1997/98 BRITISH RAIL PROPERTY BOARD BRIDGE INSPECTION AND ASSESSMENT PROGRAMME

ASSESSMENT REPORT
ALDEBY BRIDGE, ALDEBY
NCC BRIDGE NO. TM49123
BR BRIDGE NO. BYS/477

PREPARED BY

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Document Ref: AR/BDH064/ALDRPT

1997/98 BRITISH RAIL PROPERTY BOARD
INSPECTION AND ASSESSMENT PROGRAMME

ALDEBY BRIDGE, ALDEBY : NCC BRIDGE No TM49123
BR BRIDGE No BYS/477

Author of Report:-

(Title) Engineer

(Name) [redacted]

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(Title) Project Engineer

(Name) [redacted]

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NORFOLK COUNTY COUNCIL Planning & Transportation

CONTENTS

EXECUTIVE SUMMARY

Aldeby Bridge is reported as being in poor condition with extensive spalling of soffit concrete and corrosion of the bull nose rail truss members that are the primary structural element of the bridge.

The Inspection for Assessment report and Form AA, Approval in Principle suggest the deck is a constant depth, however careful examination of the record drawings suggests the top surface of the deck concrete follows the profile of the top chord of truss. Therefore any assessment work adopting a reinforced concrete analogy would have to take account of the varying depth of section.

The assessor has concluded that the loss of concrete around the bottom rails and the extensive corrosion will have removed any bond between the two materials and they will not be acting as required for a reinforced concrete section analysis to be completely valid. The assessor has therefore determined the structure's load carrying capacity adopting the truss analogy method identified as an option in Form AA.

The assessment of the bull nose rail truss has assumed section losses of 25% in accordance with the findings of the inspection report. This is a qualitative estimate of section loss and is likely to be conservative although the extent of corrosion must be a concern.

The bridge is assessed as having the capacity to carry 40 Tonnes Assessment Live Loading.

The substructure and foundations have all been assessed qualitatively and there are no obvious defects which affect the stability of the structure.

The bridge is assessed as having the capacity to carry more than 30 units of HB loading, which is the minimum HB requirement for this class of road.

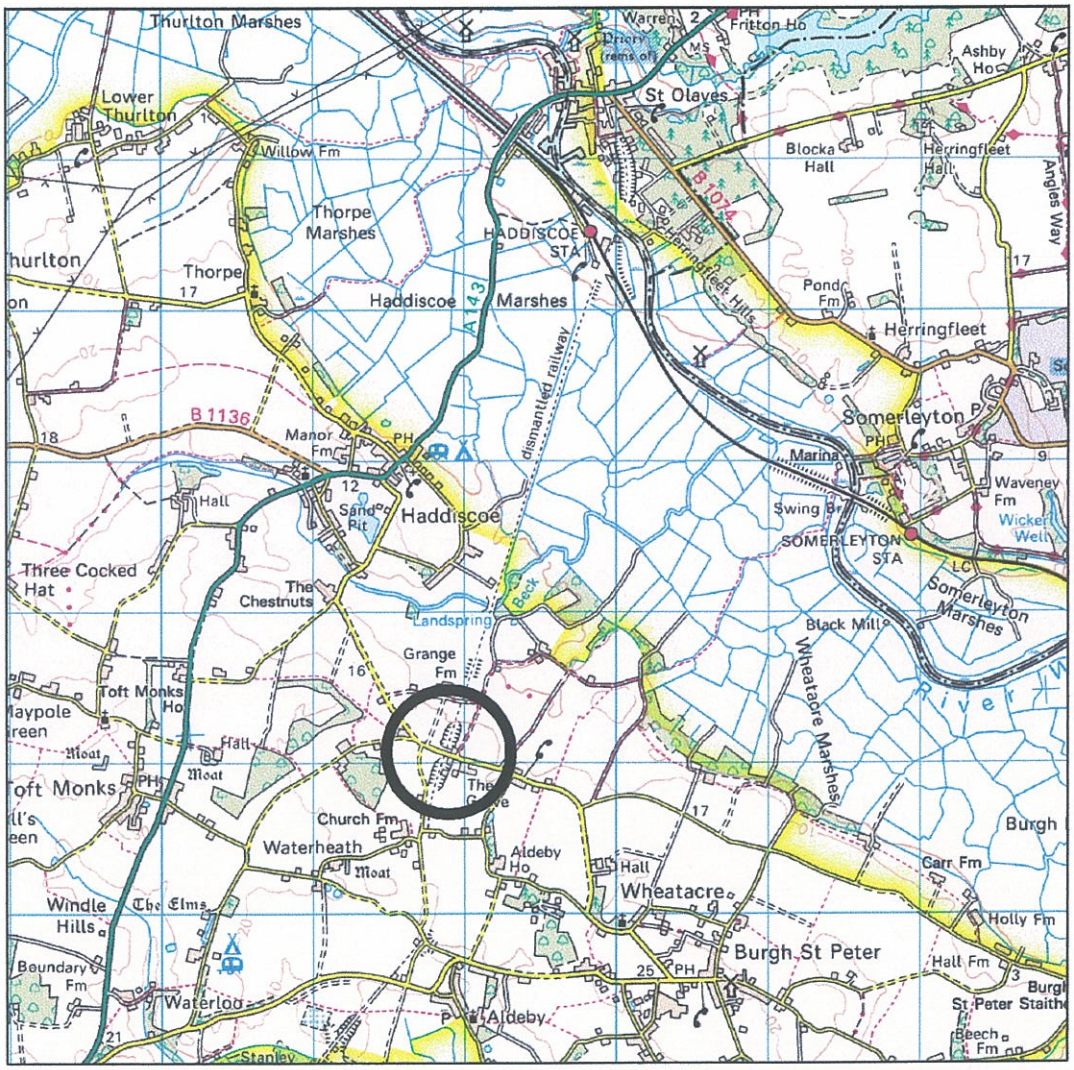
The parapets have been assessed in accordance with the County Surveyors Guide 'The Assessment and Design of Unreinforced Masonry Vehicle Parapets' and have been found to have adequate containment capacity.

NORFOLK COUNTY COUNCIL Planning & Transportation

LOCATION PLANS

1:50000 Plan

BRIDGE TITLE : **ALDEBY BRIDGE**
O.S.MAP REF : **TM 448 951**
N.C.C REF NO : **TM49123**



Aldeby Bridge

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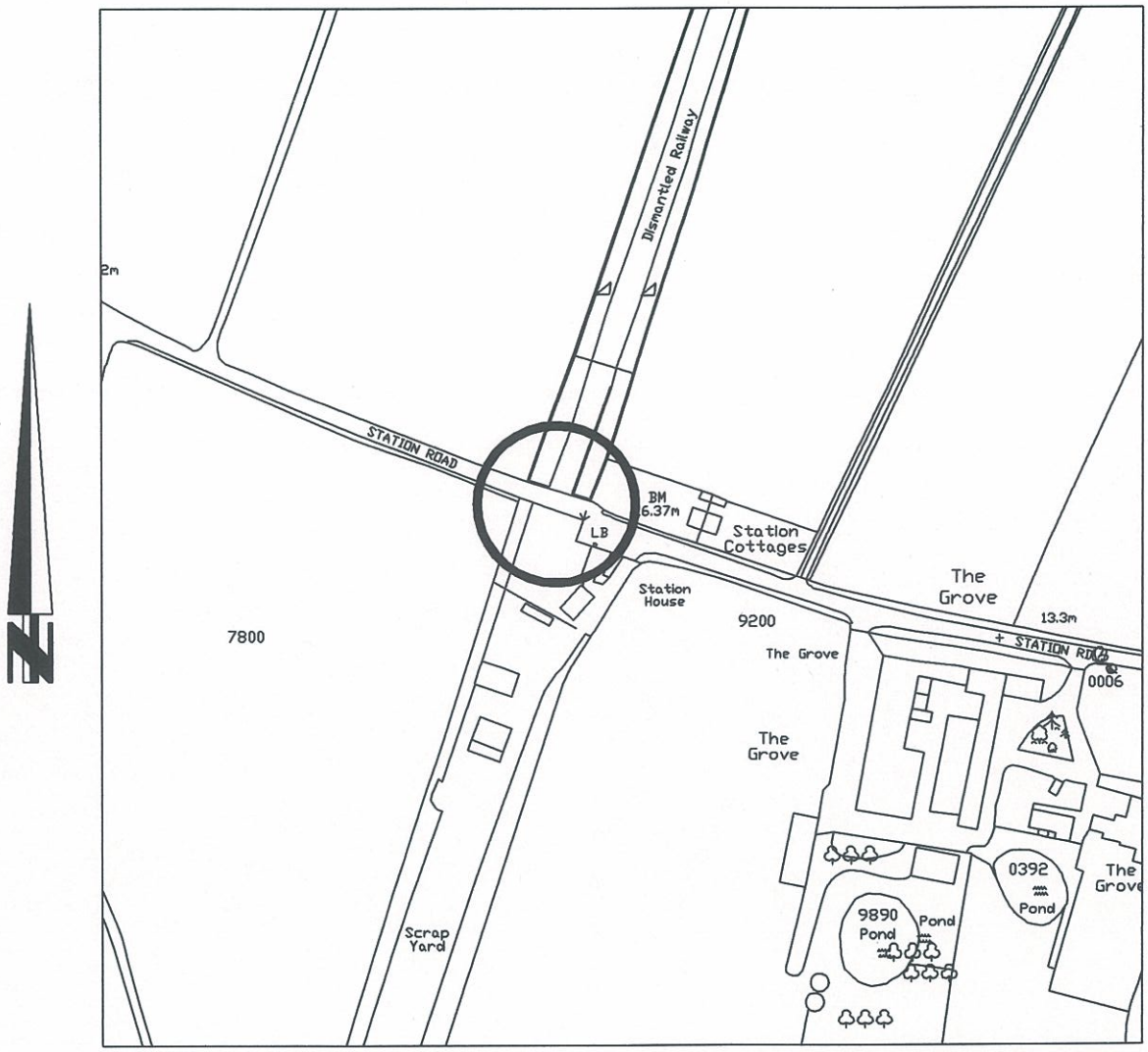
Norfolk County Council.

1.2 1:2500 Plan



Aldeby Bridge

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2.0 INTRODUCTION

2.1 The assessment of Aldeby Bridge was commissioned under the programme of inspection and assessment of BR Property Board Bridges in Norfolk.

2.2 The assessment has been based on the dimensions and condition factors included in the Inspection for Assessment Report dated November 2000.

2.3 The following record drawings were made available for reference in July 1999:

Dwg Ref 5/BYS/477/1: G.E.R. Renewal of Public Road Overline Bridge at 112^{M} 33^{C}. Between Aldeby and Haddiscoe.

Dwg Ref 5/BYS/477/2: G.E.R. Aldeby. Public Road Overline Bridge at 112^{M} 33^{C}.

3.0 BRIDGE DESCRIPTION

3.1 Aldeby Bridge carries the C388 road, over the cutting of a dismantled railway line, north of the village of Aldeby within the parish of Aldeby.

3.2 The bridge is a single span reinforced concrete slab with brick abutments, wingwalls and parapets. It has a clear, square span of 10.23m and zero skew.

3.3 The deck is a 710mm thick concrete slab which spans 10.23m between the faces of abutments. It is reinforced longitudinally, top and bottom, with bullnose rails laid on their sides at 420mm centres. The rails originally had approximately 30mm of concrete cover but the majority of them are now exposed. There is transverse reinforcement present, comprising 12mm diameter bars at 250mm centres, laid on top of the rails.

3.4 The abutments are 7.45m long and are constructed in blue engineering brick. The deck sits directly on the abutment brickwork.

3.5 The parapets are constructed in blue engineering brick with engineering brick coping units but the pilasters and newels have concrete coping stones.

3.6 The wingwalls are 5.44m long and are also constructed in blue engineering brick. They run in line with the abutments, reducing in height towards the edge of the railway cutting.

3.7 The old railway cutting has been filled to soffit level on the south side, sloping back to the original bottom of cutting ground level at 3.0m from the north elevation.

3.8 The carriageway over the bridge is 4.1m wide (single lane) with 1.0m and 1.2m wide grass verges to the north and south respectively. This gives a minimum width of 6.3m between the faces of the parapets. The road is humped over the bridge, having an approach gradient of 6.6% from the west, which rolls over to 7.8% east of the bridge.

3.9 Details of the foundations are unknown.

3.10 The date of construction is unknown.

3.11 Information from Anglian Water Services Limited indicate that a 6 inch diameter PVC water main crosses the bridge buried within the south verge.

3.12 Information from British Telecommunications indicates that overhead cables cross the bridge over the north verge.

4.0 CONCLUSIONS OF INSPECTION REPORT

4.1 Aldeby Bridge is in poor condition due to the following defects:-

a) Spalled concrete over a large area of the deck soffit.

b) Extensive corrosion to the rails and transverse reinforcement within the deck slab.

4.2 It is recommended that the spalled areas of concrete are made good.

4.3 The poor condition of the concrete and reinforcement of the deck slab gives cause for concern and is likely to significantly affect the load carrying capacity of the bridge.

4.4 The above defects will be taken into account during assessment.

5.0 ASSESSMENT METHODS AND FINDINGS

5.1 The phase 1 analysis was carried out adopting the assessment methods and parameters given in the Inspection for Assessment Report, dated November 2000, and Form AA, Approval in Principle.

5.2 The Form AA gives two alternative approaches to the Phase 1 assessment. The first is to assess the deck as a number of independent reinforced concrete beams with the bull nose rails acting as tension reinforcement. The second approach is to assume the bull nose rails act as trusses with the concrete acting as compressive diagonal bracing (this approach has been accepted for the assessment of Railtrack bridges in Norfolk). However, the loss of concrete around the bottom rails and the extensive corrosion will have removed the bond between the two materials required for a reinforced concrete section analysis to be completely valid. Therefore, the assessment of Aldeby Bridge has only been carried out adopting the truss analogy method.

5.3 The assessment of the beams has been based on reduced section properties to allow for 25% loss of section due to corrosion as reported in the inspection report. This is considered to be a conservative assumption.

5.4 The phase 1 analysis of the beams was carried out adopting a static distribution of loads.

5.5 The above approach established that the bridge has the capacity to carry 40 Tonnes Assessment Live Loading.

5.6 A phase 2 mechanism analysis was not identified for this structure.

5.7 A phase 3 analysis was carried out to determine a HB rating. The bridge was found to be capable of carrying at least 30 units, the minimum HB requirement for this class of road.

5.8 The substructure and foundations have been assessed qualitatively and there are no obvious defects which would affect the stability of the structure.

5.9 The parapets are of masonry construction and do not comply with BD52/93, the current standard for highway parapets. An assessment of the containment capacity of the parapets

has been made following the guidance given in the County Surveyor's Society Guidance Note 'The Assessment and Design of Unreinforced Masonry Parapets.'

5.10 The Guide provides charts from which the containment capacity of a parapet of given construction type, thickness and height can be determined. The charts assume that the parapets are in good condition and that any defects are made good. The containment capacity is then compared with the specific containment requirement for the parapet, which is bridge specific.

5.11 Each parapet has several horizontal cracks near the top of the parapet, which are considered to have a detrimental affect on the capacity of the parapets. The north parapet has some missing bricks under the coping stones. To account for these defects the parapet height was reduced by 300mm.

5.12 The specific containment requirement for the parapets is determined from the lesser of the following:

i) Statutory Road Speed Limit.

ii) Maximum speed attained by 85% of vehicles using that section of the highway.

iii) The theoretical speed based on highway geometrical constraints determined, as a function of the bridge cross-section, using the guide.

5.13 A containment capacity of 85 kph was determined for the parapets. The specific containment requirement is 86 kph, based on highway geometrical constraints. This marginal failure of the parapets' capacity, together with the conservative reduction of the parapet height, indicates that the parapets have adequate containment capacity.

5.14 Aldeby Bridge at Aldeby crosses a disused railway and therefore the risk that masonry may detach, as a result of a vehicle collision with the parapets, is not considered significant.

6.0 CONCLUSIONS

6.1 Aldeby Bridge has the capacity to carry 40 Tonnes Assessment Live Loading adopting the parameters stated in Form AA, Approval in Principle.

6.2 The substructure and foundations have all been assessed qualitatively and there are no defects which are considered to affect the stability of the structure.

6.3 Based on the parameters stated in Form AA, Approval in Principle, the bridge is assessed as having the capacity to carry greater than 30 units, the minimum HB requirement for this class of road.

6.4 The parapets have been assessed in accordance with the County Surveyors Guide 'The Assessment and Design of Unreinforced Masonry Vehicle Parapets' and have been found to have adequate containment capacity.

6.5 The bridge crosses a disused railway and therefore the risk that masonry may detach, as a result of a vehicle collision with the parapets, is not considered significant.

APPENDIX A
ASSESSMENT CALCULATIONS

CALCULATION INDEX

FILE No.	BDT064-R42	STRUCTURE NUMBER	TM 49123

STRUCTURE NAME	ALDEBY BRIDGE

DESIGNER			
NAME	[redacted]	DATE	09/01

CHECKER			
NAME	[redacted]	DATE	10/03

REVIEWER [redacted]

INDEX AMENDED INDEX / CALCS REFLECT REVIEWER COMMENTS ON ASSESSMENT / CHECK WHICH WAS OVER ONEROUS WITH REGARD TO AWL / PARAPET LOADS.

SHEET		
SHEET 1	1.0	INTRODUCTION
1 & 2	2.0	METHODOLOGY
2	3.0	ASSESSMENT SUMMARY
3	4.0	DIMENSIONS & X-SECTIONS
10	5.0	MATERIAL PROPERTIES
10A	6.0	MAIN SPAN & TRUSS SPACING
11	7.0	LOADING Mid-14c Accidental Wheel Load
17	8.0	LOAD EFFECTS ON INNER TRUSS pages 19-20 Not Used
22-34 ~~23-34~~		* NOT USED *
38	9.0	SECTION CAPACITY OF TRUSS
41 - 41a	10.0	LOAD EFFECTS ON OUTER TRUSS
42 ~~43~~-48		* NOT USED *
49	11.0	CONNECTIONS
53 ~~53~~-54		* NOT USED *
55	12.0	HB RATING
60A	13.0	AWL RATING
61	14.0	PARAPET ASSESSMENT

NORFOLK COUNTY COUNCIL Planning & Transportation

PLANNING AND TRANSPORTATION

Form DOPM 41/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 1
Sub Section:-			
Project File Ref:- BDH604-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

1.0 INTRODUCTION.

These calculations have been carried out to assess the adequacy of Aldeby Bridge's load carrying capacity.

2.0 METHODOLOGY

The bridge comprises a single span concrete slab, reinforced longitudinally with bullnose rails forming trusses.

Due to the extensive spalling of concrete at the soffit (Max 180mm) it is considered that a reinforced concrete slab analogy is unrealistic. The bottom rail of most of the trusses is unlikely to have a good bond with the concrete. — IAR Fig 4.

Consequently, the following calculations will assess the Aldeby Bridge as a series of steel trusses with the concrete forming compressive diagonal bracing.

Note: Bridge shall be assessed using BD21/97 Medium Traffic Flow and Poor Road Condition (MP) as required by the AIP.

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PLANNING AND TRANSPORTATION

Form DOPM 41/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 2
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 08/02
		Checked by:- [redacted]	Date:- 11/02

Ref:-

ASSESSMENT SUMMARY

ELEMENT	LOAD EFFECT	RATING	REF.
INNER TRUSS	BENDING	40T ALL 40T AWL	38 37
	SHEAR	40T ALL 40T AWL	40
OUTER TRUSS	BENDING	~~37T AWL~~ ~~40T AWL~~	47
	SHEAR	40T AWL	48A
CONNECTIONS - SUPPORT	TENSILE	40T ALL 7.5T AWL	50B 50A
-FISHPLATE	TENSILE	40T ALL	53
HB RATING	BENDING	37 UNITS	58
	SHEAR	71 UNITS	59
(- SUPPORT CONNECTION)	TENSILE	33 UNITS	59
	QUALITATIVE	ADEQUATE	62

[redacted] 13/11/02

OVERALL RATING: ✗ 40T ALL, INNER TRUSS CRITICAL (BENDING)

✗ ~~37~~ 40T AWL, OUTER TRUSS CRITICAL (BENDING) [redacted] 11/02.

✗ >30 HB UNITS, SUPPORT CONNECTION CRITICAL (TENSILE)

✗ PARAPETS ADEQUATE.

NORFOLK COUNTY COUNCIL Planning & Transportation

DESIGN AND CONSTRUCTION DIVISION

Form DC 23/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 3
Sub Section:-			
Project File Ref:- BJH004-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

4.0 DIMENSIONS AND X-SECTIONS.

The bridge compises a single span concrete slab with brick abutments, wingwalls and parapets. IAR.

The concrete slab is simply supported with a depth of 650 mm. The original depth was ~ 710 mm, however corrosion of the bottom rails has blown off much of the soffit, reducing the slab thickness and exposing the rails.

The slab is reinforced longitudinally with two tiers of 80lb bullnose rails, laid on their sides, at 420mm centres.

Record drawings have shown that the top chord is bowed such that the top and bottom chords form a truss embedded in the slab.

Sheet #4

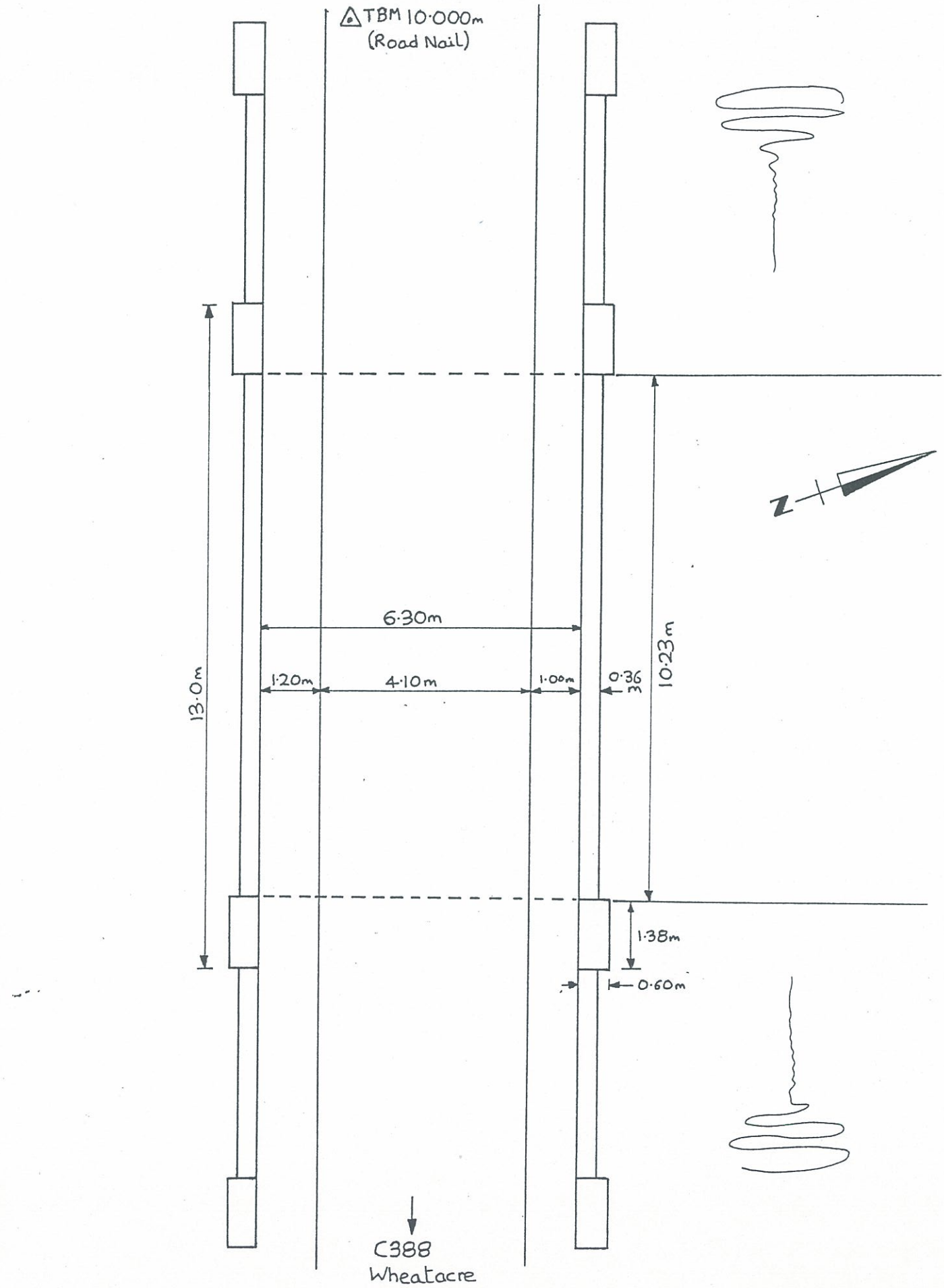

Figure 1 : Plan (Scale 1:100)

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East

West

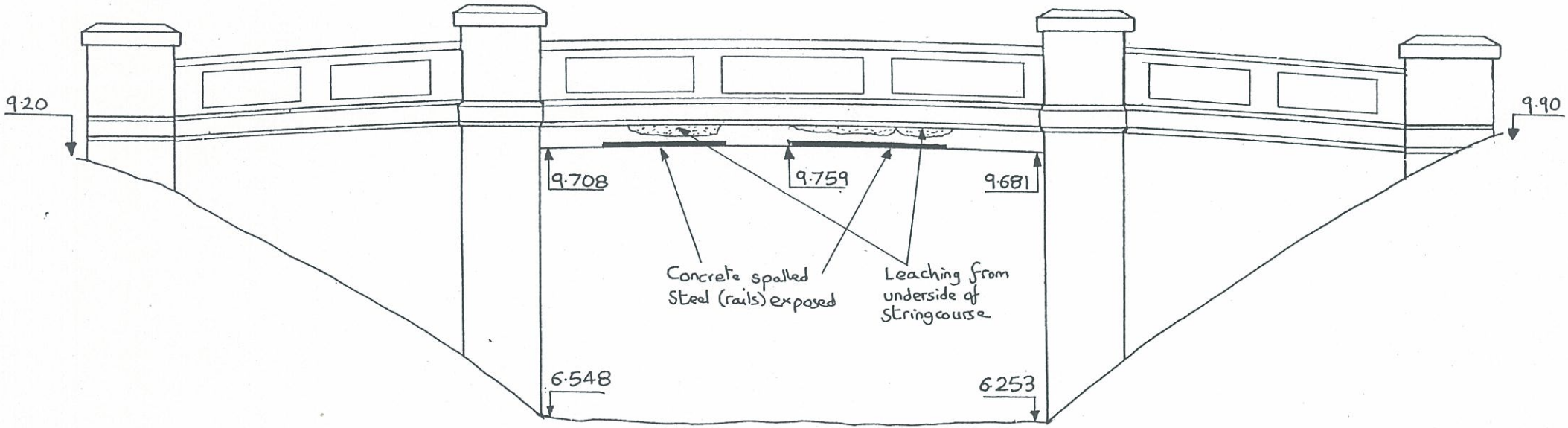

Figure 2 : North Elevation (Not to Scale)

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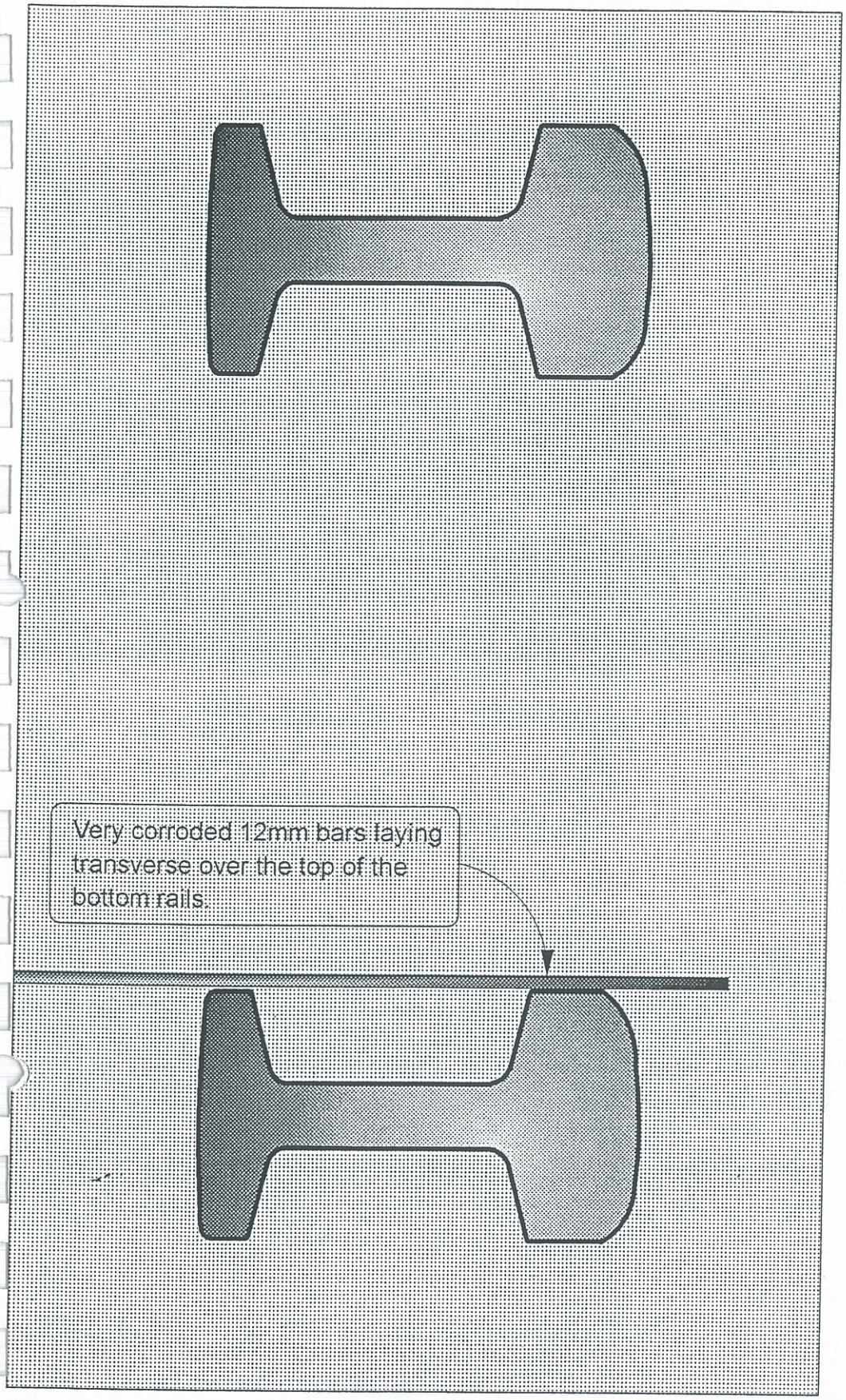
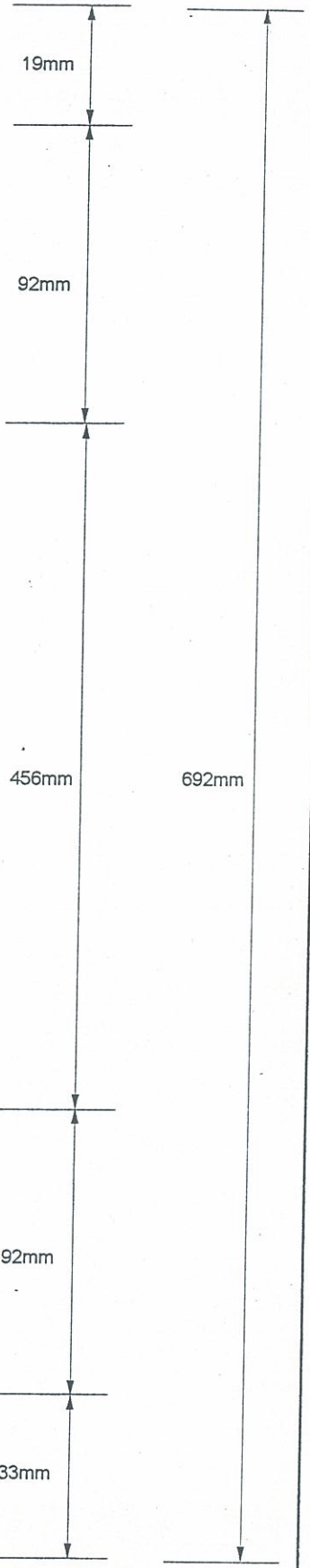
Sheet #5





NORFOLK COUNTY COUNCIL
Planning & Transportation

J M SHAW O.B.E, B A Dip T, FRTPI, FRSA, Fimgt, FIHT
DIRECTOR OF PLANNING & TRANSPORTATION
COUNTY HALL
NORWICH, NR1 2SG

DRAWING TITLE

Cross-sectional sketch of enclosed bull-rails on North face of bridge.

REV	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	S.Shearwood	Feb '98
DESIGNED BY	J.Graham	Mar '98
DRAWN BY	J.Graham	Mar '98
CHECKED BY	R.Noakes	Mar '98

DRAWING No: F:\flwshare\material\bridges\B979897b

PROJECT TITLE: **Aldeby Bridge**

SCALE: Not to Scale

FILE No: B97/98:097

TAKEN FROM "THE ENGINEER'S YEARBOOK" - 1935

No. of B.S. Section and Nominal Weight in lbs. per yard (kgs. per metre).	Height of Drop.		Maximum Permanent Set resulting from the two blows.		No. of B.S. Section and Nominal Weight in lbs. per yard (kgs. per metre).
	1st Blow.	2nd Blow.	Ordinary Carbon Rail.	Higher Carbon Rail.	
	Falling Weight of 20 cwts. (2,240 lbs. = 1,016 kgs.) Centres of bearers, 3 feet 6 inches (1·07 m.) apart.				
	ft. (m.)	ft. (m.)	in. (mm.)	in. (mm.)	
60 (29·76)	5 (1·52)	10 (3·05)	3·9 (99·06)	3·7 (93·98)	60 (29·76)
65 (32·24)	5 (1·52)	12 (3·66)	3·9 (99·06)	3·7 (93·98)	65 (32·24)
70 (34·72)	6 (1·83)	12 (3·66)	3·9 (99·06)	3·7 (93·98)	70 (34·72)
75 (37·20)	6 (1·83)	12 (3·66)	3·9 (99·06)	3·7 (93·98)	75 (37·20)
80 (39·68)	6 (1·83)	15 (4·57)	4·2 (106·68)	4·0 (101·60)	80 (39·68)
85R(42·16)	6 (1·83)	15 (4·57)	4·2 (106·68)	4·0 (101·60)	85R(42·16)
90R(44·64)	7 (2·13)	18 (5·49)	4·3 (109·22)	4·1 (104·14)	90R(44·64)
95R(47·13)	7 (2·13)	20 (6·10)	4·3 (109·22)	4·1 (104·14)	95R(47·13)
100 (49·61)	7 (2·13)	20 (6·10)	4·1 (104·14)	3·9 (99·06)	100 (49·61)

14. All ingots used in the manufacture of the rails shall be not less than 200 square inches (1,290·32 cm.²) in area at the larger end. The ingot shall be so fed into the cogging rolls that the bottom end arrives at the shears or hot saws first. From each end of the bloom and/or rail bar sufficient crop shall be cut to ensure that all unsound portions have been removed.

24. Dimensions and Weights of 'B.S.' Bull-Head Railway Rails.

No. of B.S. Section and Nominal Weight in lbs. per yard (kgs. per metre).	Height of Rail.	Width of Head.	Calculated Weight of Rail before Drilling. Lbs. per yard (Kgs. per metre).	No. of B.S. Section and Nominal Weight in lbs. per yard (kgs. per metre).
60 (29·76)	ins. (mm.) 4⅝ (120·65)	ins. (mm.) 2 5/16 (58·74)	59·79 (29·66)	60 (29·76)
65 (32·24)	4⅞ (123·83)	2⅜ (60·33)	64·58 (32·04)	65 (32·24)
70 (34·72)	5 (127·00)	2 7/16 (61·91)	70·13 (34·79)	70 (34·72)
75 (37·20)	5⅛ (130·18)	2½ (63·50)	74·56 (36·99)	75 (37·20)
80 (39·68)	5⅜ (136·53)	2 9/16 (65·09)	79·49 (39·43)	80 (39·68)
85R (42·16)	5 13/32 (138·91)	2 11/16 (68·26)	84·88 (42·11)	85R (42·16)
90R (44·64)	5 15/32 (140·89)	2¾ (69·85)	89·77 (44·53)	90R (44·64)
95R (47·13)	5 29/32 (145·26)	2¾ (69·85)	94·59 (46·92)	95R (47·13)
100 (49·61)	5 29/32 (150·02)	2¾ (69·85)	99·84 (49·53)	100 (49·61)

27. The standard length of the rails for straight line shall be 30 feet (9·14 m.), 36 feet (10·97 m.), 40 feet (12·19 m.), 45 feet (13·72 m.) and 60 feet (18·29 m.).

29. The rails shall be the specified length at a temperature of 62° Fahr. (16·67° C.). Any rail may be rejected which is more than three-sixteenths (3/16) of an inch (4·76 mm.) above or below the length specified at that temperature, whether for straight or curved line.

Areas of Head, Web, and Foot of 'B.S.' Bull-Head Railway Rails.

B.S. No. and Nominal Weight.		Head.			Web.			Foot.			Whole Section.			
		Area.		Per Cent.	Area.		Per Cent.	Area.		Per Cent.	Area.		Calculated Weight.	
lbs. per yd.	kgs. per metre.	sq. in.	mm.²		sq. in.	mm.²		sq. in.	mm.²		sq. in.	mm.²	lbs. per yd.	kgs. per metre
60	29·76	2·71	1749	46·4	1·29	830	21·80	1·87	1208	31·80	5·87	3786	59·79	29·66
65	32·24	2·95	1906	46·6	1·36	880	21·50	2·02	1303	31·90	6·34	4089	64·58	32·04
70	34·72	3·21	2068	46·7	1·45	938	20·70	2·22	1435	32·60	6·88	4441	70·13	34·79
75	37·20	3·43	2212	46·8	1·53	989	20·80	2·36	1521	32·40	7·32	4722	74·56	36·92
80	39·68	3·62	2334	46·4	1·73	1119	22·10	2·45	1582	31·50	7·80	5034	79·49	39·43
85R	42·16	4·07	2623	48·79	1·81	1165	21·67	2·46	1588	29·54	8·33	5375	84·88	42·11
90R	44·64	4·27	2752	48·42	1·97	1268	22·30	2·58	1665	29·28	8·81	5685	89·77	44·53
95R	47·13	4·48	2892	48·27	1·97	1268	21·17	2·84	1830	30·56	9·28	5990	94·59	46·92
100	49·61	4·91	3169	50·12	1·97	1268	20·05	2·92	1886	29·83	9·80	6322	99·84	49·53

31. The holes for fishbolts shall be drilled through the web from the solid at each end of the rail of the sizes and in the position shown in the British Standard Specification for Steel Fish-plates for Bull-head Railway Rails (Report No. 47—1928) or on a drawing to be supplied by the engineer (or the purchaser).

These holes shall be at right angles to the web of the rail, and clean cut, all burrs being carefully removed, and shall be checked by the manufacturer with suitable templates and gauges to be furnished by him and at his expense, and approved by the engineer (or the purchaser).

32. Should any of the holes vary from the correct size or position more than one-thirty-second (1/32) of an inch (0·79 mm.) the rail or rails in which such deviation occurs may be rejected.

Flat-bottomed or Flanged Rails.

This form of rail is largely used in India, in the Colonies, in America, and on the Continent.

British Standard Specification and Sections of Flat-Bottom Railway Rails.*

(No. 11—July 1926.) (*Abstract.*)

Table I (*Abbreviated*).—Dimensions.

B.S. No. and Nominal Weight.	A	B	C	D	E	F	G	J	K
lb. per yd.	in.	in.	in.	in.	in.	in.	in.	in.	in.
25R*	2 7/8	2¾	1½	29/32	29/32	7/16	1 13/64	5/16	3/16
30R	3 1/8	3	1 5/8	1 9/64	1	15/32	1 15/64	5/16	3/16
35R	3 3/8	3 1/4	1 3/4	1 13/64	1 5/32	15/32	1 25/64	5/16	3/16
40R	3 5/8	3 1/2	1 7/8	1 17/64	1 9/32	17/32	1 33/64	5/16	7/32
45R	3 7/8	3 3/4	1 31/32	1 21/64	1 7/32	9/16	1 39/64	5/16	7/32
50R	4 1/8	3 15/16	2 1/16	1 25/64	1 11/32	19/32	1 47/64	5/16	7/32
55R	4 5/16	4 1/8	2 5/32	1 29/64	1 15/32	5/8	1 55/64	5/16	7/32
60R	4 1/2	4 5/16	2 1/4	1 33/64	1 19/32	21/32	2 3/64	5/16	7/32
65R	4 11/16	4 7/16	2 5/16	1 37/64	1 23/32	11/16	2 7/64	5/16	7/32
70R	4 7/8	4 5/8	2 13/32	1 41/64	1 27/32	23/32	2 15/64	5/16	7/32
75R	5 1/16	4 13/16	2 7/16	1 45/64	1 31/32	47/64	2 19/64	5/16	7/32
80R	5 1/4	5	2 1/2	1 49/64	1 15/16	49/64	2 23/64	5/16	7/32
85R	5 7/16	5 3/16	2 9/16	1 53/64	1 63/64	25/32	2 29/64	5/16	7/32
90R	5 5/8	5 3/8	2 5/8	1 57/64	2 1/32	51/64	2 33/64	5/16	7/32
95R	5 13/16	5 9/16	2 11/16	1 61/64	2 5/32	53/64	2 37/64	5/16	7/32
100R	6	5¾	2¾	1	2 1/16	27/32	2 1/2	5/16	7/32

* By permission of the British Standards Institution.

Sheet # 7

Norfolk County Council

Form DOPM 41/A

PLANNING AND TRANSPORTATION

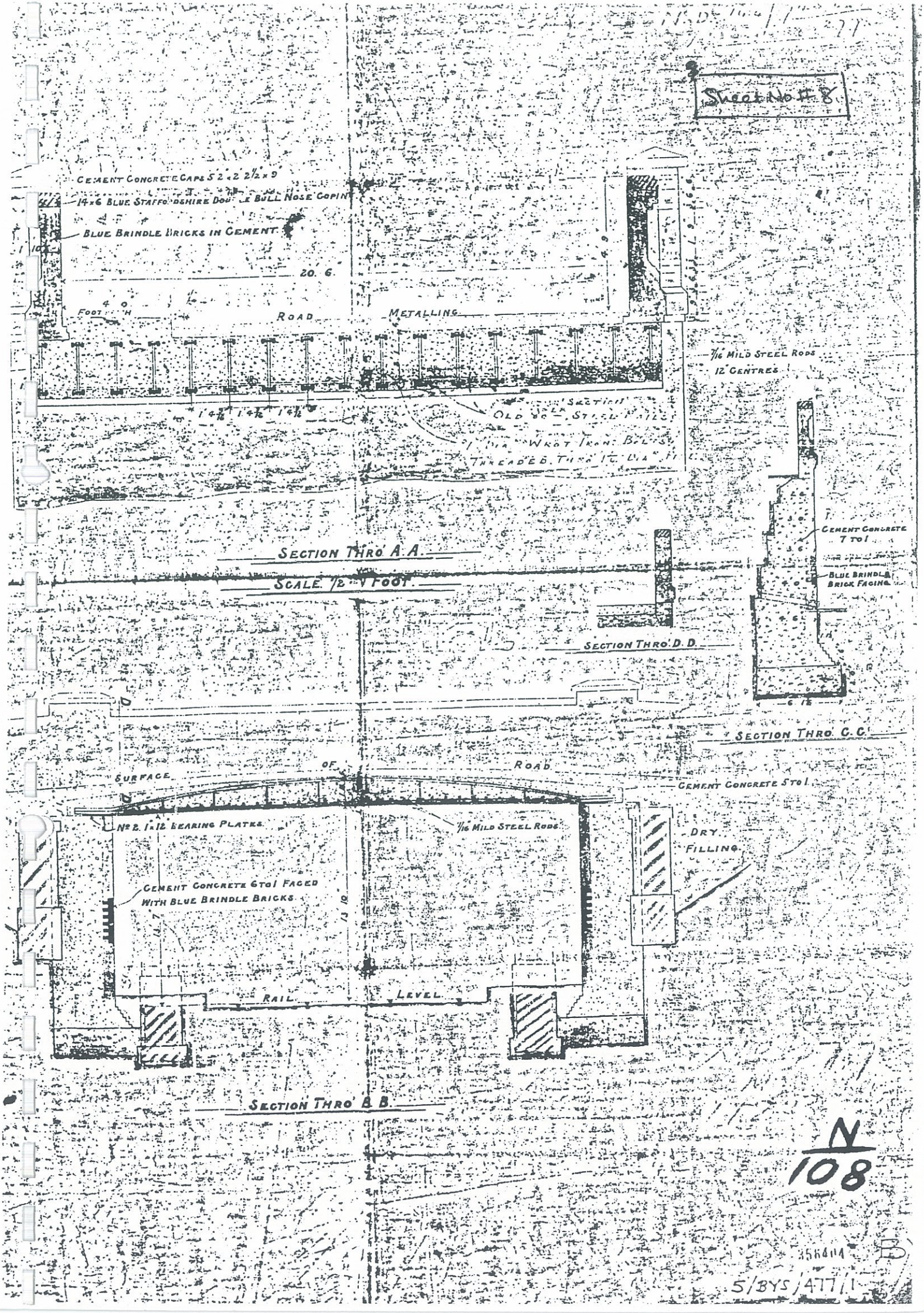
CALCULATION SHEET

Project Title:- BRPB – Aldeby Bridge			**SHEET NO.** 15
Sub Section:-			
Project File Ref:- BDH0064 – R42	**Drawing Ref:-**	**Prepared by** [redacted]	**Date:-** 21/
		Checked by [redacted]	**Date:-**

Ref:-

Page Not Used.

Sheet No F 8



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108

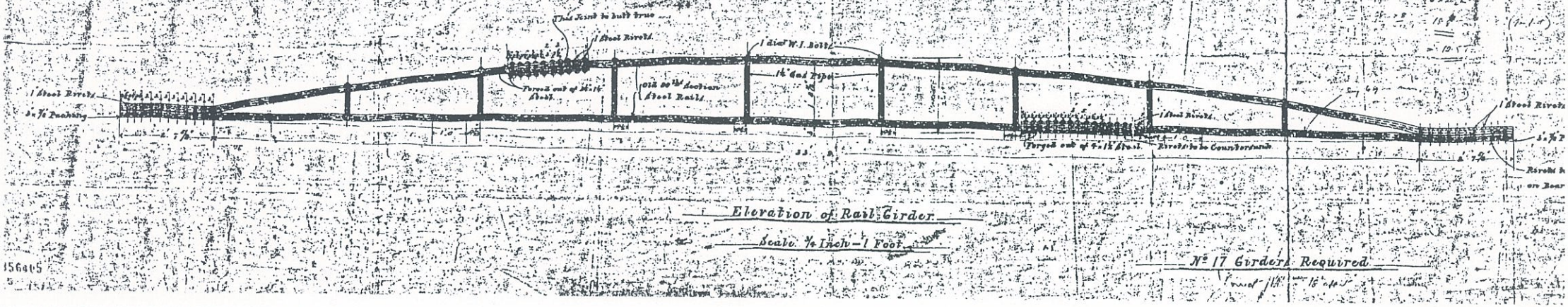
356414 B

5/BYS/4771

Sheet 5

G.E.R. Aldeby.

Public Road Overline Bridge at 112. 33



No 17 Girders Required.

15640S

NORFOLK COUNTY COUNCIL Planning & Transportation

DESIGN AND CONSTRUCTION DIVISION

Form DC 23/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 10
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

5.0 MATERIAL PROPERTIES.

- Concrete slab: in the absence of any information regarding the strength of the concrete, a characteristic strength of $15 N/mm^2$ has been assumed in accordance with BD 21/97 Cl 4.7 ✓

- Reinforcement: In the absence of any information regarding the strength of the steel rails, a characteristic strength of $230 N/mm^2$ has been assumed in accordance with BD 21/97 Cl 4.4. ✓

~~6.0 MAIN SPAN & TRUSS SPACINGS.~~

Clear span = 10.23 M.

length of bearing area = 0.25 x slab depth

effective span = distance between centroids of bearing pressure diagrams — BD 44/95 Cl 5.3.1.1 (c)

$\therefore$ effective span $= 10.23 + \left[\frac{2}{3} \times 0.25 \times 0.65\right]$

$= \underline{10.338 M}$

~~Truss spacing = 0.42 M~~

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 10A
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

6.0 MAIN SPAN & TRUSS SPACINGS.

Clear span = 10.23M. ✓ IAR

~~There are 2 different methods of assessing the~~ Effective span, appropriate to a steel bridge:

BD 56/96 Part 11 Cl 16.3 & Part 12 Cl 16 (A)

~~AND BD 21/97 Cl 6.5. (B).~~

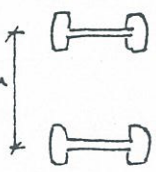
Calculate both and use most conservative value.

(A). Eff. span = $10.23 + \left(\frac{2}{3} \times 0.5858\right)$ = 10.621M.

∴ depth of truss =

520.7 + 65.09
= 585.8 mm.

(1'8½" - record dwg) see pg 9



record info see pg 7.

~~(B) Eff. span = $10.23 + \left(\frac{2}{3} \times \frac{1}{4} \times 0.5858\right)$ = 10.328M.~~

∴ Eff. span = 10.621M ~~(most conservative)~~.

Truss spacing = 0.42M. ✓

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 11
Sub Section:-			
Project File Ref:- BDH06H - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

Reviewer Comment: Record Dregs Suggest concrete top surface follows truss profile. DL varies (not critical at this stage) [redacted]

7.0 LOADING.

7.1 Dead load.

Concrete (reinforced) deck, 0.65m thick. — All unit weights from BD 21/97 T 4.1

Slab weight = $2400 \times 9.81 \times 0.65 \times 0.42 \times 10^{-3}$

= 6.43 kN/m / TRUSS.

7.2 Super-imposed dead load.

Trial excavation shows 130mm of surfacing and 50mm of fill. * — IAR.

Fill = $1800 \times 9.81 \times 0.08 \times 0.42 \times 10^{-3}$

= 0.593 kN/m / TRUSS.

Surfacing = $2300 \times 9.81 \times 0.1 \times 0.42 \times 10^{-3}$

= 0.948 kN/m / TRUSS

* However BD 21/97 T 3.1 Note # states that the top 100mm of road construction should be considered as surfacing.

7.3 Live load.

7.3.1 HA loading - UDL. — BD 21/97

carriageway width = 4.1m => 1 no. notional lane. — T 5.1

$w = 336\left(\frac{1}{10.62}\right)^{0.67} = \frac{\cancel{70.25}}{69}$ kN/m / 3.65m lane. — Cl 5.19

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 12
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

~~Carriageway is considered to be Hg - medium traffic, good surface~~ Consider Full HA UDL

∴ Reduction factor = ~~0.79~~ 1.0 ✓ OK AMS — Fig 5/6

Load adjustment for 2.5m lane:

$AF = \frac{3.65}{2.5} = 1.46$ — Cl 5.2.5

$\therefore w = \frac{69}{1.46} \times 0.79 = 47.3$ kN/m / 2.5m lane ✓

$w = \frac{47.3}{2.5} \times 0.42 = 7.94$ kN/m / TM55. ✓

HA loading - KEL.

W = 120kN across 3.65m lane — Cl 5.19

using the same reduction factors as above,

$W = \frac{120}{1.46} \times 0.79 \times \frac{0.42}{2.5} = 13.81$ kN ~~Bg~~ / TM55. ✓

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 13
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

7.3.2 Single wheel load.

BD 21/97

W = 100 kN (Full HA) ✓

T 5/3/2

The load is distributed over a contact area such that the resultant pressure = 1.1 N/mm²

cl 5.34

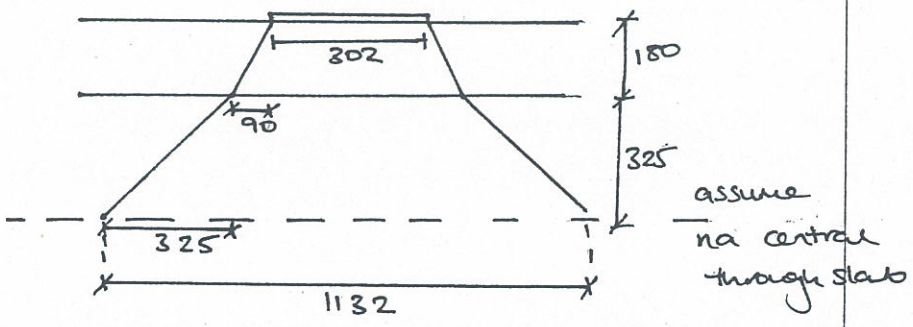
ie $\frac{W}{A} = 1.1$ $\therefore A = \frac{100 \times 10^3}{1.1} = 90909.1\ mm^2$

∴ area is equivalent to a 302 mm square. ✓

Dispersal through the slab is 1 : 2 through surfacing and 1 : 1 through concrete slab down to the neutral axis. Ratios are horiz : vert.

BD 37/88

cl 6.2.6



Hence the load will spread over at least $\left(\frac{1132}{420}\right) = 27$ ~~1000~~ trusses, which are spaced 420 mm apart. ✓

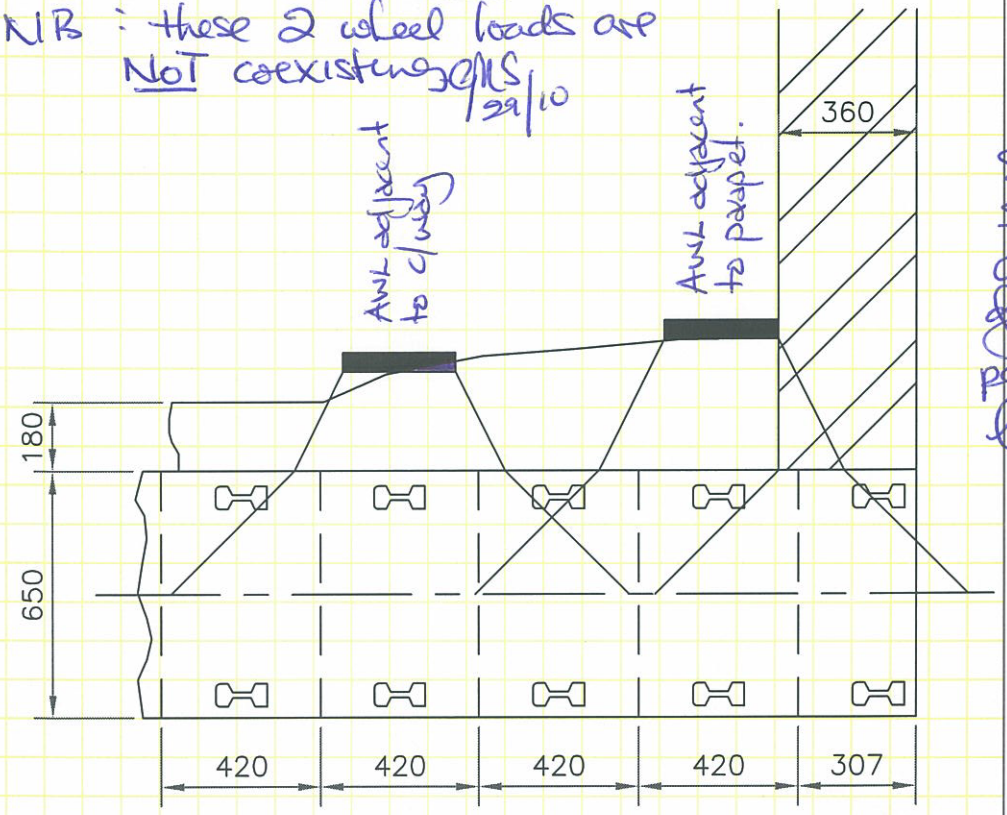
$\therefore$ W = 37 kN / TRUSS. $\left[100 \times \frac{420}{1132}\right]$

Project Title:- BRPB – Aldeby Bridge			SHEET NO. 14a
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 20/10/03
		Checked by:- [redacted]	Date:- 29/10/03

Ref:-

Accidental Wheel Load

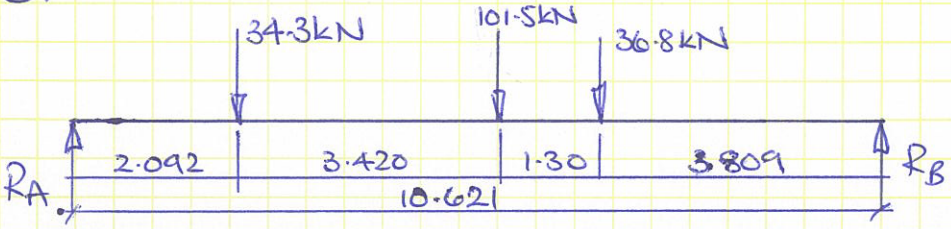
NB : these 2 wheel loads are NoT coexisting JC/MS 29/10



Sketch showing dispersal of wheel/parapet loads [redacted] 29/10

Consider effect of AWL on Internal Beam

For 10.621m effective span, most critical Annex D vehicle is 26 tonne vehicle ref. RC.



Loading from one train of wheels with impact factor applied to axle 2.

Excel spreadsheet used to determine critical vehicle/position – these calcs reflect the spreadsheet result [redacted] 29/10

Project Title:- BRPB – Aldeby Bridge			SHEET NO. 14b
Sub Section:-			
Project File Ref:- BDH064 – R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 20/10/03
		Checked by:-	Date:- 29/10/03

Ref:-

$$R_B = \left[(34.3 \times 2.092) + (101.5 \times 5.512) + (36.8 \times 6.812)\right] \div 10.621$$

$$= 83.03\,kN$$

$$R_A = 34.3 + 101.5 + 36.8 - 83.03 = 89.57\,kN$$

Maximum Moment

$$= 89.57 \times 5.512 - 34.3 \times 3.420$$

$$= \underline{376.4\,kNm}$$

From previous sketch assume AWL is carried by 3 No trusses ✓

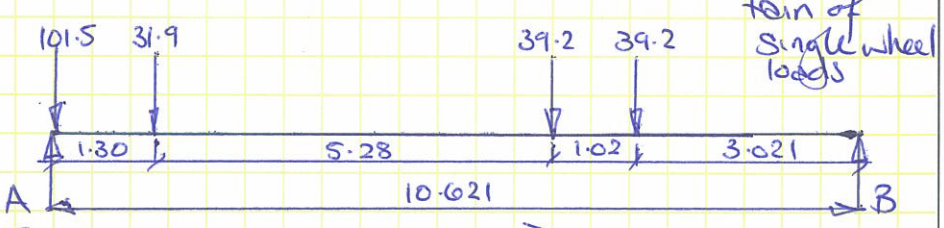
$\therefore$ nominal moment / truss $= \frac{376.4}{3} = \underline{125.5\,kNm}$

Applying $\gamma_{fL} = 1.5$ Moment $= \underline{188.2\,kNm}$ ✓

Note: γ_{f3} not included.

Maximum Shear

Maximum Shear comes from 40 tonne (3+2 vtic) vehicle with axles 2 to 5 on structure. 11.5 tonne axle with 1.8 factor sits adjacent to support.



$$R_A = \frac{\left[39.2(3.021 + 4.041) + 31.9(9.321)\right]}{10.621} + 101.5 = \underline{155.6\,kN}$$

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 16
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 21/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

LOAD SUMMARY. — TABLE 7.1

Load Type.	Nominal load (per Truss)	γ_{f1}	ULS load (per Truss)	
DL (conc)	6.43 kN/m	1.15	7.39 kN/m	BD 21/97
SDL - FU	0.593 kN/m	1.2	0.712 kN/m	γ_{f1} - T3.10
-surfacing	0.948 kN/m	1.75	1.66 kN/m	
LL - HA - udl	7.94 kN/m	1.5	11.91 kN/m	
-kel	13.81 kN	1.5	20.72 kN	
- single wheel	37 kN	1.5	55.5 kN	
- acc. wheel	W_1 34.3	1.5	51.5 kN	
See P. 14 for W values	W_2 101.5	1.5	152.3 kN	
	W_3 36.8	1.5	55.2 kN	
	W_4, W_5, W_6 29.4	1.5	44.1 kN	

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 17
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

8.0 LOAD EFFECTS ON INNER TRUSS

Note: BM_{Max} is taken at midspan.

SF_{Max} is ~~taken 3d from~~ at the support ~~(where approp.)~~

8.1 APPLIED LOADS

8.1.1 Dead Load

$BM = 7.39 \times \frac{10.621^2}{8} =$ 104.2 kNm / Truss ✓

$SF = 7.39 \times \frac{10.621}{2} =$ 39.24 kN / Truss. ✓

8.1.2 SIDL - fill

$BM = 0.712 \times \frac{10.621^2}{8} =$ 10.04 kNm / Truss ✓

$SF = 0.712 \times \frac{10.621}{2} =$ 3.78 kN / Truss. ✓

8.1.3 SIDL - surfacing.

$BM = 1.66 \times \frac{10.621^2}{8} =$ 23.41 kNm / Truss ✓

$SF = 1.66 \times \frac{10.621}{2} =$ 8.82 kN / Truss. ✓

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 18
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

8.1.4 Live Load - UDL

$BM = \frac{11.91}{8} \times 10.621^2 =$ 167.9 kNm /TMSS ✓

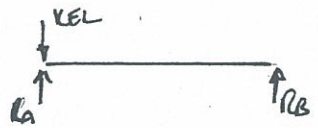
$SF = 11.91 \times \frac{10.621}{2} =$ 63.25 kN /TMSS ✓

8.1.5 Live Load - KEL

$BM = 20.72 \times \frac{10.621}{4} =$ 55.02 kNm /TMSS ✓

$SF = \frac{(10.338 - 1.915)}{10.338} \times$ 20.72

$= 15.28$ kN /TMSS. ✓



$SF = R_A = KEL.$

8.1.6 Live Load - single wheel

$BM = 55.5 \times \frac{10.621}{4} =$ 147.37 kNm /TMSS ✓

$SF = \frac{(10.338 - 1.915)}{10.338} \times$ 55.5 kN /TMSS ✓

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CALCULATION SHEET

Project Title:- BRPB - Aldeby Bridge			**SHEET NO.**
Sub Section:-			
Project File Ref:- BDH0064 - R42	**Drawing Ref:-**	**Prepared by:-** [redacted]	**Date:-** 21/10/03
		Checked by:-	**Date:-**

Ref:-

Pages 19 - 20 Not used

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CALCULATION SHEET

* PAGES 22-34 NOT USED * . JW.

Project Title:- ALDEBY BRIDGE			SHEET NO. 21
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

SUMMARY OF MAXIMUM BMs & SFs. — TABLE 8.1 — INNER BEAMS

NOTE:
ALL BM @ midspan.
ALL SF @ support.

LOAD TYPE	ULS Load (per truss)	BM MAX (kNM/truss)	SF MAX (kN/TRUSS)
DL	7.39kN/M	104.2	39.24
SIDL-fill	0.712 kN/M	10.04	3.78
-surfacing	1.66 kN/M	23.41	8.82
LL-HA-udl	11.91 kN/M	167.9	63.25
-kel	20.72 kN	55.02	20.72
-single	55.5 kN	147.37	55.5
-acc.wheel	~~W1, W2, W3, W4, W5.~~	~~208.5~~ 188.2 ✓	~~95.5~~ 77.8 ✓
Σ DL+SIDL		137.65	51.84
Σ udl+kel		222.92	83.97
Σ DL+SIDL+udl+kel		360.57	135.81 * — WORST CASE
Σ DL+SIDL+single		285.02	107.34
Σ DL+SIDL+acc.		325.9 ✓ ~~208.5~~	129.6 ✓ ~~95.5~~

MLS 29/10

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 21A
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 11/01
		Checked by:-	Date:- 11/02

Ref:-

Note : Transverse load effects due to SWLS shall not be considered since the transverse reinforcement is severely corroded. Therefore, all loads shall be taken by beam strips.

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Project Title:- BRPB - Aldeby Bridge			**SHEET NO.**
Sub Section:-			
Project File Ref:- BDH064-R42	**Drawing Ref:-**	**Prepared by:-** [redacted]	**Date:-** 21/10/03
		Checked by:-	**Date:-**

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Pages 22 to 34 Not used

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CALCULATION SHEET

* PAGES 23-34 NOT USED * 22 JCH

Project Title:- ALDEBY BRIDGE			SHEET NO. 35 JCH
Sub Section:-			
Project File Ref:- BD1064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 21/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

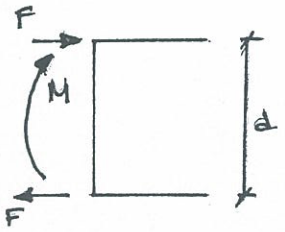
8.2

Consider a steel truss.

Determine moment / axial force applied.

A quick moment capacity check shall be carried out, modelling the forces in the top and bottom rail using the following simplified approach:

Force (tension or comp.) = $\frac{M}{d}$

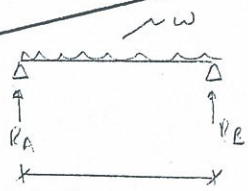


~~Maximum moment applied at midspan = 374.7 kNm / Truss~~

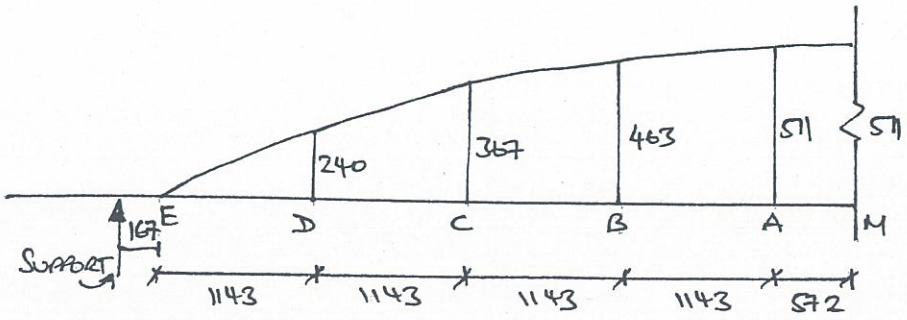
See Table 8.1

$M = \frac{wL^2}{8}$ $\therefore w = \frac{374.7 \times 8}{10.358^2}$

$\therefore w = 28.05$ kN/M / Truss



~~$\therefore R_A = R_B = 145$ kN / Truss.~~



See p 9

Strut heights are scaled from the record drawings.

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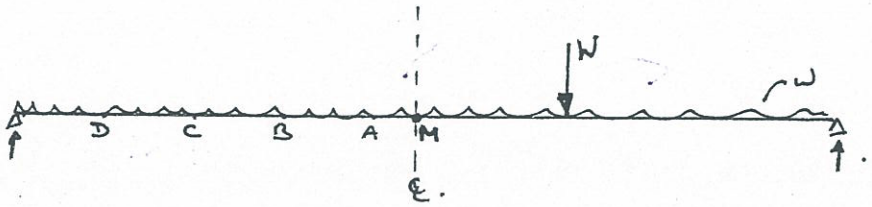
CALCULATION SHEET

Project Title:- ALDEBY BRIDGE				SHEET NO. 36
Sub Section:-				
Project File Ref:- BD1064 R42	Drawing Ref:-	Prepared by:- [redacted]		Date:- 09/01
		Checked by:- [redacted]		Date:- 11/02

Ref:-



Worst case position for w - @ point being considered.

$w_{DL} = 7.39 + 0.712 + 1.66 = 9.76$ kN/m /Truss. — ref. pg 21

$w_{LL} = 11.91$ kN/m /Truss.

$W_{LL} = 20.72$ kN /Truss.

(D). $M_{D_{DL}} = \left[\left(9.76 \times \frac{10.621}{2}\right)(1.143+0.167)\right] - \left(9.76 \times \frac{1.31^2}{2}\right) = 59.52$ kNm /Truss (51.83 = 9.76 × 10.621/2; 1.31 = 1.143 + 0.167)

$F_{D_{DL}} = 248$ kN /Truss

$M_{D_{LL}} = \left[\left(11.91 \times \frac{10.621}{2}\right) + \frac{20.72(10.621+1.31)}{10.621}\right]1.31 - 11.91 \times \frac{1.31^2}{2} = 96.43$ kNm /Truss. (63.25 = 11.91 × 10.621/2)

$F_{D_{LL}} = 401.8$ kN /Truss

(C) $M_{C_{DL}} = \left[51.83 \times (1.31+1.143)\right] - \left(9.76 \times \frac{2.453^2}{2}\right) = 97.78$ kNm /Truss

$F_{C_{DL}} = 266.4$ kN /Truss

$M_{C_{LL}} = \left[63.25 + \frac{20.72(10.621-2.453)}{10.621}\right]2.453 - 11.91 \times \frac{2.453^2}{2} = 158.4$ kNm /Truss

$F_{C_{LL}} = 431.6$ kN /Truss

(B) $M_{B_{DL}} = \left[51.83 \times (2.453+1.143)\right] - \left(9.76 \times \frac{3.596^2}{2}\right) = 123.28$ kNm /Truss

$F_{B_{DL}} = 266.3$ kN /Truss

$M_{C_{LL}} = \left[63.25 + \frac{20.72(10.621-3.596)}{10.621}\right]3.596 - 11.91 \times \frac{3.596^2}{2} = 199.72$ kNm /Truss

$F_{B_{LL}} = 431.4$ kN /Truss

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 37
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

(A) $M_{A_{DL}} = \left[51.83 \times (3.596 + 1.143)\right] - \left(9.76 \times \frac{4.739^2}{2}\right) = 136.03$ kNm/Truss

$F_{A_{DL}} = 266.2$kN/Truss

$M_{A_{LL}} = \left[63.25 + \frac{20.72(10.621 - 4.739)}{10.621}\right] 4.739 - 11.91 \times \frac{4.739^2}{2} = 220.38$ kNm/Truss

$F_{A_{LL}} = 431.27$kN/Truss.

(M) $M_{M_{DL}} = \left[\frac{9.76}{8} \times 10.621^2\right] = 137.62$kNm/Truss.

$F_{M_{DL}} = 269.32$kN/Truss

$M_{M_{LL}} = \left(\frac{11.91 \times 10.621^2}{8}\right) + \left(\frac{20.72 \times 10.621}{4}\right) = 222.96$ kNm/Truss

$F_{M_{LL}} = 436.34$kN/Truss.

∴ Worst load effects at (M), Midspan.

Check AWL:

$F_{M_{AWL}} = \frac{188.2}{0.571} = \frac{329.6}{408.02}$kN/Truss < $F_{M_{LL}}$ ok.

AWL not Critical [redacted] 09/10/03

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 38
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

9.0 SECTION CAPACITY OF TRUSS.

9.1 Bending.

X-sectional area of rail = 5034 mm² — see sheet #7 for rail properties.

Consider 25% reduction of A_s to account for corrosion of rail — IAR 5.4.2

$A_s = 0.75 \times 5034 = 3776\ mm^2$

Reduce to account for rivet / bolt holes. - Reduce by 1 No. 1" dia. hole through web. — record dwg. See Page 9.

$\therefore A_s = 3776 - (25.4 \times 17) = \underline{3344\ mm^2}$ (web thickness)

$P_D = \frac{A_e \sigma_c}{\gamma_m \gamma_{f3}}$ — BD56/96 Cl 10.6.1

$A_e = 3344\ mm^2$.

σ_c = compressive stress. Let $l_e = 0$ as concrete will act as lateral restraint

$\therefore \sigma_c = \sigma_y$.

γ_m, γ_{f3} from Cl 4.3.3

$\therefore P_D = \frac{3344 \times 230}{1.05 \times 1.1} = \underline{666\ kN\ /\ Truss.}$

$\gamma_m \quad \gamma_{f3}$

BD21/97 Cl 5.7.8 & Fig 5/2-5/7

$\therefore C = \frac{666 - 269}{436} = \underline{0.91}$ — dr 40TAll

INNER TRUSS BENDING 40T All

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 39
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

9.2 Shear.

Check shear capacity of truss at supports.

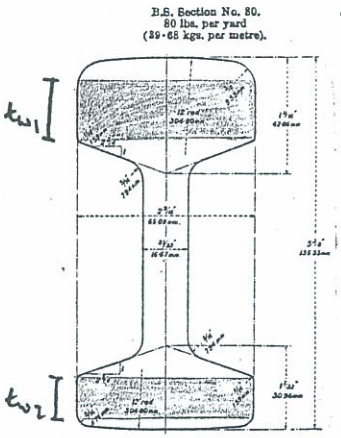
At supports, 2 bullnose steel rails are riveted together, on top of each other.

$$V_s = \left[\frac{t_w (d_w - h_h)}{\gamma_m \gamma_{f3}}\right] \tau$$

BD 56/96 Cl 9.9.2.2

Consider shaded area of rail as taking applied shear; (as rail is placed on its side)

Complete dimensions for the 80 RAIL are not available. However, comparison with similar rails suggests that approximately 10mm of the head and foot are not suitable for carrying shear.



Kempe's "Engineer's Yearbook" 1935.

$\therefore t_{w1} = 20mm$

$t_{w2} = 12mm$

$t_w = t_{w1} + t_{w2} = 32mm.$

d_w = overall depth of a rolled section
= width of head of rail
= 65.09mm.

h_h = height of any holes in web plate
= 0mm.

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 40
Sub Section:-			
Project File Ref:- BD1064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

τ = shear strength of web panel

= relates to τ_y; ϕ; M_{Ew}; λ through Figs 11-17.

It can be seen in Figs 11-17 that if $\lambda < 50$ then $\tau \simeq \tau_y$ regardless of the values of ϕ and M_{Ew}.

$$\lambda = \frac{d_w}{t_w}\sqrt{\frac{\sigma_{yw}}{355}} = \frac{65.09}{32.}\sqrt{\frac{230}{355}} = .164 < 50$$

$\therefore \tau = \tau_y$. $\quad \tau_y = \frac{\sigma_{yw}}{\sqrt{3}} = \frac{230}{\sqrt{3}} = 132.8\ N/mm^2$

$\therefore \tau = 132.8\ N/mm^2$

$$\therefore V_D = \left[\frac{32.(65.09 - 0)}{1.1 \times 1.05}\right] 132.8 \times 10^{-3}$$

$V_D = 239.5$ kN /Truss.

γ_M, γ_{f3} values - T2.

$$\therefore C = \frac{239.5 - 51.84}{83.97} = 2.23 \quad \therefore \text{ok 4OT ALL}.$$

Ref: T 8.1

INNER TRUSS SHEAR 4OT ALL

Check 4OTALL : $SF_{tot} = 51.84 + 95.5$

$= 147.34 < 239.5$

ok 4OT ALL

Project Title:- BRPB – Aldeby			SHEET NO. 41
Sub Section:-			
Project File Ref:- BDH0621 – R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 20/10/03
		Checked by:- [redacted]	Date:- 29/10/03

Ref:-

Loading to outer truss.

Consider AWL adjacent to parapet as shown on page 14a.

Assume load from train of wheels is carried by 3 No trusses.

Also, assume parapet dead load is carried by the two outermost trusses. [redacted]

Width of beam carried by outer truss = 307mm

$\therefore$ DL = $2400 \times 9.81 \times 0.65 \times 0.307 \times 10^{-3}$

= **4.70 kN/m** of truss.

Parapet load = $\frac{2400 \times 9.81 \times 1.4 \times 0.36 \times 10^{-3}}{2}$ (1.4 = height; 2 = carried by 2 trusses.) [redacted]

= **5.93 kN/m**

Total DL+SDL load = $(4.70 \times 1.15_{\gamma_{fL}}) + (5.93 \times 1.20_{\gamma_{fL}})$

= **12.52 kN/m**

Max BM due to DL + SDL = $\frac{12.52 \times 10.621^2}{8}$

= **176.5 kNm**

Maximum Shear due to DL + SDL = $\frac{12.52 \times 10.621}{2}$

= **66.5 kN**

Project Title:- BRPB - Aldeby			SHEET NO. 41a
Sub Section:-			
Project File Ref:- BDH064-R47	Drawing Ref:-	Prepared by:- [redacted]	Date:- 20/10/03
		Checked by:- [redacted]	Date:- 29/10/03

Ref:-

Maximum BM + SF from AWL is as previous

i.e. BM = 188.2 kNm
SF = 77.8 kN
} (factored by γ_{f_2})

pg 14b+c

∴ Total Bending Moment
= 176.5 + 188.2 = 364.7 kN

Total Shear Force
= 66.5 + 77.8 = 144.3 kN

Axial force in truss member at midspan
$= \frac{364.7}{0.571} = 638$ kN

limiting axial force = 6666 kN > 638 kN page 38
∴ OK for 40 tonnes AWL.

Shear capacity = 239.5 kN > 144.3 kN page 40
∴ OK in shear for 40T AWL.

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CALCULATION SHEET

Project Title:- BRPB - Aldeby Bridge			**SHEET NO.**
Sub Section:-			
Project File Ref:- BDH064-R42	**Drawing Ref:-**	**Prepared by:-** [redacted]	**Date:-** 21/10/03
		Checked by:-	**Date:-**

Ref:-

Pages 42 to 48 Not used

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 44
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:-

Ref:-

11.0 CONNECTIONS

The two connections available for checking (ie that the author has information about) is — ref. sheet 9

i) support connection

ii) fishplates at ¼ points

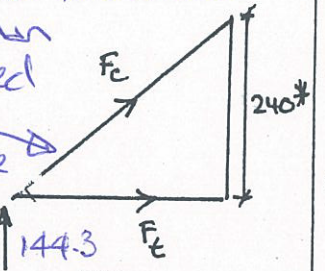
i) Support connection.

Maximum load at support is shear = 144.3 kN / TRUSS — See Pg 41a

~~$\theta = \tan^{-1} \frac{240}{1143} = 11.9°$~~

Top chord is curved and at the support the chord is steeper than in the assumed triangle. Measured from the record drawing $\theta = 12.2°$

~~Note: actual top chord is curved and hence this value of θ is inaccurate.~~



* scaled from record drawing.

See p9.

Resolving vertically:

(DL) $F_c \sin\theta = 144.3$ kN / TRUSS [redacted] 20/10/03

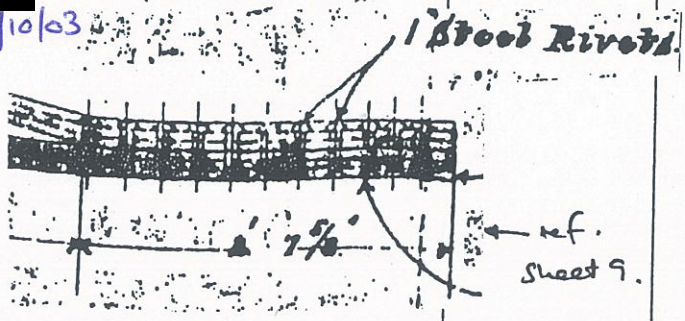
$\therefore F_c = 682.8$ kN / TRUSS

Resolving horizontally:

$F_t = F_c \cos\theta$

$\therefore F_t = 667.4$ kN / TRUSS

[redacted] 20/10/03



~~Similarly, (LL) $F_t = 83.97 \times \frac{\cos\theta}{\sin\theta} = 398.5$ kN / TRUSS.~~

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CALCULATION SHEET

Project Title:- ALDERN BRIDGE			SHEET NO. 50
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/04/02

Ref:-

Determine capacity of connection:

$$\tau = \frac{V}{n A_{eq}} \not> \frac{\sigma_q}{\gamma_m \gamma_{fs} \sqrt{2}}$$

BD 56/96 Cl 14.5.3.4

let $\frac{V}{n A_{eq}} = \frac{\sigma_q}{\gamma_m \gamma_{fs} \sqrt{2}}$

$\therefore V = \frac{\sigma_q \, n \, A_{eq}}{\gamma_m \gamma_{fs} \sqrt{2}}$ where $\sigma_q = 0.85 \sigma_y$

$= 196 \text{ N/mm}^2$

$A_{eq} = \pi \left(\frac{25.4}{2}\right)^2 = 506.7 \text{ mm}^2$

n = number of fasteners

γ_m, γ_{fs} - see BD 56/96 Cl 4.3

$\therefore V = \frac{196 \times 11 \times 506.7}{1.05 \times 1.1 \times \sqrt{2}} = 668.81 \text{ kN / THISS} > FT$

$\therefore$ OR FN 40T AWL.

SUPPORT CONNECTION 40T AWL

~~$R_A^* = 668.81$ kN / THISS~~

$S_A^* = 637.6$ kN / THISS

$\therefore \frac{R_A^*}{S_A^*} = \frac{668.81}{637.6} = 1.05 > 1.0$ ~~$\therefore$ adequate for 40T AWL.~~

$\therefore \frac{R_A^*}{S_A^*} = \frac{668.81}{867.3} = 0.771 < 1.0 \therefore$ FAIL 40T AWL.

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 57
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

(ii) fishplates at 1/4 points.

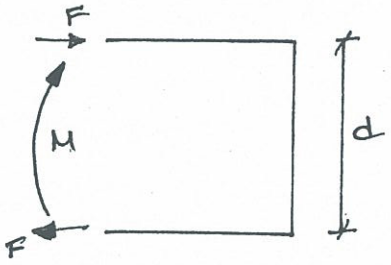
Axial forces ~~[illegible]~~ will be imposed on these connections when bending is applied to the truss.

There are 2no. fishplates - one to top chord of a quarter point; another to bottom chord of other quarter point.

See p.9.

Since at quarter points, top chord is close to horizontal (~5° off) it shall be assumed to be so, and hence the connections shall be subjected to the same load using the simple model depicted below:

$F = \frac{M}{d}$.



~~Maximum bending moment applied to truss = 374.73 kNm / TRUSS~~ ~~See Table 6.1~~

~~Using the methodology used previously (p 33)~~

~~$M_{1/4pt} = 28.1\left(0.275 + 2.5\frac{(1.143)^2}{2}\right) - 145\left(0.275 + 2.5(1.143)\right)$~~

~~$= -316.35$ kNm / TRUSS~~

~~$\therefore F_{1/4pt} = \frac{316.35}{0.415} = 762.3$ kN / TRUSS.~~

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 57A.
Sub Section:-			
Project File Ref:- B31064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

Fishplate connection located (1143×2·25)+167 = 2·739M from support. — see pg 52

Determine axial force applied @ 2·739m from support.

Using methodology on pages 35-36

$$BM_{DL@2.739} = \left(\frac{9.76\times10.621}{2}\times2.739\right) - \left(\frac{9.76\times2.739^2}{2}\right)$$

$$= 105.4\text{kNm} \quad \Rightarrow F = \frac{105.4}{0.391} = \frac{270}{269}\text{ kN/Tnss}$$

$$BM_{LL@2.739} = \left[\left(\frac{11.91\times10.621}{2}\right) + 20.72\left(\frac{10.621-2.739}{10.621}\right)\right]2.739 - \left(11.91\times\frac{2.739^2}{2}\right)$$

$$= 170.87\text{kNm} \quad \Rightarrow F = \frac{170.7}{0.391} = \frac{436.6}{436}\text{ kN/Tnss}.$$

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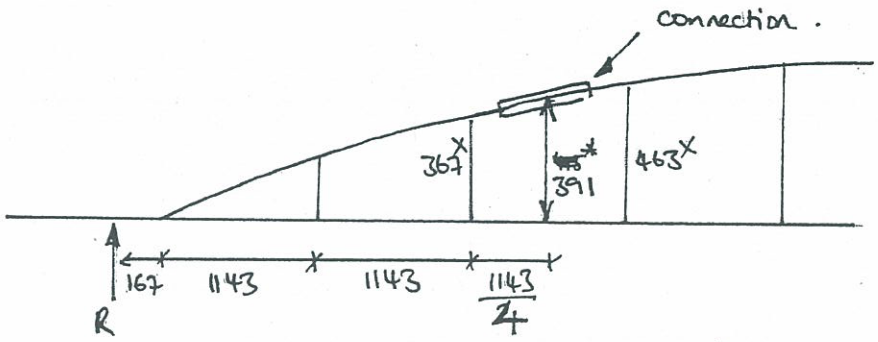
CALCULATION SHEET

* PAGE 54 NOT USED. JLH

Project Title:- ALDEBY BRIDGE			SHEET NO. 52
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 4/02

Ref:-

See p 9.



X scaled from record drawing

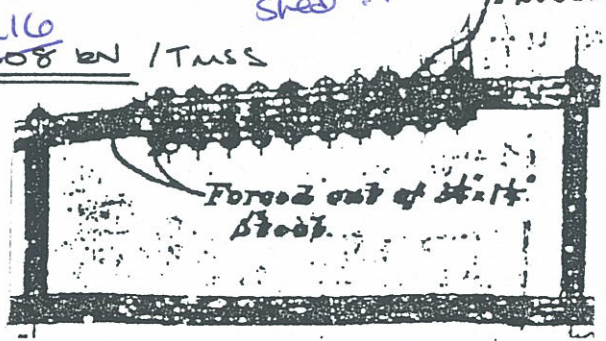
* interpolated.

Determine capacity of connection:

Use methodology ~~as~~ as in p 50

rivets in double shear ∴ n = 20.

$$V = \frac{196 \times 20 \times 506.7}{1.05 \times 1.1 \times \sqrt{2}} = \frac{1216}{608} \text{ kN / TMSS}$$



~~$R_A^* = 608$ kN / TMSS~~

$S_A^* = 762$ kN / TMSS

$\frac{R_A^*}{S_A^*} = \frac{608}{762} = 0.8$ ~~< 1.0 ∴ not adequate for 40 T AWL.~~

↑page 9.

~~By inspection, capacity is much less than 40 T AWL.~~

~~Check adequacy for HA & LL only~~

$C = \frac{1216}{608} - \frac{270}{436.6} = \frac{2.17}{0.744}$ ⇒ 17T (Hp/Mp)
25T Lp
38T (Hg/Mg)
40T Lg

BD 21/97 cl 5.28 & Figs 5/2 - 5/7

FISHPLATE CONNECTION 17T AIL (MP)

OK for 40 Tonne [redacted] 21/10/03

Revision 1

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 53
Sub Section:-			
Project File Ref:- BD21/84-R242	Drawing Ref:-	Prepared by:- [redacted]	Date:- 11/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

Therefore, rating of fishplate connection is FAIL.

However, the assessment does not account for the concrete slab surrounding the bullnose rails.

It is considered that much of the compressive force in the top chord of the truss will be carried by the concrete.

* It is therefore judged that the fishplate connection passes 40 TAL. *

ie ~~V_{cap}~~ $\Rightarrow$ 706.6 kN (MINIMUM) (= DL + 40 TAL).

axial force ~~load~~ effects due to bending moments.

$C = 0.9$ to give 40 TAL (Mp)

$\therefore \frac{V_{cap} - 270}{436.6} = 0.9 \quad \therefore V_{cap} = 663\ kN$

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CALCULATION SHEET

Project Title:- BRPB - Aldeby Bridge			**SHEET NO.** 54
Sub Section:-			
Project File Ref:- BDH064 - R42	**Drawing Ref:-**	**Prepared by:-** MDN	**Date:-** 21/10/03
		Checked by:-	**Date:-**

Ref:-

Page Not Used

CALCULATION SHEET

* PAGES 53 & 54 NOT USED *
JLH

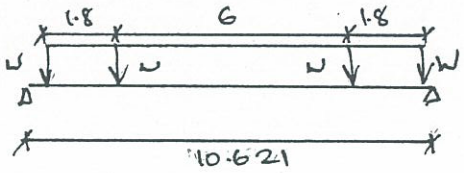
Project Title:- ALDEBY BRIDGE			SHEET NO. 55
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 31/03/00
		Checked by:- [redacted]	Date:- 11/02

Ref:-

BD 37/88 cl 6.3.

12.0 HB Rating.

The span of Aldeby will accomodate 4 axles.

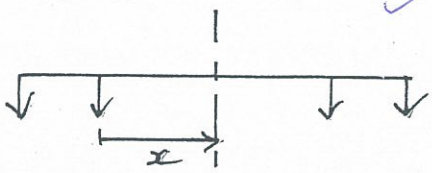


12.1 Bending HB Rating.

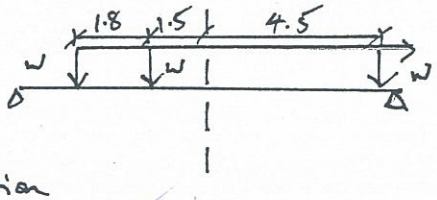
+ For a worst bending moment occurs when the vehicle is positioned such that the distance between its centroid and its nearest wheel is bisected by the centre line of the beam.

centroid of the vehicle, x

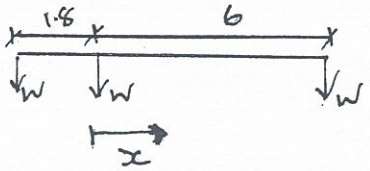
By inspection x = 3M.



Positioning the vehicle such that the worst bending moment occurs removes an axle from the span.



This will change the position of x:



$$Wx + (1.8+x)W = W(6-x)$$
$$1.8W + 2Wx = 6W - 6Wx$$
$$4.2W = 3Wx$$
$$x = 1.4M.$$

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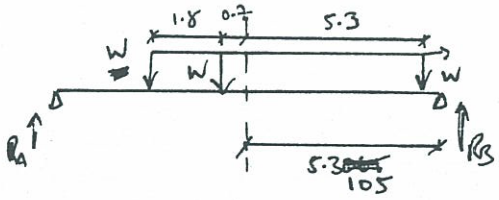
CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 56
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

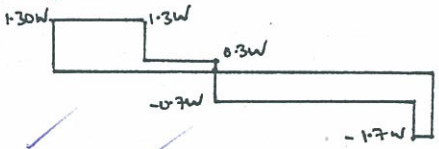
Ref:-

Repositioning →.



R_B $R_A = \frac{0.0105W + 6.0105W + 7.8105W}{10.621}$ ✓

$= 1.302W$ kN/~~Truss~~ ✓



$\therefore BM_{max}$ (@ SF=0) $= 1.302W \times 4.6105 - 1.8W$ ✓

$= 4.203W$. kNm /~~Truss~~ ✓

ULS BM $= 4.203 \times 1.3 = 5.464W$. kNm /~~Truss~~ ✓

Consider distribution as page 13

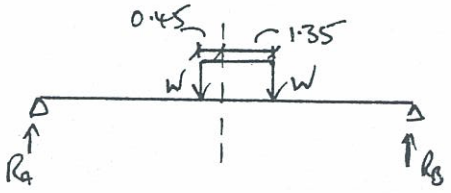
$BM_{HB} = 5.464\overset{W}{} \times \frac{420}{1132} = \underline{2.027W \text{ kNm /Truss}}$ ✓

$BM_{DL@4.6105M} = \left(9.76 \times \frac{10.621}{2}\right) 4.6105 - \left(9.76 \times \frac{4.6105^2}{2}\right) = \underline{135.23 \text{ kNm /Truss}}$ ✓

($W_{DL\,TOT}$ pg 21)

$\therefore BM_{max} = \underline{(135.23 + 2.027W) \text{ kNm /Truss}}$. — (1) ✓

ALSO Consider



✓

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 57
Sub Section:-			
Project File Ref:- BDH064 - R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

$$\frac{(5.3105-1.35)W+(5.3105+0.45)W}{10.621} = R_A = 0.915W.$$

$\therefore BM_{max}$ (@ SF=0) $= 0.915W \times (5.3105-0.45)$

$= 4.45W$ kNm / ~~Tmss~~

ULS BM $= 4.45W \times 1.3 = 5.78W$ kNm / ~~Tmss~~.

Consider distribution as pg 13

BM $= 5.78W \times 0.371 = \underline{2.15W}$ kNm / Tmss

BM_{DL} @ 4.8605m from support $= \left(9.76 \times \frac{10.621}{2}\right) 4.8605 - 9.76 \times \frac{4.8605^2}{2}$

$= \underline{136.63}$ kNm / Tmss.

$\therefore \underline{BM_{max} = 136.63 + 2.15W}$. —— (2)

Determine axial force due to these BMs.

(1) ~~d~~ d @ 4.6105 = between A & B - ref. page 35

$\therefore \left[\frac{511-463}{1143} \times 1015\right] + 463 = d = 505.6$mm.

$\Rightarrow F = \underline{267.5 + 4.01W}$ kN / Tmss. $\left(\frac{M}{d} = F\right)$ pg 35

(2) Similarly, $d = 0.511$m $\Rightarrow F = \underline{267.4 + 4.207W}$ kN / Tmss.

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CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 58
Sub Section:-			
Project File Ref:- BDH004-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/01

Ref:-

P_{app} = 666 kN / TMSS. (pg 38)

(1) let $666 = 267.5 + 4.01W$.

W_{Max} = 99.4 kN. 1 HB Unit = 2.5 kN

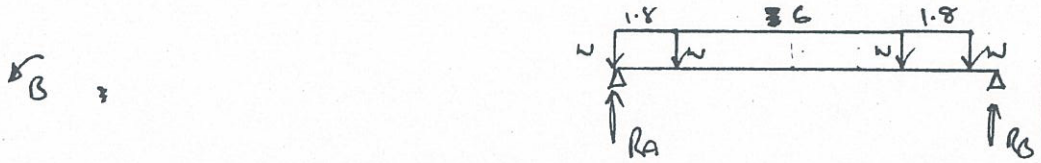
∴ No. of HB units = $\frac{99.4}{2.5}$ = 39.75 Units. ✓ 39 Units.

(2) let $666 = 267.4 + 4.207W$

W_{max} = 94.75 kN

⇒ No of HB Units = 37.89 Units. ✓ 37 Units.

12.2 Shear HB Rating.



$$R_A = \frac{(10.621-1.8-6-1.8)W+(10.621-1.8-6)W+(10.621-1.8)W+10.621W}{10.621}$$

R_A = 2.19W kN / ~~TMSS~~. ✓

Consider distribution as page 13

$R_A = 2.19 \times 1.3 \times 0.371 = 1.056W$ kN / TMSS. ✓

(1.3 ↑ ULS)

SF_{DL} = 57.83 kN / TMSS. - pg 21 ✓

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 59
Sub Section:-			
Project File Ref:- BDH06H-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

$\therefore SF_{HB} = (51.83 + 1.058W)$ kN / Truss.

$V_{cap} = 239.5$ kN/T — ref page 40

$\therefore$ let $239.5 = 51.83 + 1.058W$.

$W_{max} = 178.2$ kN 2.5 kN = 1 HB Unit

$\therefore$ No. of HB Units $= \frac{178.2}{2.5} = 71.3$.

71 UNITS

12.3 Connections.

Consider capacity of connections to carry HB loading.

i) Support connection. - ref. page for methodology. 49.

$SF_{HB} = (51.83 + 1.058W)$ kN / Truss as above.

$\therefore F_{t_{HB}} = (51.83 + 1.058W)\frac{\cos 12.2^\circ}{\sin 12.2^\circ} = (246 + 5.01W)$ kN / Truss.

$V_{cap} = 668.81$ kN / Truss. - ref. page 50

$\therefore 668.81 = 246 + 5.01W \Rightarrow W_{max} = 84.4$ kN

$\Rightarrow 33.76 =$ no. of HB units.

35 UNITS - CRITICAL

NORFOLK COUNTY COUNCIL Planning & Transportation

PLANNING AND TRANSPORTATION

Form DOPM 41/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 60
Sub Section:-			
Project File Ref:- BDH004-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 09/01
		Checked by:-	Date:- 11/02

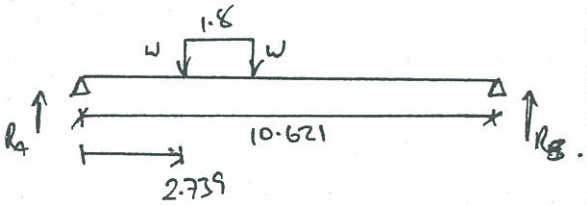
Ref:-

ii) fishplates @ 1/4 points. (pg 51)

1/4 span = (1143 × 2.25) + 167 - ref pg 52

Determine BM_{HB} @ 2.739m from support.

Position for max HB:



R_B ~~[illegible]~~ 2.

$$\frac{6.082W + 7.882W}{10.621} = R_A = 1.315W \text{ kN} / \text{Truss}$$

$\therefore M_{2.739} = 1.315W \times 2.739 = 3.601W$ ~~kNm~~ / Truss

ULS & distributed $\therefore M = 3.601W \times 1.3 \times 0.371 = 1.737W$ kNm / Truss

$$BM_{DL} = \left(\frac{9.76 \times 10.621}{2}\right) 2.739 - 9.76 \times \frac{2.739^2}{2} = 105.4 \text{ kNm / Truss}$$

$\therefore BM = (105.4 + 1.737W)$ kNm / Truss.

V_{cap} = ~~608~~ 1216 kN / Truss (double shear of rivets) ref. pg. 52

$$F_{HB\ @\ 2.739} = \frac{105.4 + 1.737W}{0.391} = 269.6 + 4.442W.$$

Let: ~~608~~ 1216 = ~~296.6~~ 269 + 4.442W W_{max} = ~~76.2~~ 213 kN / Truss

⇒ Max No. of HB units = ~~30.5~~ 85.

HB RATING 30 HB UNITS FISHPLATE CONNECTION CRITICAL

JLH 11/01

✱ However cf pg 53 ✱ V_{cap} = ~~[illegible]~~ 665 kN

35 ⇒ ~~40~~ HB units. ✱

JLH 11/01

NORFOLK COUNTY COUNCIL Planning & Transportation

DESIGN AND CONSTRUCTION DIVISION

Form DC 23/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 61
Sub Section:-			
Project File Ref:- BDM064 – R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 04/01
		Checked by:- [redacted]	Date:- 11/02

Ref:-

12.0 PARAPET ASSESSMENT.

Brickwork Type : Blue Engineering Brick

Parapet Thickness : 360 mm.

Parapet Length : approx. 23.88 m >10M.

PARAPETS MEET CONDITIONS FOR USE OF DESIGN GUIDE

Parapet Height : 1.34M (av).

Width between parapets : 1.2M verge / 4.1M c/way / 1.0M verge = 6.3M.

Speed Limit : National Speed Limit = 60 mph.

ref. County Surveyor's Society Report Guidance Note for the Assessment and ~~Report~~ Design of Unreinforced Masonry Vehicle Parapets.

Defects to Parapets.

1. Longitudinal cracking (max. 3mm wide) to top 300mm of both parapets.
2. Bricks missing beneath coping units to area of N parapet.
3. Cracked coping stones to both parapets at pilasters and newels.
4. S parapet - vertical crack (max 1.5 mm wide) 1.3M east of ℄.
5. N parapet - vertical crack (max 3 mm wide) at west pilaster.

Allowable Impact Speed (Capacity of Parapet)

see Fig 10.4 page 63

Remove 300mm from parapet ht to allow for missing bricks and cracking.

∴ Hight = 1.0M (SAY) → 85 kph. (52.8 mph)

NORFOLK COUNTY COUNCIL Planning & Transportation

DESIGN AND CONSTRUCTION DIVISION

Form DC 23/A

CALCULATION SHEET

Project Title:- ALDEBY BRIDGE			SHEET NO. 62
Sub Section:-			
Project File Ref:- BDH064-R42	Drawing Ref:-	Prepared by:- [redacted]	Date:- 04/01
		Checked by:-	Date:- 11/02

Ref:-

Required Impact Speed (Predicted Speed of Vehicle) — fig 5.3 see page 64

Divergent width a) Offside - worst case - 0.5m from parapet edge
$= 1.2 + 4.1 + 1.0 - 0.5 - {}^{1.8}/_{2} = 4.9\text{m}$ → 86kph

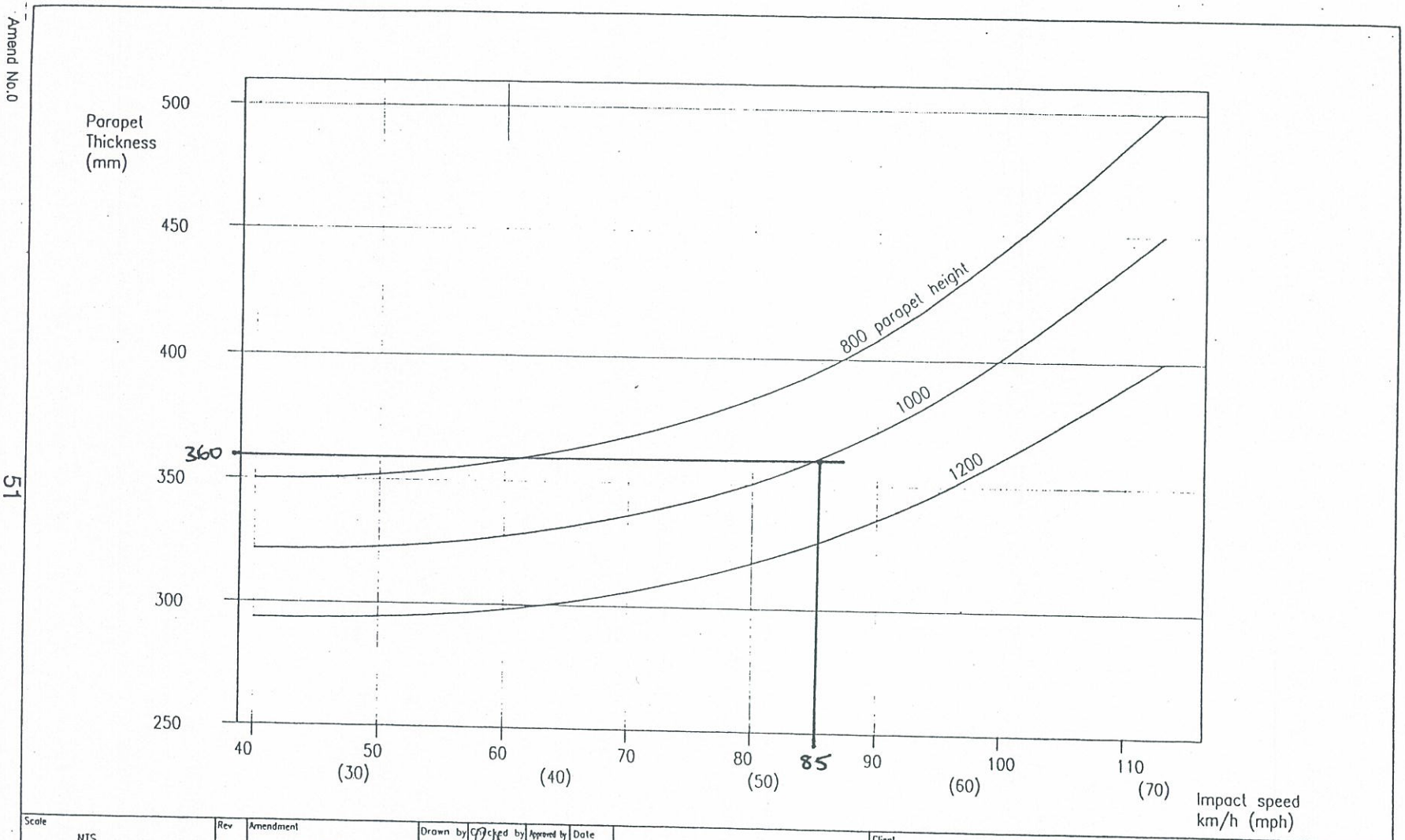
b) Nearside : 0.5m away from c/way edge.
$= 1.2 + 4.1 - 0.5 - {}^{1.8}/_{2} = 3.9\text{m}$ → 77kph.

SUMMARY

1. Parapets assessed in accordance with Design Guide.
2. Defects which may affect containment capacity have been accounted for by conservatively reducing the parapet height.
3. No $ other defects may affect capacity.
4. Allowable Impact Speed = 85kph ≈
   Required Impact Speed = 86 kph

∴ It is judged that parapets DO have adequate containment capacity.

PARAPETS HAVE ADEQUATE CAPACITY.



Scale NTS	Rev A	Amendment FOR GENERAL ISSUE	Drawn by SD	Checked by RA	Approved by [redacted]	Date 27.1.95	Client LANCASHIRE COUNTY COUNCIL		
ACAD Ref Fig 104							Scheme PARAPET RESEARCH PROJECT		
Drawn by D.W. Date 8.94							Title CONTAINMENT CAPACITY FOR ASHLAR, BRICK (ENG CLASS B) MORTARED LIMESTONE AND SANDSTONE PARAPETS IN MIN 1:20 MORTAR (20° ANGLE OF IMPACT)		PARKMAN PURSUING EXCELLENCE - SHARING SUCCESS
Checked Date 1/95							Office of issue MANCHESTER	Telephone no. 061 736 0442	Drawing no. FIGURE 10.4 Rev A
Approved [redacted] Date 1/95									

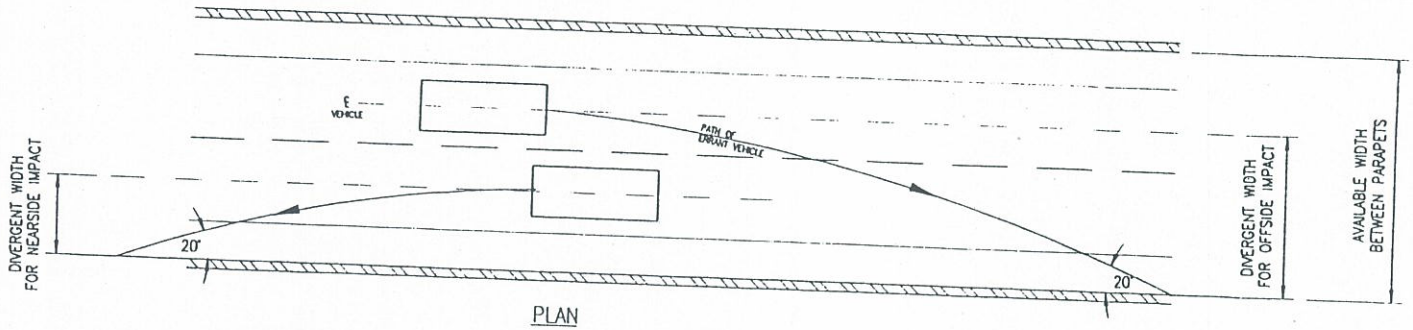
Amend No.0

January 1995

51

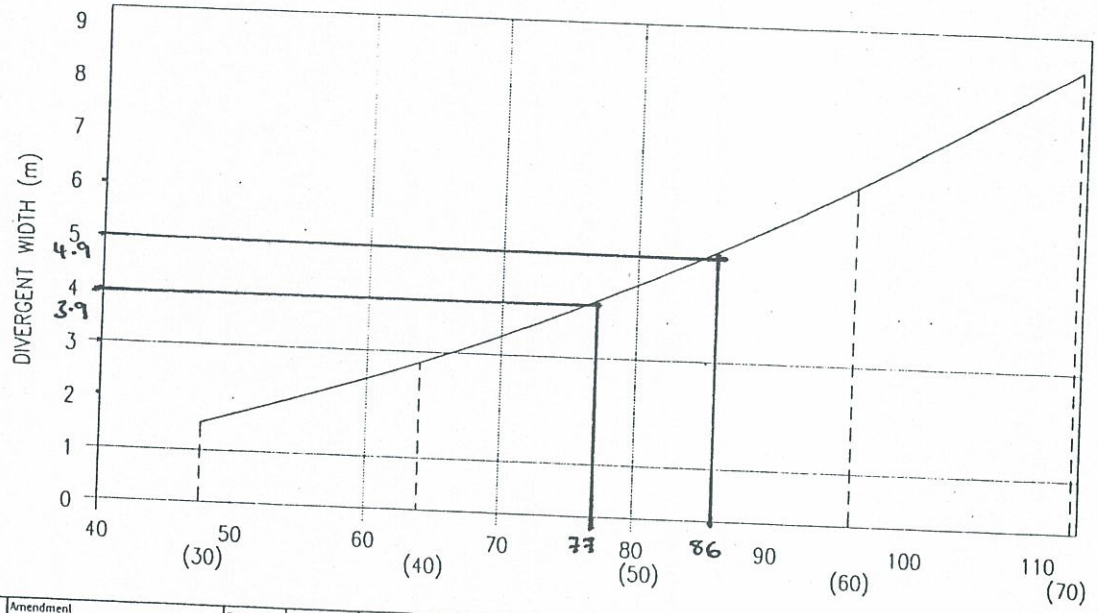
Prepared by [redacted]

Sheet No 63
04/01



PLAN

CURVE DEVELOPED FROM
TRRL REPORT No 801
FOR : μ = 0.7
g = 9.81m/s²
α = 20°

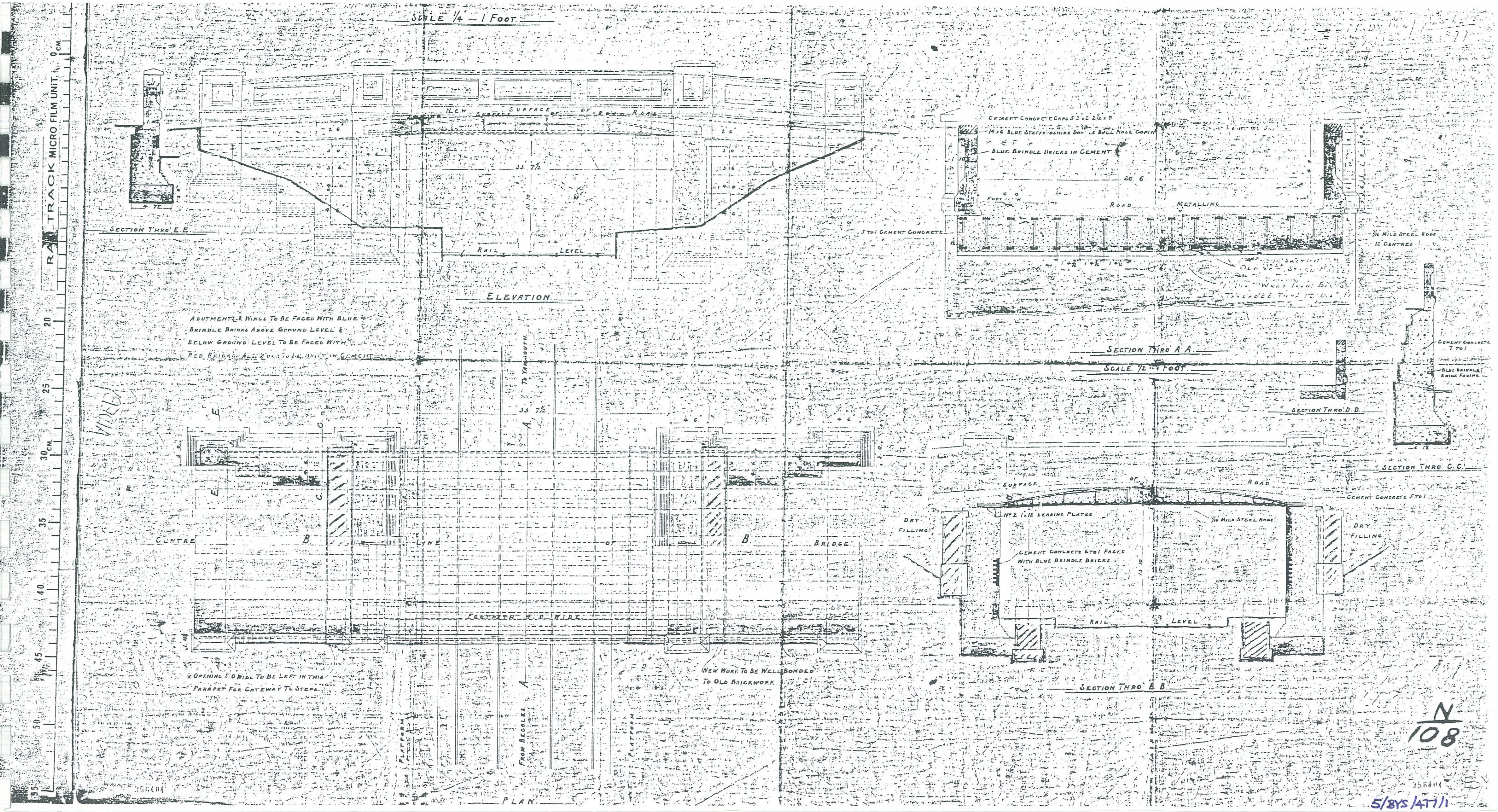


Scale NTS	Rev A	Amendment FOR GENERAL ISSUE	Drawn by [redacted]	Checked by	Approved by	Date 27-1-95	Client LANCASHIRE COUNTY COUNCIL
ACAD Ref FIG-53							Scheme PARAPET RESEARCH PROJECT
Drawn by D.W. [redacted] Date 8.94							Title CHART RELATING DIVERGENT WIDTH AND IMPACT SPEED OF ERRANT VEHICLE
Checked by Date							Office of issue MANCHESTER
Approved by Date							Telephone no. 061 736 0442
							Drawing no FIGURE 5.3
							Rev A

PARKMAN
PURSUING EXCELLENCE - SHAPING SUCCESS

Sheet No 64
Prepared by [redacted]
10/4/01

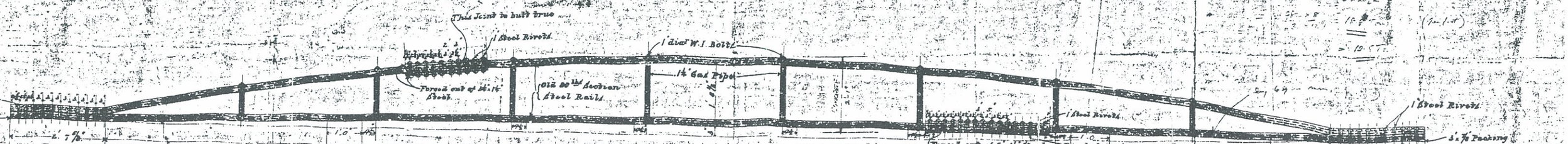
APPENDIX B
RECORD DRAWINGS


RAIL TRACK MICRO FILM UNIT
SCALE 1/4 - 1 FOOT
NEW SURFACE OF ROAD
SECTION THRO' E.E.
RAIL LEVEL
ELEVATION
ABUTMENTS & WINGS TO BE FACED WITH BLUE
BRINDLE BRICKS ABOVE GROUND LEVEL &
BELOW GROUND LEVEL TO BE FACED WITH
TO YARMOUTH
BLUE BRINDLE BRICKS IN CEMENT
ROAD METALLING
5 TO 1 CEMENT CONCRETE
SECTION THRO' A.A.
SCALE 1/2 - 1 FOOT
SECTION THRO' D.D.
SECTION THRO' C.C.
SURFACE OF ROAD
CEMENT CONCRETE 5 TO 1
DRY FILLING
CEMENT CONCRETE 6 TO 1 FACED
WITH BLUE BRINDLE BRICKS
RAIL LEVEL
SECTION THRO' B.B.
CENTRE B LINE OF B BRIDGE
OPENING 5.0 WIDE TO BE LEFT IN THIS
PARAPET FOR GATEWAY TO STEPS
NEW WORK TO BE WELL BONDED
TO OLD BRICKWORK
PLATFORM
FROM BECCLES
PLATFORM
PLAN
N/108
5/BYS/477/1

Extract from
5/B45/477/2

G.E.R. Aldeby.

Public Road Overline Bridge at M. C. 112. 33



Elevation of Rail Girder

Scale ¾ Inch = 1 Foot

No 17 Girders Required

5/B

NORFOLK COUNTY COUNCIL Planning & Transportation

APPENDIX C
FORMS AA AND AA/1

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

STRUCTURE/LINE NAME	Aldeby Bridge
ELR/STRUCTURE NO	BR No. 477 BYS/477

BRIEF DESCRIPTION OF EXISTING BRIDGE

(a) Span Arrangement

Single span reinforced concrete slab deck over the cutting of a dismantled railway line. The bridge is simply supported with a clear span of 10.23m and zero skew.

The slab sits directly on the abutment brickwork.

Further details are included in the 'Inspection for Assessment Report' dated November 2000.

(b) Superstructure Type

The slab is 710mm thick. The longitudinal reinforcement comprises 80lb bullnose rails at 420mm centres top and bottom. The top chord is curved in the vertical plane to form a truss with the bottom chord.

The transverse reinforcement comprises 12mm diameter bars laid on top of the bottom rails, at 250mm centres. The original minimum cover to the reinforcement was 30mm, but this has deteriorated throughout the soffit.

Trial excavations have determined that the deck lies under 50mm of fill and 130mm of surfacing.

The parapets are constructed from blue engineering brick with engineering brick coping units. They have a minimum height of 1.23m above the verges. The parapets are straight, 360mm thick and extend over the wingwalls to terminate at brick newels.

The carriageway over the bridge is 4.1m wide with 1.0m and 1.2m wide verges to the north and south respectively.

(c) Substructure Type

The abutments are 7.45m long and constructed in blue engineering brick.

The wingwalls are 5.44m long, straight in plan and constructed in blue engineering brick.

There are no details of the foundations available

(d) Details of any Special Features

None.

FORM 'AA' (BRIDGES)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

ASSESSMENT CRITERIA

(a)	Loadings and Speed	Live loading to be used:- (i) *HA Loading* Initial assessment for 40 tonnes Assessment Live Loading in accordance with Departmental Standard BD21/97 (a reduced level of Assessment Live Loading will be determined if the structure is inadequate for this loading). (ii) *HB Loading* Subject to meeting the requirements for the 40 tonnes Assessment Live Loading, the structure's HB rating will be determined in accordance with Clauses 6.3 and 6.4 of BD 37/88 combined, where appropriate, with the loads stated in (i) above. (iii) *Footway Live Loading* Footway and verge areas will be assessed for footway loading applied in accordance with Clause 5.36 of BD21/97. *Traffic Speed:-* 30mph (48km/h)
(b)	Codes to be Used	List of relevant documents from the TAS (dated November 1997). See Appendix 1.
(c)	Proposed Method of Structural Analysis	*Phase 1*:- The decks will be assessed using simple hand methods adopting two alternative approaches: • The deck will be treated as a reinforced concrete section with the bullnose rail trusses acting as reinforcement. • The deck will be treated as longitudinal steel trusses with the concrete treated as compressive diagonal bracing. *Phase 2*:- A phase 2 assessment method has not been identified for this structure. Phase 3:- Subject to meeting the requirements of the 40 tonnes Assessment Live Loading, the structure will be further assessed to determine its HB capacity in accordance with the methods detailed above.
(d)	Details of any Special Requirements	None

FORM 'AA' (BRIDGES)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

STRUCTURAL ASSESSMENT ENGINEER'S COMMENTS

- The Inspection for Assessment Report concludes that the bridge is in a poor condition. The report recommends that reduced section properties be used for the assessment.

- The Reduction Factor K for 40 tonnes Assessment Live Loading will be derived on the basis of Medium Annual Average Hourly HGV Flow and Poor Road Surface. The Traffic Flow category and Road Surface condition have been adopted on the basis of observations during the inspection visit. The sensitivity of the assessment for high traffic volumes will be considered.

- In the absence of any testing, a characteristic strength of steel shall be taken as 230N/mm^2 in accordance with Departmental Standard BD21/97 Clause 4.4.

- Similarly, a characteristic strength of concrete shall be taken as 15N/mm^2 in accordance with Departmental Standard BD21/97 Clause 4.7.

- Note that for each of the two proposed methods of structural analysis identified for the Phase 1 assessment, a different effective span shall be used.

  (a) When the deck is considered as a reinforced concrete section with the bullnose rail trusses acting as reinforcement, the effective span = 10.23m + (2/3 * 0.611m) = 10.637m.

  Ref: BD44/95 Cl 5.3.1.1c)

  The bridge records note that: the length of the beam in contact with the abutment = 2ft $7^5/_8$ in = 804mm.
  the effective depth of the beam = 611mm

  (b) When the deck is considered as longitudinal steel trusses with the concrete treated as compressive diagonal bracing, the effective span = 10.23m + (2/3 * 0.576m) = 10.614m

  Ref: BD56/96 Cl 16.3

  The bridge records note that: the length of the beam in contact with the abutment = 2ft $7^5/_8$ in = 804mm.
  the depth of the beam = 576mm

- All assumptions shall be subjected to a sensitivity analysis.

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

CIVIL ENGINEERS COMMENTS

BRB WORKS COMMENTS - IF APPLICABLE

PROPOSED CATEGORY FOR INDEPENDENT CHECK:

SUPERSTRUCTURE	Category 1 for Phase 1, Category 2 for Phase 2.
SUBSTRUCTURE	Category 1 for Phase 1, Category 2 for Phase 2.
NAME OF CHECKER SUGGESTED IF CAT 2 OR 3	NCC Bridge Maintenance Section led by D. McCarter.

CATEGORY 1

THE ABOVE ASSESSMENT, WITH AMENDMENTS SHOWN, IS APPROVED IN PR

SIGNED

TITLE..

DATE..

CATEGORY 2 AND 3

THE ABOVE ASSESSMENT, WITH AMENDMENTS SHOWN, IS APPROVED IN PRINCIPLE:

SIGNED .....

TITLE.....

DATE.....

SIGNED .....

TITLE.....

DATE.....

FORM 'AA/1' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

ADDITIONAL INFORMATION REQUIRED FOR BRB OWNED PUBLIC ROAD OVERBRIDGES

ASSESSED AS PART OF BRIDGEGUARD III

STRUCTURE/LINE NAME Aldeby Bridge

ELR/STRUCTURE NO BR No. 477

SCOPE OF ASSESSMENT

If the bridge achieves a 40 tonne assessment live load rating, a HB rating shall be determined.

ASSESSMENT CRITERIA

a) Standard and Codes of Practice to be used in assessment:-
List of relevant documents from the TAS (dated November 1997). See Appendix 1.

b) Proposed method of structural analysis

Phase 1:- The deck will be assessed using simple hand methods adopting two alternative approaches. The deck will be treated as:

- a reinforced concrete section with the trusses acting as reinforcement.
- longitudinal trusses with concrete treated as compressive diagonal bracing.

Phase 2:- A phase 2 assessment method has not been identified for this structure.

Phase 3:- Subject to meeting the requirements of the 40 tonnes Assessment Live Loading the structure will be further assessed to determine its HB capacity in accordance with the methods detailed above.

c) Planned Highway works/modifications at the site
None.

d) Road designation/class and whether classed as a heavy load route
C388 - which is not a heavy load route.

e) Any other requirement
None

The above is agreed subject to the amendments and comments shown belo[redacted]

SIGNED ...[redacted].....

NAME: P.[redacted]
For and on[redacted]
COUNCIL

TITLE: PRI[redacted]rk)

DATE.....[redacted].....

APPENDIX 1

BRITISH RAILWAYS PROPERTY BOARD ASSESSMENT PROGRAMME

TECHNICAL APPROVAL SCHEDULE "TAS" (NOVEMBER 1997)

SCHEDULE OF DESIGN AND ASSESSMENT DOCUMENTS RELATING TO BRITISH RAILWAYS PROPERTY BOARD BRIDGES AND STRUCTURES CARRYING HIGHWAYS (All documents are taken to include revisions current at date of this TAS)

1. BRITISH RAILWAYS BOARD - GROUP STANDARD

GC/TP0356 Approval in Principle and Checking Procedures for Bridges and Other Structures - Issue 1 (Revision A) February 1993.

2. DEPARTMENT OF TRANSPORT - DEPARTMENTAL STANDARDS

2.1 BRIDGES AND STRUCTURES

BD 2/89 Technical Approval of DTp Highway Structures on Motorways and Other Trunk Roads.
BD 12/95 Corrugated Steel Buried Structures.
BD 21/97 The Assessment of Highway Bridges and Structures.
BD 31/87 Buried Concrete Box Type Structures.
BD 37/88 Loads for Highway Bridges.
BD 44/95 The Assessment of Concrete Highway Bridges and Structures.
BD 52/93 The Design of Highway Bridge Parapets.
BD 56/96 The Assessment of Steel Highway Bridges and Structures.
BD 61/96 The Assessment of Composite Highway Bridges and Structures.

3. DEPARTMENT OF TRANSPORT - DEPARTMENTAL ADVICE NOTES

BA 16/97 The Assessment of Highway Bridges and Structures.
BA 39/93 Assessment of Reinforced Concrete Half-Joints.
BA 44/96 Assessment of Concrete Highway Bridges and Structures.
BA 51/95 The Assessment of Concrete Structures Affected by Steel Corrosion.
BA 52/94 The Assessment of Concrete Structures Affected by Alkali Silica Reaction.
BA 56/96 The Assessment of Steel Highway Bridges and Structures.
BA 61/96 The Assessment of Composite Highway Bridges.

4. DEPARTMENT OF TRANSPORT - TECHNICAL MEMORANDA (BRIDGES)

BE 3/78 Reinforced Earth and Anchored Earth Retaining Walls and Bridges Abutments for Embankments.
BE 5/75 Rules for the Design and Use of Freyssinet Concrete Hinges in Highway Structures.
BE 23 Shear Key Decks.

5. MISCELLANEOUS

Guidance Note for the Assessment and Design of Unreinforced Masonry Vehicle Parapets produced by the County Surveyor's Society Vol 1 (First Edition - 1995)

BRITISH RAILWAYS PROPERTY BOARD ASSESSMENT PROGRAMME

ADDITIONAL DOCUMENTS ISSUED SUBSEQUENT TO THE TECHNICAL APPROVAL SCHEDULE "TAS" (NOVEMBER 1997)

The following documents have been issues under the Bridgeguard 3 Assessment Programme to provide guidance on aspects not adequately covered by Standards. They are not mandatory and the assessing engineer should satisfy himself that they are applicable to the structure under consideration.

BRIDGEGUARD CURRENT INFORMATION SHEETS

CIS 16: Assessment of Piers
CIS 18: Mechanism analysis of Multi span arches
CIS 19: Condition Factors in rigorous Arch analysis
CIS 20: Assessment of Skew Arches
CIS 21: Single span Arches with h greater than d
CIS 22: Jack Arches, Buckle Plates
CIS 23: Use of BD and BA61 on cased and filler beam bridges
CIS 27: HB/MEXE method
Letter: Pedestrian Live Loading

APPENDIX D
FORMS BA AND BAA

FORM 'BAA' (BRIDGES)

GC/TP0356
Appendix:6
Issue:1
Revision:A
Date: FEB 93

CERTIFICATION FOR ASSESSMENT CHECK

NOTIFICATION OF ASSESSMENT CHECK

STRUCTURE NAME/ROAD NO. **Aldeby Bridge, Aldeby/ C388**

LINE NAME **G. E. R^{Y}. (Closed)**

ELR CODE/STRUCTURE NO. **BR No. BYS/477**

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

40 Tonnes Assessment Live Load

Up to 30 units HB Loading

Critical member/s: **None**

RECOMMENDED LOADING RESTRICTIONS

None

DESCRIPTION OF STRUCTURAL DEFICIENCIES AND RECOMMENDED STRENGTHENING

There is significant concrete spalling exposing the bull nose rails which are severely corroded. There is a risk that progressive corrosion will compromise the assessed capacity of the structure.

[redacted]

Team Leader (Assessment), Norfolk County Council

Head of Technical, Norfolk County ~~Coun~~cil

FORM 'BA' (BRIDGES)

GC/TP0356
Appendix:5
Issue:1
Revision:A
Date: FEB 93

CERTIFICATION FOR ASSESSMENT CHECK

STRUCTURE/LINE NAME **Aldeby Bridge, Aldeby**

CATEGORY OF CHECK **Category 1**

ELR/STRUCTURE NO. **BR No. BYS/477**

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

(1) It has been assessed in accordance with the Approval in Principle (where appropriate) as recorded on Form AA approved on **14 December 2000**

(2) It has been checked for compliance with the following principal British Standards, Codes of 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).

1. **Record drawings supplied by Rail Property Ltd July 1999.**
2. **The effective span for the steel truss has been calculated in accordance with BD56/96**
3. **The depth of the deck has been taken as 650mm to account for extent of spalled soffit concrete**
4. **The assessment has allowed for 25% loss of section of bull nose rails as reported in the insp**

[redacted]

OSITION DATE

Team Leader (Assessment), Norfolk County Council 29/10/03

[redacted]

ead of Technical, Norfolk County uncil 29/10/03

THE CERTIFICATE IS ACCEPTED BY .....

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

STRUCTURE/LINE NAME	Aldeby Bridge
ELR/STRUCTURE NO	BR No. 477 BYS/477

BRIEF DESCRIPTION OF EXISTING BRIDGE

(a) Span Arrangement

Single span reinforced concrete slab deck over the cutting of a dismantled railway line. The bridge is simply supported with a clear span of 10.23m and zero skew.

The slab sits directly on the abutment brickwork.

Further details are included in the 'Inspection for Assessment Report' dated November 2000.

(b) Superstructure Type

The slab is 710mm thick. The longitudinal reinforcement comprises 80lb bullnose rails at 420mm centres top and bottom. The top chord is curved in the vertical plane to form a truss with the bottom chord.

The transverse reinforcement comprises 12mm diameter bars laid on top of the bottom rails, at 250mm centres. The original minimum cover to the reinforcement was 30mm, but this has deteriorated throughout the soffit.

Trial excavations have determined that the deck lies under 50mm of fill and 130mm of surfacing.

The parapets are constructed from blue engineering brick with engineering brick coping units. They have a minimum height of 1.23m above the verges. The parapets are straight, 360mm thick and extend over the wingwalls to terminate at brick newels.

The carriageway over the bridge is 4.1m wide with 1.0m and 1.2m wide verges to the north and south respectively.

(c) Substructure Type

The abutments are 7.45m long and constructed in blue engineering brick.

The wingwalls are 5.44m long, straight in plan and constructed in blue engineering brick.

There are no details of the foundations available

(d) Details of any Special Features

None.

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

ASSESSMENT CRITERIA

(a)	Loadings and Speed	Live loading to be used:- (i) *HA Loading* Initial assessment for 40 tonnes Assessment Live Loading in accordance with Departmental Standard BD21/97 (a reduced level of Assessment Live Loading will be determined if the structure is inadequate for this loading). (ii) *HB Loading* Subject to meeting the requirements for the 40 tonnes Assessment Live Loading, the structure's HB rating will be determined in accordance with Clauses 6.3 and 6.4 of BD 37/88 combined, where appropriate, with the loads stated in (i) above. (iii) *Footway Live Loading* Footway and verge areas will be assessed for footway loading applied in accordance with Clause 5.36 of BD21/97. *Traffic Speed:-* 30mph (48km/h)
(b)	Codes to be Used	List of relevant documents from the TAS (dated November 1997). See Appendix 1.
(c)	Proposed Method of Structural Analysis	*Phase 1*:- The decks will be assessed using simple hand methods adopting two alternative approaches: • The deck will be treated as a reinforced concrete section with the bullnose rail trusses acting as reinforcement. • The deck will be treated as longitudinal steel trusses with the concrete treated as compressive diagonal bracing. *Phase 2*:- A phase 2 assessment method has not been identified for this structure. Phase 3:- Subject to meeting the requirements of the 40 tonnes Assessment Live Loading, the structure will be further assessed to determine its HB capacity in accordance with the methods detailed above.
(d)	Details of any Special Requirements	None

FORM 'AA' (BRIDGES)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

STRUCTURAL ASSESSMENT ENGINEER'S COMMENTS

- The Inspection for Assessment Report concludes that the bridge is in a poor condition. The report recommends that reduced section properties be used for the assessment.

- The Reduction Factor K for 40 tonnes Assessment Live Loading will be derived on the basis of Medium Annual Average Hourly HGV Flow and Poor Road Surface. The Traffic Flow category and Road Surface condition have been adopted on the basis of observations during the inspection visit. The sensitivity of the assessment for high traffic volumes will be considered.

- In the absence of any testing, a characteristic strength of steel shall be taken as 230N/mm^2 in accordance with Departmental Standard BD21/97 Clause 4.4.

- Similarly, a characteristic strength of concrete shall be taken as 15N/mm^2 in accordance with Departmental Standard BD21/97 Clause 4.7.

- Note that for each of the two proposed methods of structural analysis identified for the Phase 1 assessment, a different effective span shall be used.

  (a) When the deck is considered as a reinforced concrete section with the bullnose rail trusses acting as reinforcement, the effective span = 10.23m + (2/3 * 0.611m) = 10.637m.

  Ref: BD44/95 Cl 5.3.1.1c)

  The bridge records note that: the length of the beam in contact with the abutment = 2ft $7^5/_8$ in = 804mm.
  the effective depth of the beam = 611mm

  (b) When the deck is considered as longitudinal steel trusses with the concrete treated as compressive diagonal bracing, the effective span = 10.23m + (2/3 * 0.576m) = 10.614m

  Ref: BD56/96 Cl 16.3

  The bridge records note that: the length of the beam in contact with the abutment = 2ft $7^5/_8$ in = 804mm.
  the depth of the beam = 576mm

- All assumptions shall be subjected to a sensitivity analysis.

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A
Date: FEB. 93

APPROVAL IN PRINCIPLE FOR ASSESSMENT

CIVIL ENGINEERS COMMENTS

BRB WORKS COMMENTS - IF APPLICABLE

PROPOSED CATEGORY FOR INDEPENDENT CHECK:

SUPERSTRUCTURE	Category 1 for Phase 1, Category 2 for Phase 2.
SUBSTRUCTURE	Category 1 for Phase 1, Category 2 for Phase 2.
NAME OF CHECKER SUGGESTED IF CAT 2 OR 3	NCC Bridge Maintenance Section led by D. McCarter.

CATEGORY 1

THE ABOVE ASSESSMENT, WITH AMENDMENTS SHOWN, IS APPROVED IN PR

SIGNED

TITLE...

DATE...

CATEGORY 2 AND 3

THE ABOVE ASSESSMENT, WITH AMENDMENTS SHOWN, IS APPROVED IN PRINCIPLE:

SIGNED .....

TITLE.....

DATE.....

SIGNED .....

TITLE.....

DATE.....

FORM 'AA/1' (BRIDGES)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

ADDITIONAL INFORMATION REQUIRED FOR BRB OWNED PUBLIC ROAD OVERBRIDGES ASSESSED AS PART OF BRIDGEGUARD III

STRUCTURE/LINE NAME Aldeby Bridge

ELR/STRUCTURE NO BR No. 477

SCOPE OF ASSESSMENT

If the bridge achieves a 40 tonne assessment live load rating, a HB rating shall be determined.

ASSESSMENT CRITERIA

a) Standard and Codes of Practice to be used in assessment:-
List of relevant documents from the TAS (dated November 1997). See Appendix 1.

b) Proposed method of structural analysis

Phase 1:- The deck will be assessed using simple hand methods adopting two alternative approaches. The deck will be treated as:

- a reinforced concrete section with the trusses acting as reinforcement.
- longitudinal trusses with concrete treated as compressive diagonal bracing.

Phase 2:- A phase 2 assessment method has not been identified for this structure.

Phase 3:- Subject to meeting the requirements of the 40 tonnes Assessment Live Loading the structure will be further assessed to determine its HB capacity in accordance with the methods detailed above.

c) Planned Highway works/modifications at the site
None.

d) Road designation/class and whether classed as a heavy load route
C388 - which is not a heavy load route.

e) Any other requirement
None

The above is agreed subject to the amendments and comments shown below

[redacted]

APPENDIX 1

BRITISH RAILWAYS PROPERTY BOARD ASSESSMENT PROGRAMME

TECHNICAL APPROVAL SCHEDULE "TAS" (NOVEMBER 1997)

SCHEDULE OF DESIGN AND ASSESSMENT DOCUMENTS RELATING TO BRITISH RAILWAYS PROPERTY BOARD BRIDGES AND STRUCTURES CARRYING HIGHWAYS (All documents are taken to include revisions current at date of this TAS)

1. BRITISH RAILWAYS BOARD - GROUP STANDARD

GC/TP0356 Approval in Principle and Checking Procedures for Bridges and Other Structures - Issue 1 (Revision A) February 1993.

2. DEPARTMENT OF TRANSPORT - DEPARTMENTAL STANDARDS

2.1 BRIDGES AND STRUCTURES

BD 2/89 Technical Approval of DTp Highway Structures on Motorways and Other Trunk Roads.
BD 12/95 Corrugated Steel Buried Structures.
BD 21/97 The Assessment of Highway Bridges and Structures.
BD 31/87 Buried Concrete Box Type Structures.
BD 37/88 Loads for Highway Bridges.
BD 44/95 The Assessment of Concrete Highway Bridges and Structures.
BD 52/93 The Design of Highway Bridge Parapets.
BD 56/96 The Assessment of Steel Highway Bridges and Structures.
BD 61/96 The Assessment of Composite Highway Bridges and Structures.

3. DEPARTMENT OF TRANSPORT - DEPARTMENTAL ADVICE NOTES

BA 16/97 The Assessment of Highway Bridges and Structures.
BA 39/93 Assessment of Reinforced Concrete Half-Joints.
BA 44/96 Assessment of Concrete Highway Bridges and Structures.
BA 51/95 The Assessment of Concrete Structures Affected by Steel Corrosion.
BA 52/94 The Assessment of Concrete Structures Affected by Alkali Silica Reaction.
BA 56/96 The Assessment of Steel Highway Bridges and Structures.
BA 61/96 The Assessment of Composite Highway Bridges.

4. DEPARTMENT OF TRANSPORT - TECHNICAL MEMORANDA (BRIDGES)

BE 3/78 Reinforced Earth and Anchored Earth Retaining Walls and Bridges Abutments for Embankments.
BE 5/75 Rules for the Design and Use of Freyssinet Concrete Hinges in Highway Structures.
BE 23 Shear Key Decks.

5. MISCELLANEOUS

Guidance Note for the Assessment and Design of Unreinforced Masonry Vehicle Parapets produced by the County Surveyor's Society Vol. 1 (First Edition - 1995)

BRITISH RAILWAYS PROPERTY BOARD ASSESSMENT PROGRAMME

ADDITIONAL DOCUMENTS ISSUED SUBSEQUENT TO THE TECHNICAL APPROVAL SCHEDULE "TAS" (NOVEMBER 1997)

The following documents have been issues under the Bridgeguard 3 Assessment Programme to provide guidance on aspects not adequately covered by Standards. They are not mandatory and the assessing engineer should satisfy himself that they are applicable to the structure under consideration.

BRIDGEGUARD CURRENT INFORMATION SHEETS

CIS 16: Assessment of Piers
CIS 18: Mechanism analysis of Multi span arches
CIS 19: Condition Factors in rigorous Arch analysis
CIS 20: Assessment of Skew Arches
CIS 21: Single span Arches with h greater than d
CIS 22: Jack Arches, Buckle Plates
CIS 23: Use of BD and BA61 on cased and filler beam bridges
CIS 27: HB/MEXE method
Letter: Pedestrian Live Loading

NORFOLK COUNTY COUNCIL
Planning & Transportation

DESIGN AND CONSTRUCTION DIVISION | **Form DC 23/A**

CALCULATION SHEET

Project Title:- BR. Property Board			**SHEET NO.** 1
Sub Section:- Aldeby Bridge BR No 4177			
Project File Ref:- BDH064 -R42.	**Drawing Ref:-**	**Prepared by** [redacted]	**Date:-** 30/10/00
		Checked by:-	**Date:-**

Ref:-

Review contents v drgs. Spen looks OK give or take a few mm - not significant in terms of assessment.

IAC/Lab Report — Jo has flagged up problems. like spacing of trusses (Drgs received since show lab are wrong). } LAB

AIP — Photos suggest F/Path (AWL) doesn't seem appropriate, although dims suggest verges are ≥ 1.0 m. Similarly a Phase 2 LEAPS seems inappropriate — although the width to carriageway width is quite a large ratio — the problem would be if the transverse effects exceed capacity. [redacted] Any Visits

Report — Index — Page numbering not consistent

(AWL) Ec's calcs. (unchecked) show AOT ALL reduced to 7.5 T ALL (RC Approval!) I think this (SET of TRUSS) is a bit of a (can't get the right word!).