:57 u/~	.; <u>C = 12</u> 21	57	3400
		Y/97 5/	· / ~ ~			
l a	se 2					
		+ 107.30	400-	. 6.10	.40 0.439	7.5 Jmn
	_ ֈֈֈ′	= 193·32×10 6842944	= 28.25	28	·25	7,500
and a second						
bas	.e_3					
	$\int_{\mathbf{k}}$:	8267367	- 23·38	: C=11.	37 = 0.486	Group 1
	- PE	8267367	N/mm²	23.	38	
ba	se 4					
	-	193.32×10 6310.967	= 30.63		·37 <u> </u>	7.5 J 🗪
		631676/		30.	62	
+						
+						
	1					
4						I
					عقاما الإسعالات لأتساؤه بالإجتباعات	

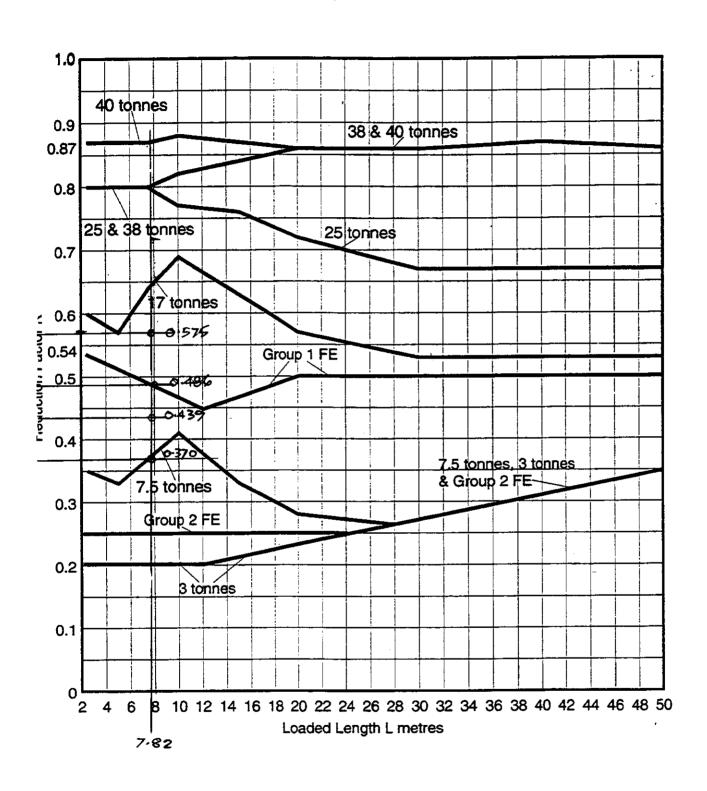


FIG 5/4. K Factors for Low Traffic Poor Surface (Lp)

ONSULTANCY	Cumbria County Council		ion Services	Sheet No. B/6
	Consultancy & Desi	gn Work Sheet		of Sheets Rev. No.
XZ	Scheme	Scheme Ref. Date Pro	,,	Prepared by
	BRPB		8 /99	Checked by
ESIGN	Hill bottage Railway Bridge	23342	ecked /99	SK
rde f.	CALCULATION	IS/WORK		Output / Remarks
	Internal Beam - assess	ment -capacity compressive stre top flange		
	wrt-	compressive stre	<u> </u>	
		, op		
	base)			
		- 40 - 98 40 ··/	2	B/3 & A/5
	£ 2 87.67 < 157 − 5	5-40 ≠ 70-60 ×/m.	27	B(3 & 1/12
	193.32 × 10 = 43 4485967	1.09 N/mm2		
	bo 4485967			
	r. c = 87.67	• •		
1	C = 87.67 > 1 43.09 : compressive stress acceptable limit.			
	: compressive stress	well within		
	acceptable limit.			
	1 . 8847 < 154 - 56	42 = 97·58~/mm	*	B/3 & A/5/1
\$40,440,400,400,400,400	f = 193.32×10 = 57.4.	/ N/mm		
	.i.	9		
	i - n Lucsivo strees	well within		
	mcceptable limit.	for adjusted HA		
	i compressive stress mcceptable limit Zeading			
	<u> </u>			
\$1.00 mm and an array of the contract of the c				
No. C&D C/DES1	REV B (3/98)			

ESIGN	Cumbria County Council Design Services		& Business Services	Sheet No. B/7 of Sheets Rev. No.
	Scheme BRPB	Scheme Ref. C 4 G 4 3 7	Date Prepared	Prepared by
TVICES	Element / Item	joblog No. 23342	Date Checked 4 / 10 / 99	Checked by
,	Hill Bollage Railway Bridge CALCULATION			Output / Remarks
7/27 7:31-5:33			ads.	
-te > /3 //	Mominal Single Axle For 40 James (4) 90 W 1800	700 b	ehveen axles	
	as only I No areletronsies sely on the	za be	+laced.	
	transversely on the the effect on the the bone as the wheel Lond.	critical	beam is	
	as span of 7:82m compared furth pat produced by district Single Wheel of Load, point load.	bution of	as	
: 16/97	(ac m/a-sea)	= 190 × 7.83	2 = 175.95 km K = 0:32	
,2.2 a	bonsider: base 3 thett ere enhan j = 30:06 H/mm	ess-saction .	<u>with</u>	A/5/I B/2
		N/mm		

SIGN	Cumbria County Council Design Services	_	Business Services	Sheet No. B/8 of Sheets Rev. No.
	Scheme	Scheme Ref. C /4G /437	Date Prepared	Prepared by
VICES	BR PB Element / Item	loblog No.	Date Checked 4 /10 /99	Checked by
	H; 11 bottage Railway Bridge CALCULATION	NS / WORK		Output / Remarks
	1 = 24 6 - 0·44 J			
	= 24.6 - (0.44×30.06)	= 11.37 N /mm	2	
			A contract the second second second	
	Jensile stress due to = 6.81 N/mm² < 11.37 N/	Single Whi	rel Ioad	
	Suitable for 403 Single Upheel Lo	Jonnes (L)		
	Single Upheel Lo	<u>-4</u> .		
	Compressive stress not	entical,		
L				
g ama i anto non antino. Esta de la composition				

DESIGN	Cumbria County Council Design Services		& Business Services	Sheet No. C// of Sheets Rev. No.
2	Scheme BR PB	Scheme Ref. C14 & 1437	Date Prepared	Prepared by
ERVICES	Element / Item	Joblog No. 23342	Date Checked 4 / 10 / 99	Checked by
ode	Hill bottage Railway Bridge CALCULATIO	NS / WORK		Output / Remarks
<u>f.</u>				
	Longitudinal bast gron &	Edge Beam.		
	bonsider the following	cases:		Z values
	1) gross cross-section with	and the second s	ent Z	5781554 mm3
		and the second s	and the second s	7726687
	2) Goss cross-section without	ut enhance	nent Z. Z.	5255958 7024261
	3) Met cross-section with	enkanceme	eut Ze	5643855
			randara da market 🖟 i 🗀 bini nchi T👺 4000	708 7 953
	4) het cross-section witho		rment Z. Z.	G443594
		s RD21/97	Al 7·13.	
	For enhancement se			
	Enhancement factor	for Edge	Beam = 1.10	A/ı/ı
		ala Maria da		
The state of the s	A / A. C27/97			
	NB. Ref. Dry C37/87 States that gire	der detail	s are	
	as for C37/94	4 Bridge		
	12 1 1/1/15 Kaj Iwa	J Bridge		
		e de la companya de La companya de la co		
Andrew Commence				
e de la companya de l				
e e e e e e e e e e e e e e e e e e e				
			andrew en la company de la La company de la company d	·

AND CAR CIDEST REV C (6/99)

 $\mathbb{R}^{n_1},\mathbb{R}^{n_2}$

DESIGN	Cumbria County Council	Design Services	_	& Business Services	Sheet No. C/J// of Sheets Ref. No.
	Scheme		Scheme Ref.	Date Prepared	Prepared by
	BRPB		C1451437	3. 19/99	S.L
RVICES	Element / Item	6 - L	Joblog No.	21 /10 / 9 9	Checked by
e	Hill bettage Rail	ray Brage	23342	21 110 139	Output /
		CALCULATIO	NS / WORK		Remarks
	Edge Beam				
				بسلوبين فالمستواسم المستوفي والمستوادي	
	Lross-sectiona	l aneas:	مهاد مؤسد وما يود، ميد الأمام أن أن أن أن أن	and a second	A STATE OF THE STA
ما إحمالية بالإناد	7,733,325,127,12				
an alaman an ang ara ara ara ara ara ara ara ara ara ar	Edge beam	Andrew Andrew State (1997)	0.03773	2	
	1 <u>1</u>	and appear to the same of the	للمحالية المتحالة الم	and the second s	
	Masony parape	26			
	01.130 x	0.45	0.5085		
	1 11		A. 170A		-
	Halfarea of	jackasch	0.169.0	and the second second	
- Jan Carrier	11.01 11/12	(0.1940	and Johnson a march the second of the second	
	Half filling	Beam			
and a few second	1 7		nangana ana ay kata dan dan dan dan dan dan dan dan dan da		
	Yarge filling	g (Soj/)		and the same of th	
a Nazar - Alaba Araba Arab Araba Araba Ar	Yarge filling	1.45×0.5	0.0365		
			erikan di Kabupatèn Babaharan Kabupatèn Babaharan Kabupatèn Babaharan Kabupatèn Babaharan Kabupatèn Babaharan Kabupatèn Babaharan	and the second s	and the second s
ili. Lagran Brown	the second of th	· ·	. The second second second		
	Dead loads	9			
			3773	2 (() /	
	Edge beam	70.61 × 0.0.	3//3	2.66 KN/M.	
		,	The state of the s	1.97	e e e e e e e e e e e e e e e e e e e
	Masonyparape			97	
	Jack arch	and the second of the second o	and the second s	.98	
		<i></i>		سانده والمستداري المرابع والأراز والإرار	
	Filling (conc)	23.54× 0.1	940 = 1	<i>1.57</i>	
	(501)	23.54× 0.1 17.66× 0.0	305	2·57 2·54 3·72	
			<u>2</u> ;	<u>5.72</u>	
		2 32 70 7	a 2	2	
	OLYSOL WE	² = 23·72 ×7 8	82 - 181-33	C KNM	
	3		e e e e e e e e e e e e e e e e e e e		
And Annual Control	V w	_ 23.72 -	.82 = 9 <i>2</i> .7	5 KN	
	ALYSOL 2	_ <u>23.72 ×7</u> 2			
				and the feet was become	
***		and the second of the second		The second secon	
*			e e e e e e e		1
	1			and the second	1 - 0 - 2

(<u>...</u>

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## 152-4 152-4	de	CALCULATIO			Output / Remarks
6 304.5 571.5 7 304.5 609.6 8 152.1 609.6 9 152.1 571.5 10 222.4 571.5 11 222.4 38.1	de .	Bernent / Item Hill Lottinge Railway Bridge CALCULATIO Lage Beam Lyross-section 70.3 70.3 15 15 20 304.5 21 304.5 304.5 304.5 304.5 304.5 304.5 304.5 304.5 304.5 304.5 304.5 38.1	23342 DNS / WORK	Date Checked 4/10/99	
		6 304.5 571.5 7 304.5 609.6 8 152.1 609.6 9 152.1 571.5 10 222.4 571.5 11 222.4 38.1 12 0 38.1			

BRPB
Hill Cottage Railway Bridge
Edge Beam
gross-section at centre of span

Page: 1
Made by: D.KIRBY
Date: 30.19.99

Ref No:

Office: 5598

Location:

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordinates of points in order: x(1) = 0 mm : X-coordinate y(1) = 0 mm Y-coordinate x(2) = 304.5 mm: X-coordinate Point 2 y(2)=0 mm Y-coordinate x(3) = 304.5 mm: X-coordinate Point 3 y(3) = 38.1 mmY-coordinate x(4) = 260.5 mm Point 4 : X-coordinate y(4) = 38.1 mmY-coordinate x(5) = 260.5 mm: X-coordinate Point 5 y(5) = 571.5 mmY-coordinate x(6) = 304.5 mmPoint 6 : X-coordinate y(6) = 571.5 mmY-coordinate : X-coordinate x(7) = 304.5 mmPoint 7 y(7) = 609.6 mmY-coordinate x(8) = 152.1 mm: X-coordinate Point 8 y(8) = 609.6 mmY-coordinate x(9) = 152.1 mm: X-coordinate Point 9 Y-coordinate y(9) = 571.5 mmx(10) = 222.4 mm: X-coordinate Point 10 y(10) = 571.5 mmY-coordinate x(11) = 222.4 mm: X-coordinate Point 11 y(11) = 38.1 mmY-coordinate x(12)=0 mm : X-coordinate Point 12 y(12) = 38.1 mmY-coordinate x(13) = 0 mm: X-coordinate Point 13 y(13) = 0 mmY-coordinate

Sectional properties

Cross-sectional area 37730 mm2

Second moments of area (inertias) Ixx=1.8327E+9 mm4 Iyy=163923798 mm4

Product of inertia A.xy Ixy=225121001 mm4

Distance of centroid from origin X=212 mm Y=260.91 mm

Principal second moments of area Iu=1.8625E+9 mm4

Iv=134087601 mm4

 $\frac{Z}{609.6-260.91} = 5255958 \text{ mm}$ $\frac{Z}{609.6-260.91} = 7024261 \text{ mm}$

C/2/2

BRPB Hill Cottage Railway Bridge Edge Beam gross-section at centre of span

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Date:

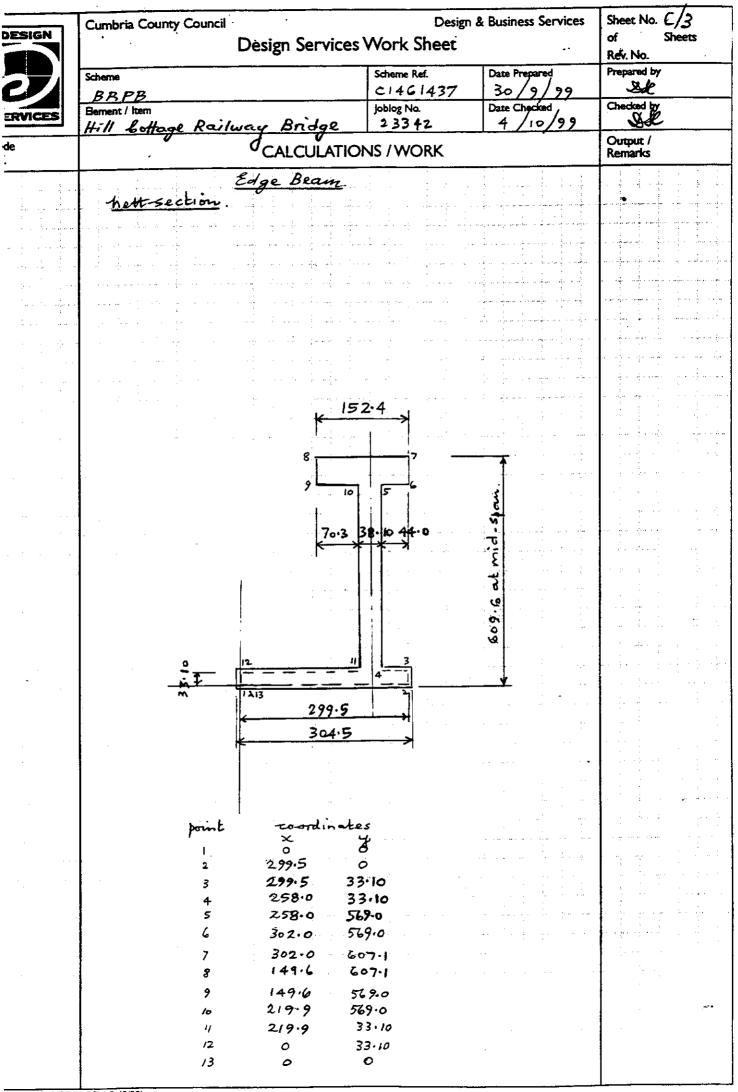
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Office: 5598

Angle of principal U counter-clockwise from XX-axis -7.5496 degrees

No650



BRPB Hill Cottage Railway Bridge Edge Beam nett-section at centre of span Page: Made by: Date: Ref No: 30.29.99

Office: 5598

Location:

Properties of any plane section

The section is defined by coordinates of corner points taken in anticlockwise order round the section. The cross section is kept to the left of the edge running from a previous point to the next point. The section is closed when the original point is specified again.

Coordinates of points in order: Point 1 : X-coordinate x(1)=0 mm y(1) = 0 mm Y-coordinate x(2) = 299.5 mmPoint 2 : X-coordinate y(2) = 0 mm Y-coordinate : X-coordinate x(3) = 299.5 mmPoint 3 y(3) = 33.10 mmY-coordinate x(4) = 258.0 mm: X-coordinate Point 4 y(4) = 33.10 mmY-coordinate x(5) = 258.0 mmPoint 5 : X-coordinate y(5) = 569.0 mmY-coordinate : X-coordinate x(6) = 302.0 mmPoint 6 y(6) = 569.0 mmY-coordinate x(7) = 302.0 mm: X-coordinate Point 7 y(7) = 607.1 mmY-coordinate : X-coordinate x(8) = 149.6 mmPoint 8 y(8) = 607.1 mmY-coordinate : X-coordinate x(9) = 149.6 mmPoint 9 y(9) = 569.0 mmY-coordinate x(10) = 219.9 mm: X-coordinate Point 10 y(10) = 569.0 mmY-coordinate : X-coordinate x(11) = 219.9 mmPoint 11 Y-coordinate y(11) = 33.10 mmx(12)=0 mm : X-coordinate Point 12 y(12) = 33.1 mmY-coordinate x(13) = 0 mmPoint 13 : X-coordinate y(13) = 0 mmY-coordinate

Sectional properties

Cross-sectional area	36138 mm2
Second moments of area (inertias)	Ixx=1.7341E+9 mm4 Iyy=142157014 mm4
Product of inertia dA.xy	Ixy=198989348 mm4
Distance of centroid from origin	X=212.37 mm Y=269.12 mm
Principal second moments of area	Iu=1.7586E+9 mm4

Iv=117660360 mm4

$$Z_c = \frac{1.7341 E9}{607.10 - 269.12} = 5130777 mm$$

$$Z_{t} = \frac{1.7341 \, \text{E9}}{269.12} = 6443594 \, \text{mm}$$

C/3/2

BRPB Hill Cottage Railway Bridge

Edge Beam

nett-section at centre of span

Page: Made by:

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Ref No:

10.

Angle of principal U counter-clockwise from XX-axis

-7.0181 degrees

No650

	Council Design Services	Design 8 Work Sheet	Sheet No. C/4 of Sheets Rev. No.	
Scheme BRPB		Scheme Ref. C1461437	Date Prepared 30 / 9 / 99	Prepared by
Element / item	P. 'I	Joblog No. 2 3 3 4 2	Date Checked	Checked by
Hill bostage	. Railway Bridge CALCULATIO			Output / Remarks
i) Gross	Edge Beam.	with enhan	cement	
	1.10			A/1/1
	5255958 × 1·10	= 5781554 I	3	
1 1	7024261 × 1:10	= 7726687 •	3	
j. L				
	SBL Shesses.			
and the second s	181-32 × 10 = 3 5255958	and the second second second		
1 1	181·32×10° = 2 7024261	5.81 N/mm		
	3 V = 92.75 × 10 d t 533.4 × 38.10	= 4.56 N/mm		
₹\$	d_t 533.4 = 38.10			
shesse	s available for L	<u> </u>		
ع الم	154 - 34.50 =	119.50 N/mm2		
	46 - 25.81 = 46 - 4.56 =	20·19 N/mm	But Subjected	
	46 - 4.56 =	41.44 N/as	to further rosbichions.	
4				
and the second of the second o				1

DESIGN	Cumbria County Council Design Services	Sheet No. C/5 of Sheets Rev. No.			
	Scheme	Scheme Ref.	Date Prepared	Prepared by	
	BRPB	c1461437	30/9/99	Shedwid by	
ERVICES	Bernent / Item	Joblog No. 23342	Date Checked.	Checked by	
de	Hill bottage Railway Bridge CALCULATIO		· / -/ -/	Output / Remarks	
-	fun keam				
	3) Nett -cross-Section will	h enhance	ment		
	0 . 1.10				
	2				
			3		
	差 ≥ 5 30777 × 1·10	= 5643855	_ m m		
	Z - (443594 × 1.16	= 7087953	3		
	Z, = 6443594 × 1.10				
	DL + SDL Stresses.				
	$\frac{1}{4} = \frac{186.32 \times 10^6}{5130777} = 3$	5.34 N/mm			
	<u> </u>				
<u> </u>	D = 181.22 v.m. 2	8.14 N/m-			
	f = 181.32×10 . 2 6443594				
	1 2 V 2 92.75 × 10 = 535.9 × 38.10	4.54 N/mm			
	16 dut 535.9×38.10				
	stiesses available for L				
	1 154 - 3534 :	118.66 N/mm	1		
	1 4				
			But Subjected		
	f ₁₁ · 46 - 28.14 :	17-86 N/mm2	Subjected		
			to further restrictions		
	J ₂ = 46 - 4.54 =	41-46 N/	resenzens.		
	f = 46 - 4.54 =	31.70 17/MIN			
		ه معاديق الشاعب المساولة المادالة			
en e					
The second secon					
e de la composición		and the second s			
		•	:		

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DESIGN	Cumbria County Council	Design	a & Business Services	Sheet No. C/6
DESIGN	Design Services Work Sheet			of Sheet Rev. No.
	Scheme	Scheme Ref.	Date Prepared 30 / 9 / 9 9	Prepared by
ERVICES	BRPB Blement / Item #:// #attack Pai/vor # index	C 1461 f 37 Joblog No. 23342	Date Checked 4/10/99	Checked by
ode ef.	Hill bottage Railway Bridge CALCULATI	ONS / WORK	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Output / Remarks
A 16/97 L l 2·7	The penultimate bear meatside wheels an and therefore the examined for live carriageway.	m is be d the - latter nee	edge bean	
3D21/97 6L5.35	as the edge beam member an appropri vehicle will be seld in accordance with a sesse Internal Beam of resultation of 7.5 James for Ba	ppendix D. sment for Live Load 1582 the	ental applied the a Level of dee	
	Beans will be checked data for which in appendix D Sable Volume 3 Section 4 Part 3 BD 21/97 D4. Vehicle Nominal Loading The nominal loading in each lane shall be as follows:	takker -	from Appendix I	

- a. Single vehicle An impact factor of 1.8 shall be applied to the most critical axle of the vehicle positioned at the most onerous part of the influence line diagram. See Chapter 14 of reference 4. The factored axle and remaining unfactored axles shall be taken as the nominal loads.
- b. Convoy of vehicles The unfactored axle weights shall be taken as the nominal loads.

The partial factors for loads given in this Standard shall be applied for deriving assessment load effects.

Assessment Libro	Valida Raf	Valido Grad	No Atlas				AX	LE WEK	JETS A	(D) SP A(294CES			
Landing Lared *	,	Waight			22	W 3	A3 (=)	₩4 *	13	#3 •	##			
	24	29.32	1	1.0	4.86	2.13	ELD3	1.02	4.13			•	L	2,8
	23	24.38	3	1.0	6.30	3.26	9,34	1.2	9.14	l	1.		· _	LA
25	RC	24.39	3	1.0	6.10	3.66	M.16	1.5	r.n	_		-	-	1.0
	RD	24.39	3	1.0	4.39	3.60	14.50	1.5	7.50		-		-	1.0
17	12	17.84	7	1.0	6.50	2.8	16.50	•		-		-		1.0
7.5	27	7,59	2	1.0	6.4	2.8	LS	-	-					1.0
3	260	3,80	2	0.75	2,39	2.6	0.50	•			[•		0.75

+ Note: W2 and W3 are interchangeable to determine the most adverse effect

Table D3 C&U Vehicles to be Considered When Assessing for Restricted Assessment Live Loading Levels

	1 200	ian Camilaa-	Mark Chase		of Sheets
₹ 888 7	Design Services We		AAOLK SUGEE		Rev. No.
_ 4	Scheme		Scheme Ref.	Date Prepared	Prepared by
	BRPB		C1461437	30/9/99	St.
MCES	Element / Item		Joblog No.	Date Checked	Checked by
VICES	Hill bottage Railway	Bridge	23342	4/10/99	SE
		CALCULATIO	NS/WORK	•	Output / Remarks
	Locate 7.5 John	e load	for max	BM.	
		dopan	<i>D</i>		
		x 2000			
		15	-> 1		
	6.	fannas y	1.5 tonnes		and the second s
			1		
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		/	<u> </u>	
		↓ £₩			
	×				
		2-7.82			1
			7		
	and 10	- L L	Lu Lu C	P	
	apply 1.8 simpo 1.8 × 6.	ic gae	0 / 100 61	onne adam	
	1.8 × 6.	0 = 1 10.	o tonnes.		
	1.5 × 2.0	= (10.8+	1·5) x		
		= 0.244		a a a a a guir a sa a a a a a a a a a a a a a a a a a	
		- 0.244			
		الجالج لأسلم علي			.
	$R_{\rm H} = \frac{L - \times'}{2L} \times \frac{1}{2}$	£W			ļ
	" Z!				
1		1			
	V = 1-2				Annual Control of the
	$x = \frac{l - x'}{2}$				
			والمتأورة أوالمنافرة والإمام مأمور بالمار		
		بالمناب المأسانية المأسانية			
	$M_{L} = \frac{(\ell - z)^2}{2}$	ΣW			
	11 40				
	1000	«4)2 10 -	97.EX	9 L_	
	- (7.82-0.2 4×7.82	12'3	} ≥ 22.56°	1 12 177	
	#×7.82				
				متركت والمشارين	
1	= 22·569 ×	9.807 K	Nm= 221.33	knn	
	learal al s.	solo la	me loadin		
	Graph a) Si	1	7		
	₹ ≥ ∘	.404			
	M' = 2	21.33 × 0.	404 = 89.4	2 knm.	
					Anna i a signi
		المجالية والأسلا	مؤسسة والإساع والتواديون		
			and any organ da region for		
				en er en	↓
			$\lim_{n\to\infty} \left(\frac{1}{n} \log n + \frac{1}{n} \log n \right) \leq \frac{1}{n} \log n $		
- I					
					1

1:37

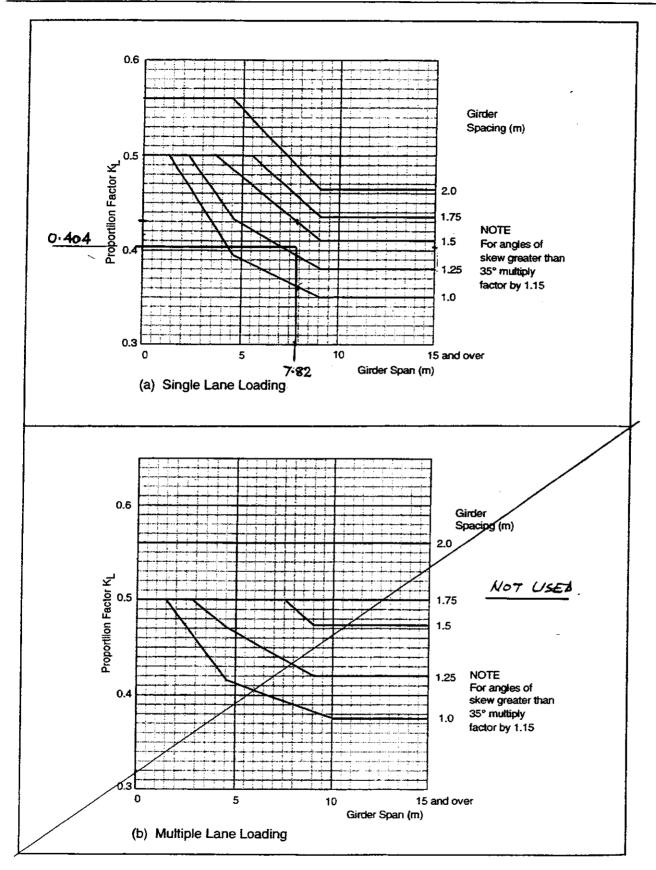


Figure 2/3 Proportion Factors for External Longitudinal Girders

DESIGN	Cumbria County Council Design Services	& Business Services	Sheet No. C/8 of Sheets Rev. No.	
2/	Scheme BRPB	Scheme Ref. 21461437	Date Prepared 30/9/99	Prepared by
ERVICES		joblog Na. 23347	Date Checked 4 / 16 / 99	Checked by
de	Hill bottage Railway Bridge CALCULATIO	ONS / WORK		Output / Remarks
	Locate 7.5 Jonne load of		F.	NGIRE AS
	2.00			
and the second s	<u> </u>	EW = (6 ×1.8) -	115 = 12·3 bonnes	
	6 formes () 1.5 tomes 8, 1.5 tomes 2 2 7.82			
		R		
	71 ±w 0 - 00	1		
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			
	R = l-x 5m			
	R = 1-x x \(\frac{1}{2}\) \\ = 7.82 - 0.244 \(\frac{12.3}{2}\) \\ = 11.916 \(\times 9.807\) \(\kappa \times 1			
	= <u>7.82 - 0.244</u> × 12.3	. 11-916 t		
	- 11,910 × 9,807 km	= 116.86kN.		
	:- S = 116.86 × K			
		17 21 1 . 10	1 - 20	
	= 116.86 × 0.404 =	TI. ZI KNJ Z	ige ovem	
	Justification for using Yehicle calculations	K for	Accidental	
	Yehicle calculations			
	1.45 1.45	7 4 1.4	7 1 1 47	
	<u> </u>	Z	2	
	edge beam beam	bean	56a=1	
	0.12 1.03 0.77	0.70		
	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	 		
	Lange of the second of the sec			
	face of parape	26		
		by statics 3155 = 0.4		
	Multiplying factor	by statics		
	1:03 × 10.5 = 0	355 < 0.4	04 . OK.	
	1/45			

1-1-

	Cumbria County Council	Design	& Business Services	Sheet No. C/9
ESIGN	Design Services	Work Sheet		of Sheets Rev. No.
	Scheme	Scheme Ref. C 1461437	Date Prepared 30 / 9 / 9 9	Prepared by
RVICES	BRPB Element / Item	joblog No. 23342	Date Checked 4 10 99	Checked by
ie	4:11 bottage Railway Bridge CALCULATIO		1 4 / 10 / 3/	Output / Remarks
	Locate 17:0 Jonne load	for max.	BM.	
	3.01	V		
	<u> </u>			
	10.5 tonnes 2 y	6.5 Honni		
	¥ 1	V		•
	<u> </u>			
	l = 7·82			
			0 1	
	apply 1.8 in part factor 1 1.8 × 10.5 = 18.9 to	to 10.5 tenn nnes	e Koad	
	6.5 × 3.0 = (18.9 + 6.	5) x (
	: x = 0.768			
ورا في المنظم				
	$R = \frac{L - x}{2l} \times \leq W$			
	<u>x</u> = <u>2-x</u>			
	2			
	M, = (l-x). zw			
	40			
	$= \frac{(7.82 - 0.768)^{2}}{4 \times 7.82} \times 25.4$	<u>.</u> 40.382 b	37	
	<u> </u>			
	= 40.382 × 9.807 knm	= 396.03 km		
	graph e) Single lane	Loading		
	K = 0.404			
	M' = 396.03 × 0.40	14 - 760.6C	KN70.	
		ana da ang atau da ang ata Ang atau da ang atau da an		
		<u> </u>		

IGN	Cumbriz County Council Design Service	s Work Sheet	& Business Services	Sheet No. C/10 of Sheets Rev. No.
	Scheme	Scheme Ref.	Date Prepared 30/9/99	Prepared by
	BR PS Bernent / Item	C1461437 Joblog No.	Date Checked	Checked by
ICES	Hill bottage Railway Bridge		4/10/99	- SE
	Hill bottage Railway Bridge CALCULATION	ONS / WORK	•	Output / Remarks
	Locate 17.0 Jonne load	for max	SF	
	3.00	EW=(10.5×1.8)) +6·5=25:4 Lonnes.	
م مأمان بأساس	10.5 tonnes 2 6.5 tonnes			
	A 1 5	^	8	
	y≲₩ <u>1 = 7.82</u>			
	$R = \frac{l-x}{2} \times \pm W$			
	1 2			
	- 7.82-0.768 x 25 7.82 22.905 x 9.807 k	·4 = 22·905	<i>R</i>	
	7.82	-021.62	L. ,	1
	22:905 × 9:807 km	/ =247.03	EN	
	S - 224-63 × 0.404	= 9n·75	E~	
	1 3 2 227 63 8 9 797			
		المسادية المدادات		
4				
4				
		en e		
in the				
il v il in inciden				
181 181				

	Cumbria County (Council	Design	& Business Services	Sheet No. C/II
DESIGN		Design Services	Work Sheet		of Sheets
	·		Scheme Ref.	Date Prepared	Rev. No. Prepared by
2)	Scheme		C1461437	30/9/99	SX
ERVICES	BRPB Bernent / Item	0.11	joblog No.	Date Checked	Checked by
	Hill bottag	e Railway Bridge	23342	17/10/77	Output /
ode f.		CALCULATIO	NS/WORK		Remarks
	base 1	(Check 7.5 Jon	nes wrt d	ending)	
<u> </u>	$\int_{b\epsilon'}$	= 89: 1 2 × 10 = 11 7726687	·57 N/mm		<i>[c/7</i>
	i Z	7726687			
		2			c/4
	- tst	25.81 N/mm2	* - - - - -		15/7
	BL 450L				
bl 4·10		24.6 - 0.44			
~~ 7 10	*L	24.6 - 0.44 / ₁ 24.6 - (0.44 × 2			
	=	24.6 - (0.44×2	5.81) = 13.2	24 N/mm	
			مادد ما الماد ما الماد ما الماد ما الماد		
	or f =	19.6-0.76			
	4	4			
	-	19.6 - (0.76×2	5.81) = -0.	02 N/mm	
	Jensil	le stress due ℓ $7 N/mm^2 < 13.2$	o LL 2		
	= 11.5	7 N/mm < 13.2	4 N/mm		
			والأراء والمستقدية وأسابها والمتهود والجاري		
		·· <u>ok</u>	for 7.5 7 accidente	onnes	
			1 Uccidente	L Venicle.	
		= <u>89-42 × 10</u> = 15 5781554	47 11/2		
	13c'	= 89.42×10 = 12	'4/~/mm		
	22	>/8/>>7			
	1	31.50 N/			c/4
	7.	. 34:50 N/mm		The second secon	
,	DL+50C				
	1	= -43.9 + 0.791			
	L				
		= -43.9 + (0.79×	(-34.50) = -	71.16 N /mm	
			4++		
	for I	= -81.3 + (3.15	x-34.50) = -1	89.98 × /mm	
	bompre	ssive stress di 47 N/mm² < 71·11	12 TO LL		
	= <u>15</u> .	47 N/mm < 7/·/	6 M/mm		
		المقور أوارك والمستقال وأوراك ويور	وأساد وبتماأ بالزماء وبواعيات		
1	0 4	<u>≓</u> <u>σκ</u>	for 7.5% ceidental	Volice o	
	check				
	limiting stress	34.50 + 71.11	6 - /02.66	(- / ??	
	< 154N/m	2			
- Nr. COD CODE	61 REV C (6/99)		<u> </u>		

ESIGN	Cumbria County Council Design Services	-	& Business Services	Sheet No. C/12 of Sheets Rev. No.
	Scheme BRPB	Scheme Ref. C14G1437	Date Prepared 30/9/99	Prepared by
RVICES	Fiement / Item	Jobiog No. 23342	Date Checked 4/10/99	Checked by
1e	Hill bottage Railway Bridge CALCULATIO		1 (7 (3) 3)	Output / Remarks
	Base 2 (Bleck 7.5 Jonne	s wrt ben	ding)	
The second secon	f 89.42 × 10 12.	/_2	0	
	$f = \frac{89.42 \times 10}{2.00000000000000000000000000000000000$	73 N / mm		
	f = 25.81 N/mm =	1		C/4
	and the second s	4		
	DZ + SB L			
El 4.10	f = 24.6 - 0.44 J			
a. 1.10	- I			
	- 24.6 - (0.44 × 25.	81) = 13.24	N/mmy	
	Jensile stress due to			
	= 12.73 N/mm ² < 13.24 M			
	: OK for	7.5 Jonnes		
	actide	ental Vehic	<u>ee</u>	
	$f_{s,t} = \frac{89.42 \times 10^{6}}{5255958} = 17.$	01 N/mm		
	5255958			
	f = 34.50 N/mm	72		c/4
	I <i>D(_+</i> > <i>D(_</i>			
	1 = -71:16 N/mm²			c/11
	1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
	the state of	10 to 1		
	bompressive stress de = 17.01 N/mm² < 71	1.16 N/mm2		
		and the second s		
	accibental	Tonnes		
	<u>acci Hestal</u>	vericke		
	akeak	ه در چد معهد میشد در در استوانید از در چین در معهد میشد در در در استوانید		
	limiting 34.50 + 71.16 =	105.66 N/m		
	stress			
	< 154 N/mm	ف المسافية والمسافية المسافية		
a again a ann an	max compressive ben	ding stre	5	
	1 34.50 + // 9J	and the second s	Stranger and American Stranger	
		5.66 N/mm	oK	
J				

DESIGN	Cumbria County Council Design Services	•	& Business Services	Sheet No. C/13 of Sheets Rev. No.	
2	Scheme BRPB	Scheme Ref. C1461437	Date Prepared 30 / 9 / 9 9	Prepared by	
ERVICES	Element / Itom	loblog No.	Date Checked	Checked by	
de	Hill bottage Railway Bridge CALCULATIO	ONS / WORK		Output / Remarks	
•					
	base 3 bleck 7.5 Jon	nes wrt b	ending.		
	1 = 89.42 × 10 = 12- 14 7087953	62 N/mm			
	7087953				
	f = 28.14 w/mm			C/5	
	01 +50L				
Bl 4-10	J = 24.6 - 0.44 J				
	2 24.6 - (0.44 × 28.	14) = 12.22	N/mm²		
	Jens, le stress due = 12.62 N/mm² > 12.	to LL			
	Unsuitable f	7.5 Jonae	5		
	Occubil BK for 3	ental Yehice O Tonnes AV			
	f = 89.42 × 10 = 56.43.855	15.84 N/mm			
	J = 35.34 N/mm	= 1,		c/5	
	BL+SBL				
	f -43.9 +0.79				
	= -43.9 + (0.79		71.82 N/mm		
	la possivo stales o	lue to U			
	Compressive stress of 15.84 N/mm2 =	< 71.82 N/.	<u>4117</u>		
	i. OK for acciblent	al Vehicle			
	theck 35:34+71:8	32 = 107.16	w/mm ²		
	stress				
	<154 N/mm²				
		androne and analysis and the second s			
	S1 REV C (6/99)				

ESIGN	Cumbria County Council Design Services	-	& Business Services	Sheet No. C/14 of Sheets Rev. No.
	Scheme BRPB	Scheme Ref. C 4 C 437	Date Prepared 3o/9/99	Prepared by
RVICES	Bernent / Item Hill bottage Railway Bridge	Jobiog No. 23342	Date Checked	Checked by
le	CALCULATIO			Output / Remarks
	base 4 bheck 7.5 Jonne.	s wrt ben	ding	
	f = 89.42 × 10 = 1	3.88 N/mm²		
	by 6443594			
	1 28.14 N/mm			
	1 44 28.72 27.75			
	DL +5BL			
· l 4.10	f = 24.6 - 0.44f			
	24.6 - (0.44 × 28.1	4) = 12.22 A	i/mm*	
	Jonsile stress due to = 13.88 N/mm² > 12.2.			
	: Unsuitable Accidental	for 7.5 Jon.	- 25	
	OK for 3.0	Jonnes HY		
	£ = 89,42 × 10° = 1	7.43 N/mm		
	5/30777			
	1 = 36.34 1/2	- /		
	= 35,34 m/mm ² 02+502	7		
	f = -71.82 m/mm			
	Compressive stress d	ue to lf		
	= 17:43 N/mm =	11.02N /mm		
	ii OK for 7.5 accibental	Jonnes		
	acciblental	Yehicle.		
	check			
	limiting 35.34 + 71:	82 = 107.	16 N/Am	
	and the second			
	< 154N/mm			
en e				
		4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	· · · · · · · · · · · · · · · · · · ·	

	Cumbria County Council	Design	& Business Services	Sheet No. C/15
DESIGN	Design Service	-		of Sheets Rev. No.
	Scheme	Scheme Ref.	Date Prepared	Prepared by
	BRPB Bement / Item	C1461437 Joblog No.	30/9/99 Date Checked	Checked by
ERVICES	Hill bottage Railway Bridge	23342	4/10/99	Output /
de	CALCULATIO	ONS / WORK		Remarks
	000 1 170 01 0)	
	base 1 (Black 17.0 Jonne	3	0	
	f ₁ , <u>160.00 × 10</u> 20	·71 N/mm		
	fu = 25.81 v/mm = f			c/4
	f = 24.6 - 0.44 f			
	= 24.6-(0.44×25)	81) = 13·24 N	/mm²	
	Jensile stress due t	s 44		
	Jensile stress due t = 20.71 N/mm > 13.29	c w/mm		
	- Unsuital	le for 17.0	Monnes	
	: Unsuitab Acciden	tal Wehicle		
	2 overstress in f =	20.71 - 13.24	- lon - 56 47	
	To overstness in f	13.24		•
	% overstress in f,+f =	(25:81+20.71)	- (25.81+13.24)	100
	% overstress in \$ + f = for 17 Jonnes =	(25.81	+ /3·24)	
	=	19.1%		
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	+ 25·81 = 46·	52 N/mm2	
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	> 46.		
	· · · · · · · · · · · · · · · · · · ·			

Scheme Scheme Scheme Rd. Ditte Proposed by Scheme Rd. Proposed	Scheme 8 RPB 8 C 1461437 4 10/99 8 L 8 RPB Element I Item Will bothage Railway Bridge CALCULATIONS / WORK Remarks Lasse 3 (black 17.0 James with Lending) Li = 160.00 × 10 22.57 M/mm To 87.953 Li = 28.14 M/mm = J Li = 24.6 - 0.45 J Li = 24.6 J	Cumbria (Design Services Work Sheet				
Beneral Name	Benerit Item	41 1 1		Scheme Ref.	1 7		
### bothage Railway Bridge 23342 5 /10/99 St. CALCULATIONS/WORK Quent/ Remarks base 3 (black 17.0 James wrb bending) \$\frac{1}{2} = 160.00 \times 10 \times 22.57 \times 1/mm \$\frac{1}{2} = 28.14 \times 1/mm = \frac{1}{2} \times 24.6 - 0.44 \frac{1}{2} \times 24.6 - 0.44 \frac{1}{2} \times 22.57 \times 1/mm \times 12.22 \	Hill bottogo Railway Bridge 233 42 5 /10/99 St. CALCULATIONS/WORK Output / Remarks Basse 3					Checked by	
base 3 (black 17:0 James wrt Bending)	base 3 (black 17:0 Jonnes with bounding)	5 Hill bo	Hage Railway Bridge		5/10/99		
160.00 × 10 22.57 N/mm 10 10 10 10 10 10 10	July 160.00 x 10 22.57 N/mm 70.87953 July 28.14 N/mm = July 6.16 - 0.49 July - 24.6 - 0.49 July - 24.6 - (0.94 x 28.14) = 12.22 N/mm Jensile Stress due to LL 22.57 N/mm > 12.22 N/mm . Musuitable for 17.0 Jonnes Accidental Vehicle % overstress in f = 22.57 - 12.22 100 = 84.7 % 12.22 Jones tress in f = (28.14 + 12.22) x 100 25.6 Z		CALCULATION	ONS / WORK			
160.00 × 10 22.57 N/mm 70.87953	July 160.00 x 10 22.57 N/mm 70.87953 July 28.14 N/mm = July 6.16 - 0.49 July - 24.6 - 0.49 July - 24.6 - (0.94 x 28.14) = 12.22 N/mm Jensile Stress due to LL 22.57 N/mm > 12.22 N/mm . Musuitable for 17.0 Jonnes Accidental Vehicle % overstress in f = 22.57 - 12.22 100 = 84.7 % 12.22 Jones tress in f = (28.14 + 12.22) x 100 25.6 Z						
160.00 × 10 22.57 N/mm 70.87953	July 160.00 x 10 22.57 N/mm 70.87953 July 28.14 N/mm = July 6.16 - 0.49 July - 24.6 - 0.49 July - 24.6 - (0.94 x 28.14) = 12.22 N/mm Jensile Stress due to LL 22.57 N/mm > 12.22 N/mm . Musuitable for 17.0 Jonnes Accidental Vehicle % overstress in f = 22.57 - 12.22 100 = 84.7 % 12.22 Jones tress in f = (28.14 + 12.22) x 100 25.6 Z	base	3 (black 17.0 Jonnes	wrt bending	<u> </u>		
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weight of jack-arch = 3.98 × 2 = 7.96 km/m 17.96 km/m $W = 17.96 \times 1.2 = 21.55 \text{ km/m}$ $W = W = 21.55 = 14.86 \text{ km/m}$ Rise of jack-arch = 0.30 m. (to midf depth of barrel)	أحسن الله		s†	<u> </u>					
weight of jack-arch = 3.98 × 2 = 7.96 km/m 17.96 km/m $W = 17.96 \times 1.2 = 21.55 \text{ km/m}$ $W = W = 21.55 = 14.86 \text{ km/m}$ Rise of jack-arch = 0.30 m. (to midf depth of barrel)		11 . 0		- 90 .	5.0 =	9 -1	lud and	12/.	,
weight of jack-orch = 3.98 × 2 = 7.96 km/m 17.96 km/m W = 17.96 × 1.2 = 21.55 km/m W = W = 21.55 = 14.86 km/m Rise of jack arch = 0.30 m (romid-depth of barrel)	weig	At of teto	unea 1	reing :	\$ ~~y	c - 16	. VU KN for		-J
weight of jack-orch = 3.98 × 2 = 7.96 km/m 17.96 km/m W = 17.96 × 1.2 = 21.55 km/m W = W = 21.55 = 14.86 km/m Rise of jack arch = 0.30 m (romid-depth of barrel)			J						1
8_{11} to 17.96 kN/m $W = 17.96 \times 1.2 = 21.55 \text{ kN/m}$ $W = W = 21.55 = 14.86 \text{ kN/m}$ 1.45 Rise of jack-arch = 0.30 m. (romid-depth of barrel)		• 1 1	and the second second second second				.96 km/m		
$W = 17.96 \times 1.2 = 21.55 \text{ kN/m}$ $W = W = 21.55 = 14.86 \text{ kN/m}$ $Rise of jack arch = 0.30 \text{ m}$ (romid depth of barrel)	weig								
$W = 17.96 \times 1.2 = 21.55 \text{ kN/m}$ $W = W = 21.55 = 14.86 \text{ kN/m}$ 1.45 Rise of jack-arch = 0.30 m. (romid-depth of barrel)	yan yan gan yan na ini san san san san san san san					<u> 7</u> 7	-96 km/.	2	
$\omega = W = 21.55 = 14.86 \text{km/m}$ 1.45 Rise of jack-arch = 0.30 m. (romid-depth of barrel)			∂ _{ft}				nom		
$\omega = W = 21.55 = 14.86 \text{km/m}$ 1.45 Rise of jack-arch = 0.30 m. (romid-depth of barrel)		W = 17.5	96×1·2	• 2/	·55 kN	lm			-
Rise of jack-arch = 0.30 m. (to midf depth of barrel)									
Rise of jack-arch = 0.30 m. (to midf depth of barrel)		$\omega = \underline{W}$	' = <u>21</u> .	<u>55</u> _	14.86	cN/m.			
(to midf depth of barrel)		L. L	1.	45					
(to midf depth of barrel)			44						
: H = 14.86 × 1.452 = 13.02 kN/m		rise of jo	ack-an	ch =	0.30	٠.			
$H = \frac{14.86 \times 1.45}{9 \times 5.25} = 13.06 \times 70$		To midy dep	of vary	-2	12.00	L. 1			
y w 111 6 /1		. H = 14°	06×1.4	<u> </u>	12.06	~~ /~	7	1	

		Design Servic	es Work Sheet	Date Prepared	of Sheets Rev. No. Prepared by
	Scheme		Scheme Ref.	1/10/99	W.
	BRPB Element / Item		Joblog No.	Date Checked	Checked by
ES	Hill bottage	Railway Bridge	23342	4/10/99	SL.
	<i>V</i>	CALCULAT	IONS / WORK		Output / Remarks
	Ui) Lons.	ider 7.5 Jonne	accidental	Yeare	
			0.0.7 /o.E	-00 64	
	· / 1_ /	= 6.0 × 1.8 ×	7.00/ = 103		
	277.55				
	W	= 1.5 × 9.807	= 14	·71 km	
	The second secon				
	assessmi	ent loads. 2 = 105.92 × 1.			
		2	,		
	W.	= 105.92 × 1.	5 = 158.88 k	W	
	W'	= 14.71 × 1.	5 = 22.061	kn.	
	Using 1	parabolic arch	formula	for	
	centra	parabolii arch l point loc	24, from t	Chark	
		H = 25 Wl 128h			
		128 h			
				- 100 00 /.	_
<u> </u>	Horizontal	thrust = 25 by W,	× 158'88×1'4	2 = 177.78 KM	
<u>.</u>	produced	by W,	128 × 0.30		
	11 10	41 = 30	5 × 22.06×1.4	5 = 21.32 km	
	Mortzoniac	L. W			
	Horizontal produced	7 2	/28 × 0·30	171:30 KN	
	Total -	horizontal d = (13.02 × 7.8	Krust on	edge	
	beam	= 1/13.02 ×7.8	12) + 171.3	o kw	
		= 273.12 KA	<u> </u>		
I					
1					
	The state of the s		the second secon		
					and the second s

ESIGN	Cumbria County Council Design Services	Sheet No. A/3 of Sheets Rev. No.		
	Scheme BRPB	Scheme Ref. C / 4-6 / 4-3 7	Date Prepared	Prepared by
RVICES	Element / Item Hill bottage Railway Bridge	joblog No. 2 3 3 4 2	Date Checked 4 /10/99	Checked by
e	CALCULATIO	NS / WORK		Output / Remarks
	Stabilizing forces to -	be consid	ered	
	0) Residual stronger	7		
	i) Residual strength	at end	apports.	
	in Tie rade and	ally / di	12	
	ii) Die rods origin	d= 25.41	uns dia	
	Diameter of fie measured	-nds -as		
	measured	= /9.0		
	J = 220 N/mm			
The second se	× = 1.2			
	X = 1-1			
	Assessment resistance o	1 Fie - 709	s //mmd/9	
	$= \frac{\pi d^2 \times \frac{220}{1 \cdot 2 \times 1 \cdot 1} \times \frac{220}{1 \cdot 2 \times 1 \cdot 1}$	10 KN		
	= 47.25 kw		-	
	3 No. tie-rods			
	: Total resistance =		And the second s	
	(Initial total resistance) =	(<u>25·4</u>) × 141·75	=253.33 km	
	Taliand for at	end su	sport	
	Frictional force at required for late edge beam = (278	eral stabi	lity of	1 5/2
	eage beam! = (273	12-141-75)	0.05	1.24
	= 65.6	y JCN		
	S1 REV C (6/90)			

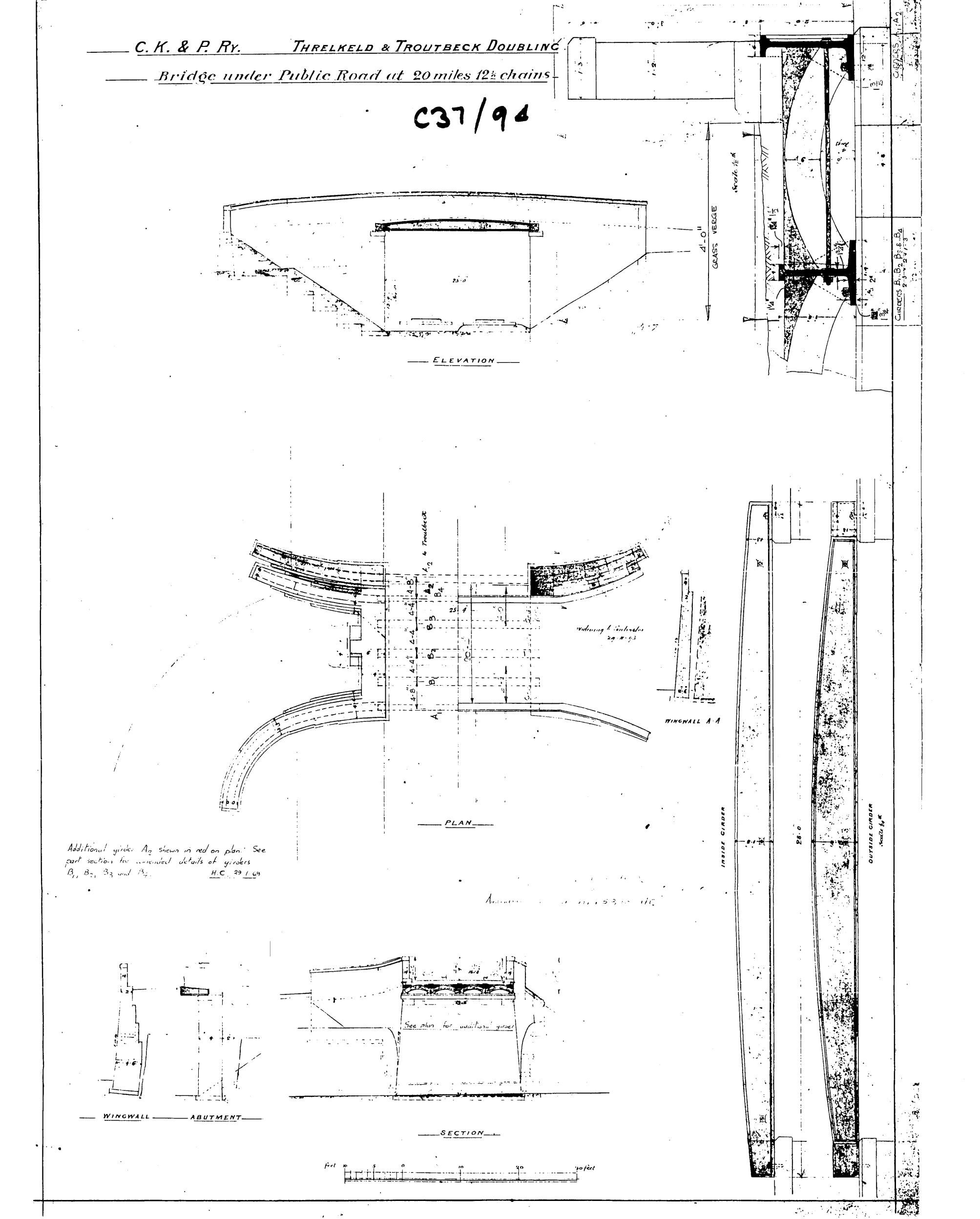
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ESIGN	Cumbria County Council Design & Business Services Design Services Work Sheet				Sheet No. b/4 of Sheets	
	Scheme BRPB Element / Item		Scheme Ref. C / 4 6 / 4 3 7 Joblog No.	Date Prepared // 10 / 99 Date Checked,	Rev. No. Prepared by Checked by	
RVICES	Hill Sottage	Railway Bridge	23342	4/10/99	Sec.	
e		CALCULATIO	NS/WORK		Output / Remarks	
	In tially	calculate;	the frict	rmal		
	resistance	e at end s	upport e	due to		
	01 + 5bL					
	w =	23.72 × 1.2	= 28.46 km	e lm.	c/1/1	
		tion = wl				
		2	2			
			_ ///-28	LN.		
	Frichonal	nesistance	= 11/·28 ×	μ		
			= 111 28 ×	Sugg		
			- /// 28 ×	0.33	and the second s	
			= 38.95 k	~ .		
			<65.69 K			
			inadequal	te:		
ساد استان برسالت						
	Kesidual	deficiency) 1-38.95 (=	26.71 L	x resustance		
	Reaction	from liv. 1this defi 26.74 = 76.	e load	to		
i di	produce	Ithis defi	dency			
4-4		<u> 26.74 = 76.</u>	40 KN			
		0.35				
	> min. rec	action from	7.5 Jonne			
		accidental)	Jehicle .			
4 - 4 -						
	: 3No. /	Jone accidi	rods are	inadequare		
	for 7.5	Jonne Accids	ental Vehi	icle		
	a.cocc.	at Labait				
	2033.2334	ent bapacit				
					and the second s	
		والمرابعة وسناه سهد				
:					1	

DESIGN	Cumbria County Council Design & Business Services Sheet No. 2/9 of Sheets Rev. No.					
2	Scheme		Scheme Ref.	Date Prepared //10/99	Prepared by	
	BRPB .		C1461437 Joblog No.	Date Checked	Checked by	
SERVICES	Hill Bottage Rail	way Bridge	23342	4/10/99	Output /	
de f.		CALCULATION	NS / WORK		Remarks	
				. 0_		
	Bheck 7.5 °	lonne Accid	ental Ven	19modia		
	tie-2	once the	replaced	by		
	3 No	25mm dia	Similar	material.		
	Jotal horizont	el thoust on	edge beam	, = 273-12 km	b/2	
	30722 30, 32					
	Resistance of 3 $= \frac{25.0^{2}}{25.4^{2}} \times 2$	No 25mm d	a. fie rods	- 245.41 kg		
	$=\frac{25.0^{\circ}}{15.4^{2}}$ x' 2	53.33				
	Frictional for	ree at end	support			
	required segge	beam				
	1 = (273.	12 - 245-41)	0.5 = 13:8	3ckv.		
		ctional resis			Resistance due	
		38.95 km			to LL neglected	
				1 10		
	3 No. 251	um dia nep	tacement	7.5 Jonas		
	Acciden	be adeque tal Vehicl	e Asses	sment	•	
	Bapaci	4				
		9				
F						
		A contract of the contract of			1	

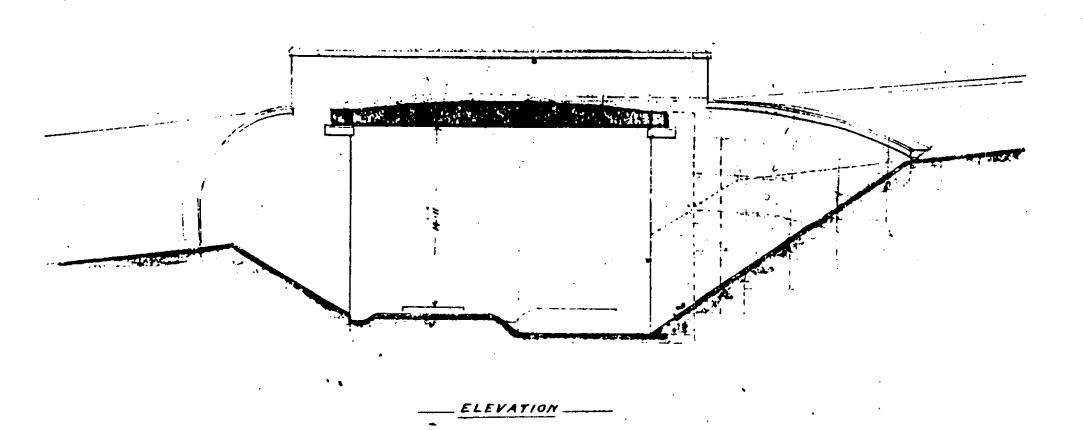
RECORD DRAWINGS

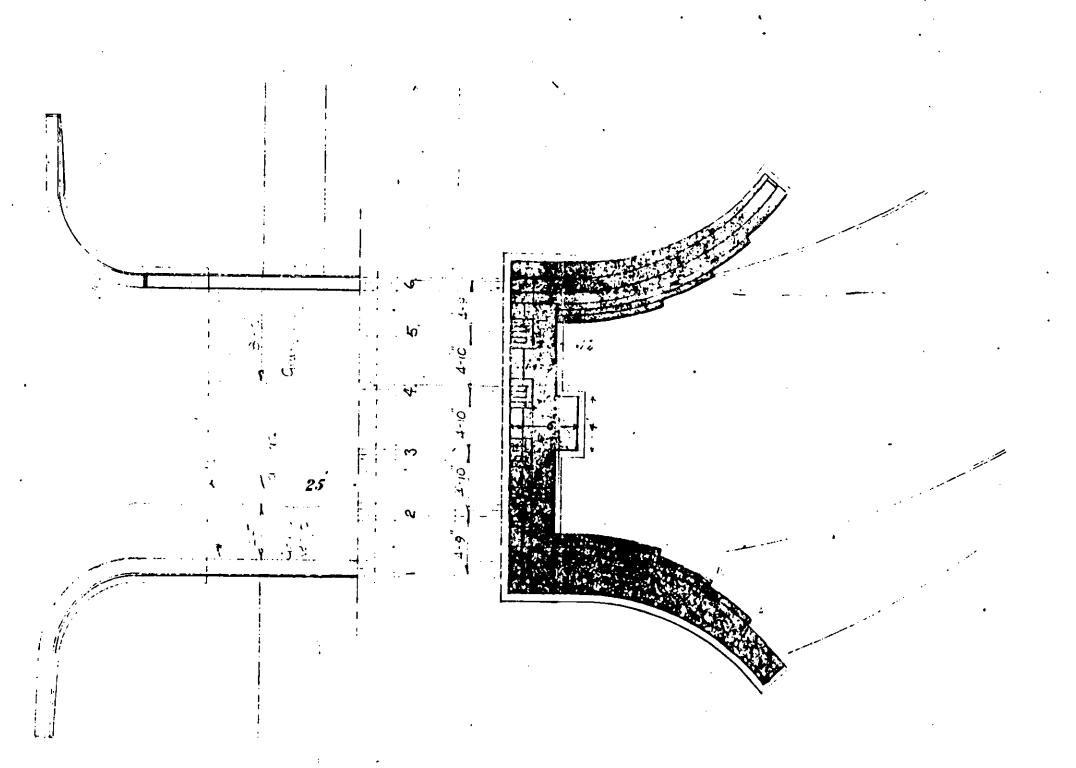
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C. K. & P. RY. THRELKELD & TROUTBECK DOUBLING_

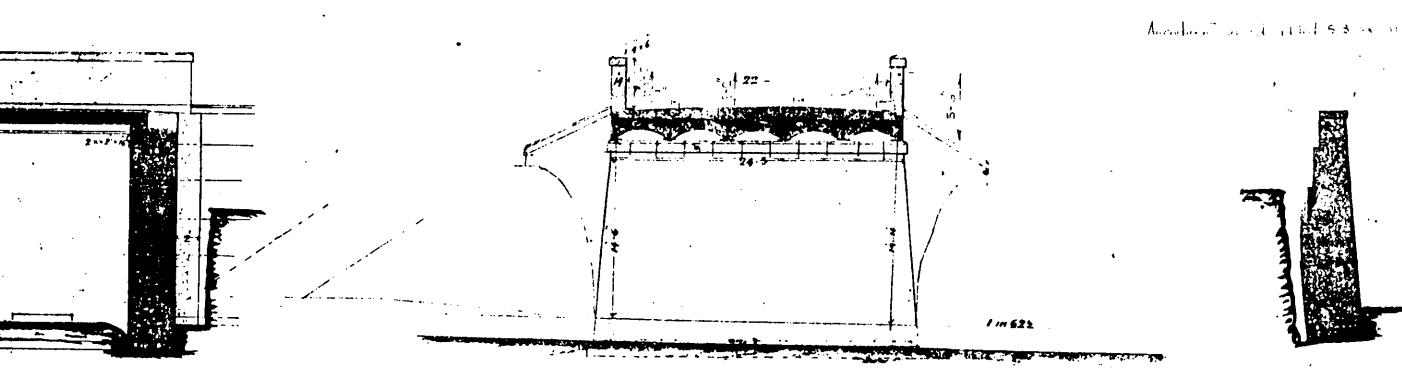
Public Road Bridge at 18m. 35 chs._



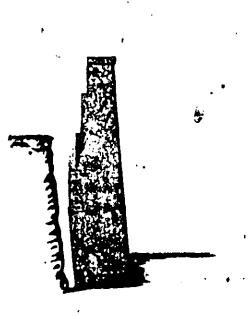


For Giroles octails see C 37/94

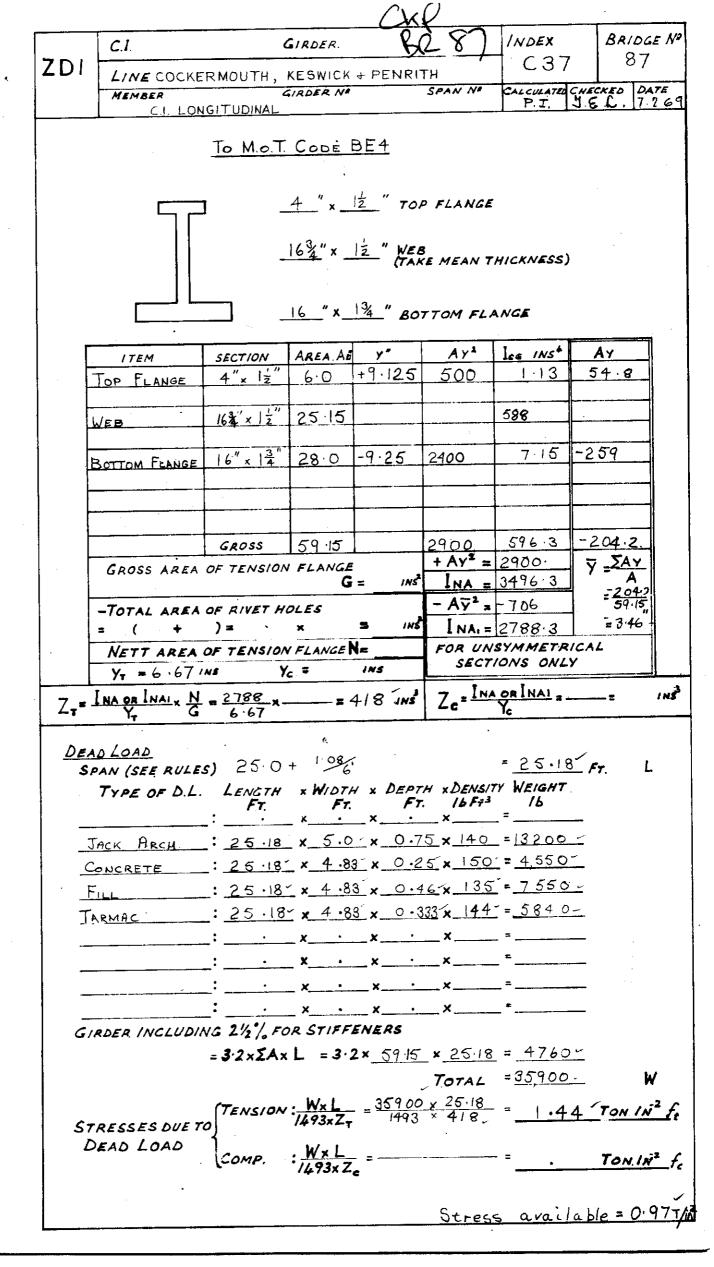
Girders & Brick Arching similar tothose of Bridge 20" 122c.



___ SECTION __



ZorZ' From Obnormal CAPACITY MoT growth for 2. 45sessment NORMAL LOADS NOTICE TO MOT CODE BET OF C. LONGITUDINAL þ Span Girder Spacing Section Modulus Stress available for Live Load Revised Modulus 15/20 x 18 PLATE FIGURE Double GIADMANO. 3 C37 524 16 0.97 132 single 418. 524.0 ins 25.18 Ft 4.83 ft BRIDGE NO 87 0.97 - tons/in & fl STAN No. is se Date Chid. J.E.C Calcid P.I Z | | 7.2.69



MINI ASSESSMENT

WHEN DIFFERENT CONSTRUCTION [AS ON CARD] CONSTRUCTION C.I. longitudinal girders and brick jack arches ROAD WIDTHS & DEAD LOAD DEPTHS String line on top of cap stone Grass Troutbeck From Threlkeld POSSIBLE MATERIAL :- IF SOFT HARD BEARING IF POSSIBLE Stone

CONDITION Good Jack arches require pointing.

No OF LINES	2	REMARKS
IS TRACK CLOSED	No	Road Classification: - Unclassified
ANY INFORMATION ON LINE CLOSURE		
•	and the second second second second	

LINE Cockernouth, Keswick & Penrith.

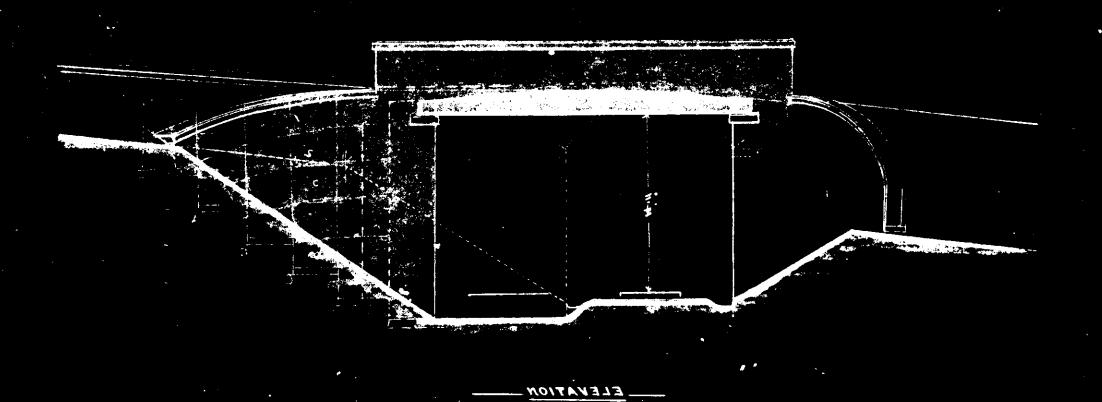
DATE 5.3. 68 REF. C 37 No.

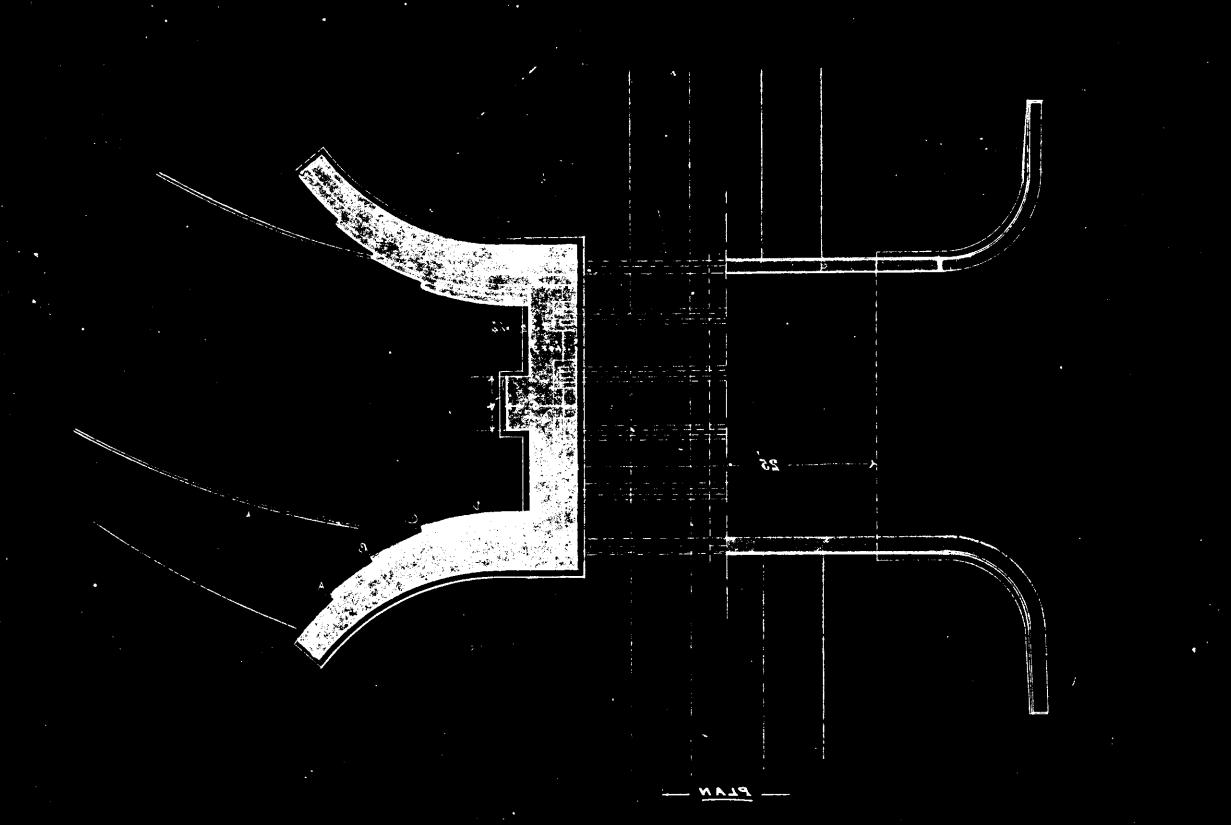
NAME LINE BET WEEN CONDUCTOR LINE BET WEEN CARRYING CONCRETE TRING CONCRETE CROSS COUR CARRYING CARRYING CARRYING CARRYING CARRYING CARRYING CARRYING CARRYING CONCRETE CROSS COUR CARRYING CARRYING CARRYING CARRYING CONCRETE STRINGERS COUR CONCRETE STRINGERS COUR COMMENTS: CARRYING COMMENTS: COMMEN	NAME	T (6)	TAINING WALL EXAMI	hs.		
Condition of Part Condition of Part Condition of Condition of Part Condition of Condition of Part Condition of Conditio	TYPE OF UNDER/O	/ER BRIDG	CARRYING COLLEGE		OVER Grands as	*:/
AACH RING SPANDREIS TO BEARING STONES TO BEARING STONES TO BEARING STONES TO HAUNCHING TO GIRDER ABUTHENTS TO HE HAUNCHING TO GIRDER TO HAUNC	Condition of Part	G = Good	Condition of Part	F = Fair	Condition of Part	F == Fair P == Poor
SPANDRELS SPANDRELS 15 BEANING TOO GIRDER 17 TROUGH FILLING WING WALLS 17 TROUGH FILLING WING WALLS 19 JACK ARCH TIE BOLTS 30 SMOKE PLATES & HTTINGS 19 JACK ARCHES 31 C J GALLAST WALLS WING WALLS 19 JACK ARCH TIE BOLTS 30 SMOKE PLATES & HTTINGS 31 C J GALLAST WALLS 32 CONCRETE STANDRERS SCOUR 12 DEALINAGE 13 SADAD SURFACE 13 SADAD SURFACE 14 CONCRETE WAIN GIRDERS SCOUR 15 CONCRETE TRINGERS 30 POINTING 30 POINTING 30 POINTING 31 C J GALLAST 32 PLAST 33 POINTING 34 POINTING 35 CONCRETE STRINGERS 36 POINTING 37 LOAD RESTRICTION PLATES COMMENTS:-	ARCH RING					
ABUTHENTS WING WALLS 18 BALLAST WALLS 19 JACK ARCHES PILASTERS PILASTERS 20 GIRDER ENCASING 21 DRAINAGE RELIEVING ARCHES PILES CROSSHEADS 21 DRAINAGE 22 FIXINGS for PIPES & CABLES 33 GAD SURFACE POUNDATIONS SCOUR 25 CONCRETE CROSS GIRDERS INVERT REMARKS (Refer to parts by above numbers) COMMENTS:-			15 BEARING STONES	5	20 JACK ARCH TIE BOLTS	(2)
ABUTHENTS WING WALLS FILASTERS FILASTERS FILASTERS FILES FILASTERS FILES FOUNDATIONS	PARAPETS	9		\	30 SMOKE PLATES & FITTING	s S
WING WALLS 19 JACK ARCHES 19 JACK ARCHES 20 GIRDER ENCASING 20 GIRDER ENCASING 21 DARINAGE 22 FIXINGS for PIPES & CABLES 23 ROAD SURFACE 23 ROAD SURFACE 25 GONCRETE CROSS GIRDERS 36 FOUNDATIONS 5 COUR 18 JECOMORETE CROSS GIRDERS 39 LOAD RESTRICTION PLATES COMMENTS:-		1/		—		9
PIERS				<u> </u>		
CROSSHEADS CROSSHEADS CRELIEVING ARCHES PILES POUNDATIONS PILES POUNDATIONS POUNDATIONS SCOUR CONCRETE CROSS GIRDERS COUR CONCRETE STRINGERS SCOUR CONCRETE STRINGERS SCOUR CONCRETE STRINGERS SCOUR CONCRETE STRINGERS SPOINTING CONCRETE STRINGERS SPOINTING FOR CONCRETE STRINGERS SPOINTING FOR CONCRETE STRINGERS CONCRE	The second secon	\		1	33	_
RELIEVING ARCHES REMARKS REMARKS REMARKS (Refer to parts by above numbers) COMMENTS:— COM		 -\		4	34	
PILES PILES PILES POUNDATIONS PLES PLES PLES POUNDATIONS PLES PLES PLES POUNDATIONS PLES PLES PLES POUNDATIONS PLES PLES PLES PLES PLES PLES PLES PLE		<u> </u>	22 FIXINGS for PIPES & CABLES		35	
FOUNDATIONS FOUNDATIONS FOUNDATIONS FOUNDATIONS SCOUR FOUNDATIONS					30	
SCOUR		— <u> </u>	24 CONCRETE MAIN GIRDERS	<u></u>		 _
REMARKS (Refer to parts by above numbers) COMMENTS:— Cod Condition. EXAMINED BY. ON Part 69 (Date) RECOMMENDATIONS:— (Date)			25 CONCRETE CROSS GIRDER	5	38 POINTING	<u> </u>
REMARKS (Refer to parts by above numbers) COMMENTS:— Cond Condition. EXAMINED BY. ON Prince (Date) RECOMMENDATIONS:— (Date)			26 CONCRETE STRINGERS		39 LOAD RESTRICTION PLAT	E3
RECOMMENDATIONS:— (Inspector Supervisor or Technical Asst.) (Date)						•
RECOMMENDATIONS:— (Inspector Supervisor or Technical Asst.)(Date)	COMMENTS:—	Cicc) •	ON 1 14.60	(Date)
(Jacobson Supervisor or Technical Asst.) (Date)	RECOMMENDATION	IS:—	EXAMINATED DI			
			Inspector Supervis	or or T	Fechnical Asst.)	(Date)

C. K. & P. RY. THRELKELD & TROUTBECK DOUBLING

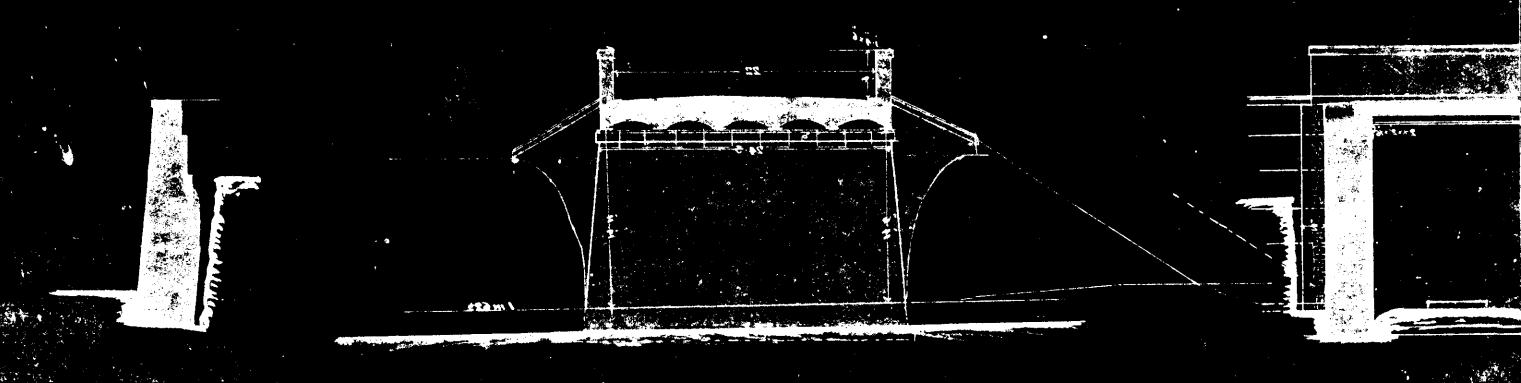
_ Public Road Bridge at 18m. 35chs_

-N°87 C37/87





Girders & Brick Urching similar tofhose of Bridge 20 m 122°



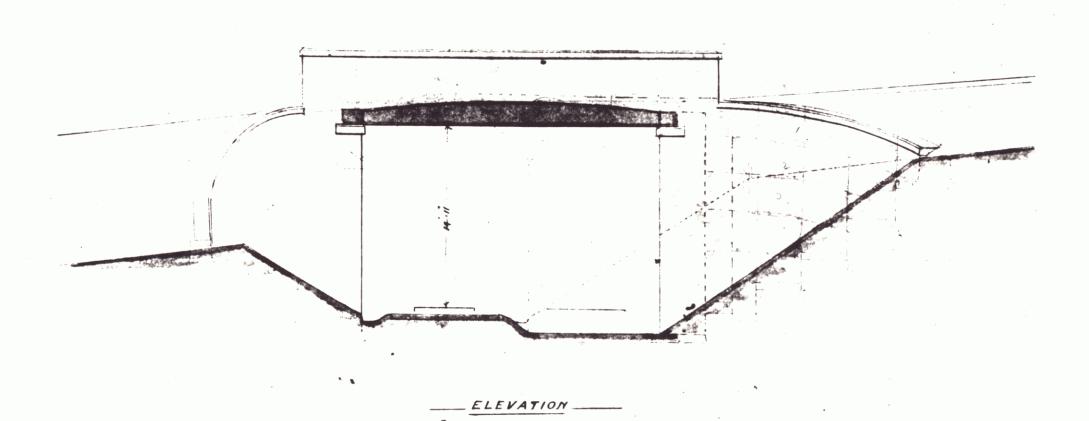
ABUTMENT

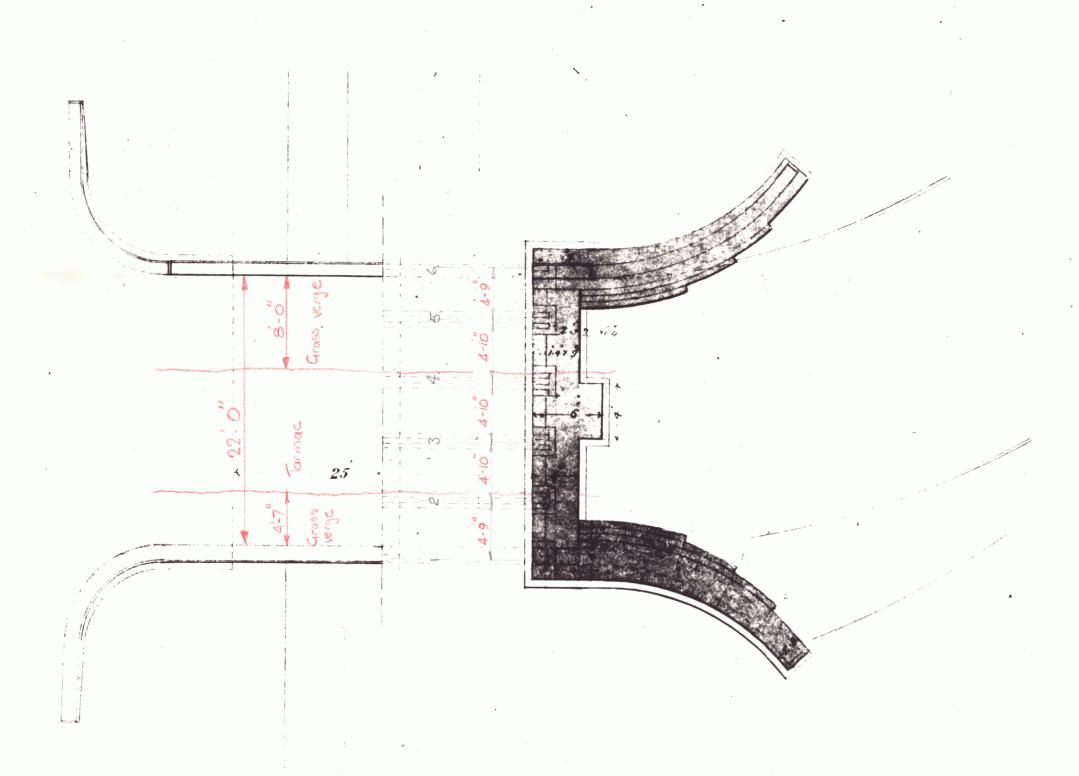
SECTION___

C. K. & P. RY. THRELKELD & TROUTBECK DOUBLING

_ Public Road Bridge at 18m.35chs._

C37/87



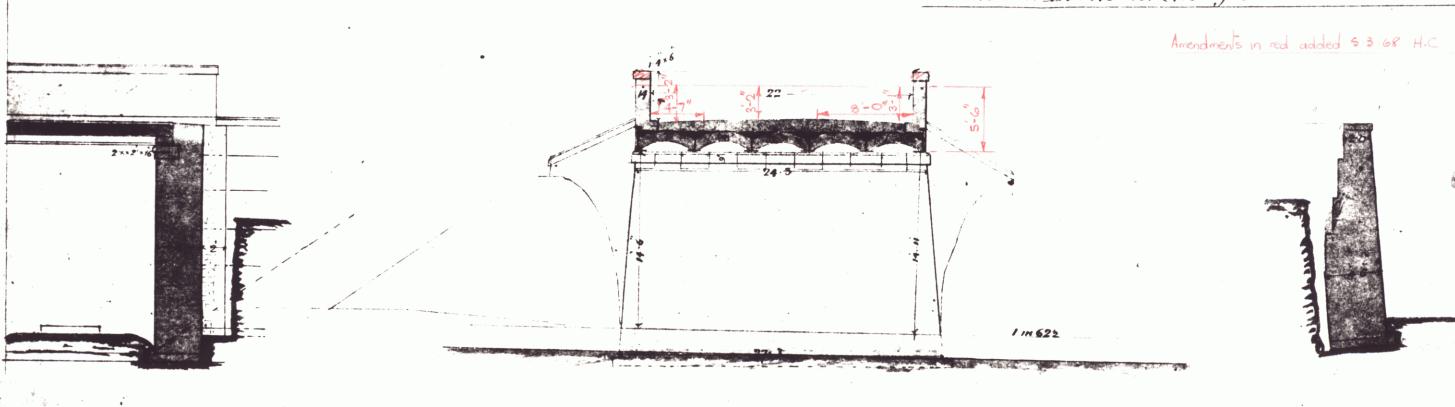


For Girder details see C 37/94.

_ PLAN ___

C37/94

Girders & Brick Arching similar to those of Bridge 20 m 122c.



__ ABUTMENT___

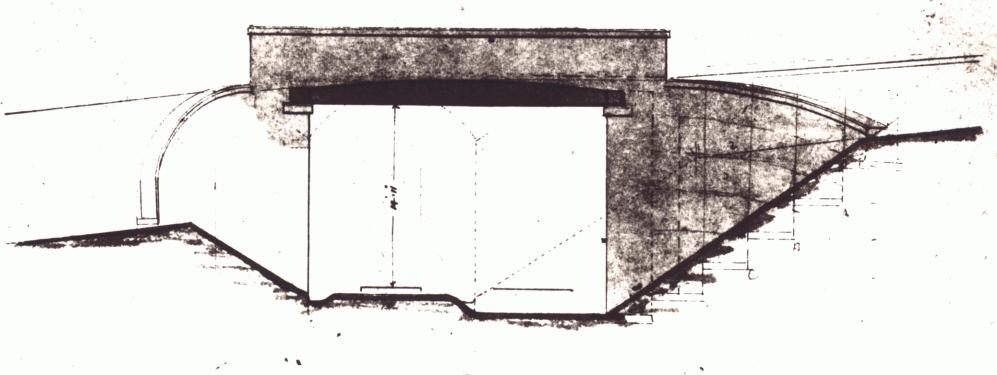
SEGTION ___

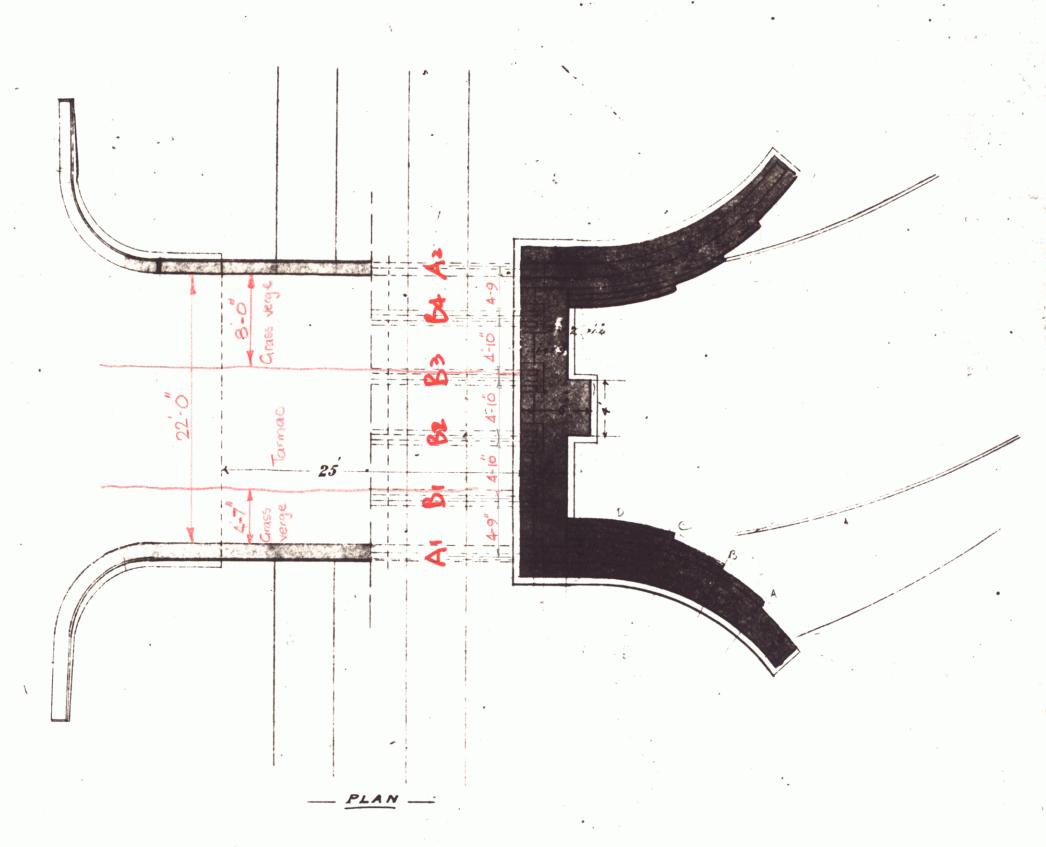
___WINGWALL_

C. K. & P. RY. THRELKELD & TROUTBECK DOUBLING

Public Road Bridge at 18m. 35 chs._

C37/87



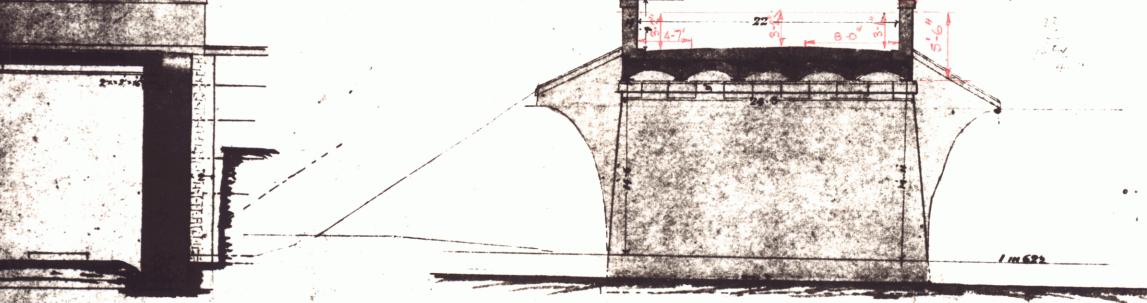


For Girder details see C 37/94

C37/94

Girders & Brick arching similar to those of Bridge 20m 124c.

Amendments in red added 5-3.68 H.C





SEGTION