

**BRB (Residuary) Ltd
Major Works Programme 2004/2009**

**VAR9/2005 ASSESSMENT
PROGRAMME**

**BE4 ASSESSMENT AND
INSPECTION REPORT**

**Balmacassie Bridge, Ellon,
Aberdeenshire**

BRIDGE REF: EBD/756



December 2008

Document control sheet

Client: BRB (Residuary) Ltd
 Project: 2004/2009 Major Works Programme
 Title: VAR9/2005 Assessment Programme

Job No: J24110PI- EBD/756

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Form AA Report			
DATE			
14 October 2008			
REVISION			
DATE			
18 Dec 2008			

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DATE	SIGNATURE	SIGNATURE	SIGNATURE

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1**General Description and Structural Details****1.1 Introduction**

Jacobs was appointed by BRB(R) to conduct the site survey at EBD/756 in sufficient detail to provide data for BE4 assessment work.

Structural Soils Ltd excavated a trial pit in the verge at the west side of the carriageway exposing the top flange of second longitudinal girder.

1.2 Location and General Description

Bridge EBD/756 carries an unclassified rural road over the track bed of the former Ellon to Boddam railway north east of Ellon in Aberdeenshire.

The road carried has a single carriageway 3.0m wide with soft verges 1.7m wide each side. The road is subject to the national speed limit, though practical traffic speeds are much lower owing to the road geometry.

The road is lightly used, though use by a 40 tonne HGV was observed.

The Ellon to Boddam railway was opened in 1897. The manufacturer's imprint on the edge girders indicates they were cast in 1895.

The OS grid reference is NJ 972 316.

1.3 Construction type

The structure is a single span overbridge with a clear span of 4.52m (14' – 10") and no skew.

The bridge has two external and four internal cast iron girders at 1.27m (4' -2") centres with brick jack arches supported on the bottom flange of the girders. The rise of the jack arches is approximately 225mm (9"). There are three sets of tie bars between each girder, the attachment being made to the cast iron girder stiffeners

The abutments and wingwalls are gravity type construction using squared granite blocks laid to courses. The girders are supported directly on the granite blocks. The wingwalls are curved extending on the arc about 7m from the pilasters.

The parapets are cast iron, supported on the edge girders and stabilised with two curved out-riggers.

2 Existing Information Search

2.1 Services Search

Documentation obtained by Structural Soils Ltd is included in Appendix B.

2.2 SI Results

The trial pit log is included in Appendix C.

2.3 Existing Drawings

There is a sketch, undated, showing deck section, elevation and plan of the bridge. Some basic beam data conflicts with that found from site measurement.

3 Structure Condition

3.1 General

The inspection and survey were carried out on 11 August 2008. Weather conditions were sunny and mild; temperature was about 18°C.

Parking was available by a field entrance about 200m north of the bridge at the end of the approach embankment. Access to the formation was gained through the field to the north west of the bridge. The formation is fenced off and care is needed to cross two wire fences with a ditch in between. Ground conditions within the formation are rough.

3.2 Superstructure

3.2.1 Edge Girders

The bottom flanges of the edge girders have general light corrosion increasing to moderate corrosion on the inside edge and a degree of calcareous staining with small stalactites. There is no significant section loss. (Photos 2 and 3)

3.2.2 Internal Girders

There is general light corrosion on all the bottom flanges increasing to moderate corrosion along the blast line at mid-span.

The second and third internal girders from the west edge have the most corrosion, with approximately 10% loss of section to the bottom flange. (Photo 4)

3.2.3 Jack arches

The jack arches are constructed from common brick. The mortar joints are generally well filled.

There is both calcareous and algal staining resulting from water percolation in the past, but apart from the east side jack arch the arches are generally dry. The inspection followed a period of heavy rainfall which might have been expected to reveal any propensity to seepage.

The jack arch between the east edge girder and the first internal girder is heavily stained and there is seepage along one of the mortar joints near the crown.

The tie bars are heavily corroded. (Photo 5) The mid-span bars have all corroded away. Those adjacent to the south abutment are severely corroded with little effective section remaining. Those near the north abutment have severe thinning at their contact with the brickwork. (Photo 4)

3.3 Abutments

The abutments are in good condition being constructed from good quality stone (Aberdeen granite). The granite blocks are squared off and laid to courses.

On the north abutment there is some deep mortar loss in the lower courses at the north east corner and one or two of the blocks may be loose.

On the south abutment there is some minor cracking and mortar loss at the south west corner.

3.4 Wingwalls

The wingwalls are solidly constructed with the same masonry as the abutments.

On the south west wingwall the coping is loose and dislocated at the outer end. There is a small amount of vegetation growth in the mortar beds of the upper courses.

There is a large tree in front of the north west wingwall. There is some minor mortar loss intermittently in the joints at mid-height. The copings are intact.

The north east wingwall displays minor mortar loss intermittently. The copings are intact. There is some dislocated masonry at the outer end of the wall. (Photo 8)

The south east wingwall is generally in good condition with minor mortar loss. There is vegetation growth in the outer face of the adjacent pilaster.

3.5 Parapets

The parapets each comprise seven cast iron panels of ¼ " plate thickness bolted together along their vertical edges. Height is 34" (0.86m) above the edge girder. On each side of the bridge there is a hole in the iron plating measuring about 30cm by 30cm. (Photo 2). It is not clear how this damage might have occurred. There is no paint on either face of the parapets, just uniform light surface corrosion. The parapets are stable but unlikely to have much resistance to vehicle impact.

The pilasters have heavy stone copings and are in good condition.

3.6 Road surface

The road surface is in good condition with no observed defects. There is a pronounced vertical curve over the bridge.

3.7 Formation

The formation is fenced off from the neighbouring fields. It is not utilised in any way and is overgrown. There is minor fly tipping under the bridge.

4.1 Methodology

The deck loading was amenable to analysis by the quick assessment method outlined in Part 2 of BE4. This was used for the internal girders.

The edge girders did not need to be checked for live loads as internal girders are positioned between them and the near-side line of wheels of the BE4 vehicle train. The edge girders were therefore checked under dead and superimposed dead load only.

The girder capacities were calculated using measurements of reduced section sizes where corrosion was present. Consequently, a general condition factor was not applied.

The adequacy of the jack arches and tie-rods was determined by the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties.)

4.2 Results

The BE4 assessment for the members gives the following results:

Element: Edge girders.

Action	Location	Dead load effect	Full C&U load effect	Total load effect	Assessed resistance	Capacity
Bending	Mid-span	8.9 ton.ft	0	8.9 ton.ft	73.7 ton.ft	Pass

Element: Internal girders

Action	Location	Dead load effect	Full C&U load effect	Total load effect	Assessed resistance	Live Load capacity
Bending	Mid-span	15.23 ton.ft	17.68 ton.ft	32.91 ton.ft	37.65 ton.ft	Full C&U 24 tons

Element: Jack Arches and Tie bars

The tie bars are badly corroded and do not meet requirements.

Element: Substructure

The abutments show no signs of structural distress. By qualitative assessment, they appear to be satisfactory for Full C&U loading.

Girder capacity is satisfactory for full C&U loading, but the tie bars are badly corroded and in many cases completely lost. The bridge capacity would be satisfactory if the tie bars were replaced.

To permit continued normal traffic use, it is recommended that temporary barriers are installed to prevent loading of the edge bays until the tie bars can be replaced.

The substructure is solidly constructed in Aberdeen granite and needs no urgent maintenance.

Damage to the cast iron parapets would be difficult to repair. The extent of the damage does not seriously compromise the efficiency of the parapets, though their containment capacity is probably low.

The bridge could be infilled without any loss of amenity.

Appendix A - Photographs



Photo 1 – West elevation



Photo 2 – East edge girder



Photo 3 – West edge girder



Photo 4 – Internal cast iron girders and jack arches (Note missing tie-bars)



Photo 5 – Corroded tie bar by east edge girder



Photo 6 – North abutment



Photo 7 – South abutment



Photo 8 – North east wingwall



Photo 9 – Road over the bridge looking south



Photo 10 – Trial pit exposing top flange of CI girder and concrete infill

Appendix B - Services Search

Certificate Of Registered Enquiry					
Certificate Number	EQ/WRVWC575		Service	Retriever	
Location of Enquiry	Bridge north of A948, Ellon, Aberdeenshire, UK				
Issued to	Structural Soils Ltd				
Address	The Potteries, Pottery Street Castleford West Yorkshire WF10 1NJ	Contact			
25/07/2008 12:59:27		Telephone			
Copyright 2007 National One Call All Rights Reserved		Fax			
		Email			
Date of Enquiry	02/07/2008	Responses Requested by	17/07/2008	Working Days Notice	11
Contacts and Responses					
Organisation	Document	Contacted	Affected	Received	Status
British Pipeline Agency Ltd	Pipeline Plan	Yes	No	Yes	Closed
BT Openreach	Telecoms. Plan	Yes	Yes	Yes	Closed
BT Geo Network	Pipeline Plan	Yes	No	Yes	Closed
Cable & Wireless	Telecoms. Plan	Yes	No	Yes	Closed
Centrica Energy	Multi-utility Plan	Yes	No	Yes	Closed
E S Pipelines Ltd	Gas Plan	Yes	No	Yes	Closed
E-On Operated Pipeline	Pipeline Plan	Yes	No	Yes	Closed
Energetics	Multi-utility Plan	Yes	No	Yes	Closed
Envoy Asset Management	Gas Plan	Yes	No	Not Expected	Closed
ESP Electricity Limited	Electricity Plan	Yes	No	Yes	Closed
Fibernet	Telecoms. Plan	Yes	No	Yes	Closed
Gas Transportation Co	Gas Plan	Yes	No	Yes	Closed
Global Crossing	Telecoms. Plan	Yes	No	Yes	Closed
Interoute - 51degrees	Telecoms. Plan	Yes	No	Yes	Closed
Mobile Phone Base Stations	Telecoms. Plan	Yes	No	Not Expected	Closed
National Grid Transmission Gas	Gas Plan	Yes	No	Yes	Closed
NPower CHP Pipelines	Pipeline Plan	Yes	No	Yes	Closed
Optilan Communications	Telecoms. Plan	Yes	No	Yes	Closed
Premier Transmission Ltd	Pipeline Plan	Yes	No	Yes	Closed
Scotland Gas Networks (Distribution)	Gas Plan	Yes	No	Not Expected	Closed
Scottish & Southern Energy	Gas Plan	Yes	No	Not Expected	Closed
Scottish & Southern Energy	Electricity Plan	Yes	No	Not Expected	Closed
Scottish Power Generation Ltd	Electricity Plan	Yes	No	Yes	Closed
Scottish Water Plant Protection	Water / Drainage Plan	Yes	No	Not Expected	Closed
THUS plc	Telecoms. Plan	Yes	No	Yes	Closed
Verizon Business	Telecoms. Plan	Yes	No	Yes	Closed
Virgin Media (NTL:Telewest)	Telecoms. Plan	Yes	No	Not Expected	Closed
Validity of Certificate: This Certificate is issued by National One Call as an accurate record of the Enquiry as detailed above and warrants that the information contained is a true and accurate record of the PlanToDig Enquiry details as entered and a schedule of actions against that Enquiry.					
This certificate in no way constitutes any permission, licence, permit, agreement, acknowledgement or other form of active or passive consent by any party to the Enquirer or their Agent undertaking any works or any other subsequent actions.					
All and any information in whatever format that was provided in response to this Enquiry remains the intellectual property of the provider and is contextual solely to the details of this Enquiry. The purposes that the information provided in response to this Enquiry shall be restricted entirely to the stated intentions of the Enquirer and shall not be made available in any format or summary for other purposes without permission of the owner of the IPR.					
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National One Call

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Response Summary

enquiries@national-one-call.co.uk
Tel: 0844 800 9957 Fax: 0845 280
2040

Enquiry Number	EQ/WRVWC575	Service	Retriever
Location of Enquiry	Bridge north of A948, Ellon, Aberdeenshire, UK		
Status: Not Affected			
Organisation	Response		
E S Pipelines Ltd	Plant Unaffected Notice With regard to your plant enquiry, I can confirm that ES Pipelines Ltd have no gas apparatus in the vicinity of site/area of interest. Reference Number: EQ/WRVWC575 If you wish to discuss this matter further please contact me on my direct line 01372 227567. Yours faithfully, [REDACTED] erations Manager		
Energetics	I would like to confirm that Energetics has NO plant located at the above address. Thanks [REDACTED] echnical Support Energetics Design and Build		
ESP Electricity Limited	Not affected		
Fibernet	Fibernet plant installations are unaffected by your proposed works at the location/s specified. If you have not already done so you should check with Fujitsu for Global Crossing plant that may be affected by your proposed works at the location/s specified.		
Gas Transportation Co	Site Ref: EQ/WRVWC575 Site Location: Bridge north of A948, Ellon, Aberdeenshire, UK GTC have no apparatus in the vicinity of your proposed work. Please note other Gas Transporters may have apparatus in this area and you should ensure that all transporters have been consulted. All future plant enquiries must contain accurate Easting and Northing references to enable us to process your enquiry ASAP. Yours faithfully, [REDACTED] lanning Assistant GTC		
Global Crossing	Location BRIDGE NORTH OF A948, ELLON Dated 09-JUL-08 With reference to your enquiry regarding the above noted location, we are unaware of any GLOBAL CROSSING (UK) LTD GLOBAL CROSSING PEC ORANGE PCS plant or services supported by Fujitsu in the area indicated in your enquiry. We bring your attention to the fact that whilst we try to ensure the information we provide is accurate, the information is provided Without Prejudice and Fujitsu accepts no liability for claims arising from any inaccuracy, omissions or errors contained herein. Fujitsu responds to plant enquiries for Global Crossing UK, Global Crossing PEC and Orange PCS simultaneously and therefore you only need send one copy of a plant enquiry to cover all of these companies. As we are moving towards a fully electronic database we urge our customers to request plant enquiries by email which will result in a higher level of service and cost saving. Please note that Fujitsu does not deal with plant enquiries for Hutchinson Network Services (GEO) and have no forwarding details. If you require any further information, please do not hesitate to contact me. Plant Protection Administrator Fujitsu Telecommunications Europe Ltd		
Interoute - 51degrees	Not affected Regards, [REDACTED] Planning & Design BEACH Communications Ltd		
Optilan Communications	With reference to your email, I can inform you that your enquiry does not affect our services. Kind Regards Heather		
THUS plc	After consulting our records, I am not aware of any Thus plant which would be affected by your works at the aforementioned site(s). [REDACTED] Utilities Officer		
Verizon Business	Verizon Business is a licensed Statutory Undertaker. We have reviewed your plans and have determined that Verizon Business (Formally known as MCI WorldCom, MFS) has no apparatus in the areas concerned. If you have any further queries please do not hesitate to call. Yours faithfully [REDACTED] Plant Protection Officer		

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Our Ref: /NNHC/2006

Your Ref:

Date: As Post Mark

National Notice Handling Centre
PP 3WW18, Telecom House,
Trinity Street,
Hanley,
Stoke-on-Trent,
ST1 5ND.

Freephone: 0800 800865

Dear Customer,

Freephone 0800 800 865

NR & SW ACT 1991 – PROPOSED WORKS AT:

Prior to commencement of work: for free onsite guidance and accurate up to date location of BT plant please contact our Plant Protection Service by the following methods

Tele 0800 9173993

Fax 01332 578650

Email Dial before you dig DBYD@openreach.co.uk

Visit the website www.dialbeforeyoudig.com

Thank you for your letter of describing the above proposals.

Enclosed are copies of our drawing marked up to show the approximate locations of BT apparatus which is present in the immediate vicinity of your works. It is intended for general guidance only. No guarantee is given of its accuracy.

It should not be relied upon in the event of excavations or other works made near to British Telecommunications plc apparatus which may exist at various depths and may deviate from the marked route.

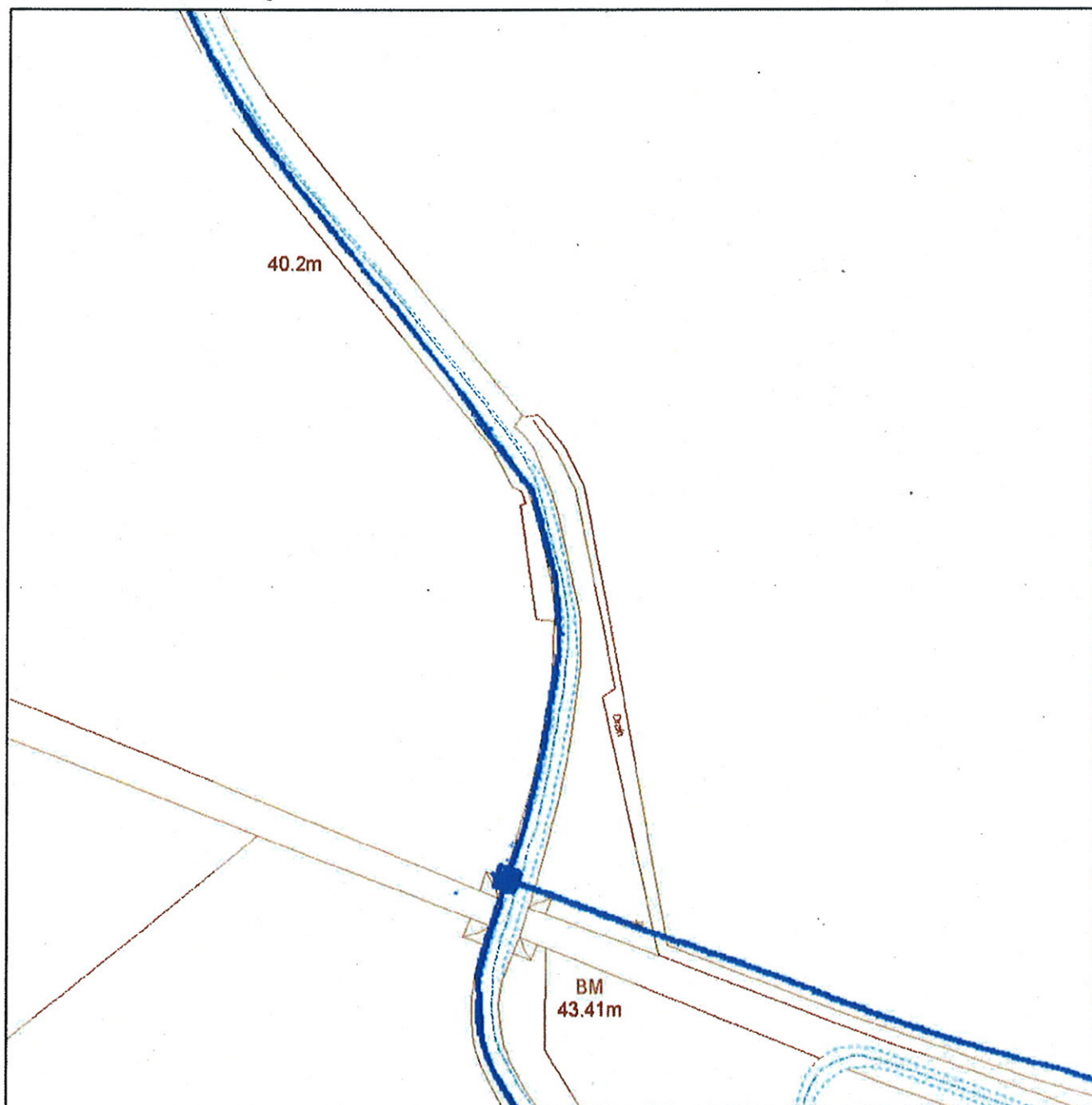
To avoid damage it is recommended that mechanical excavators or borers are not used within 600mm of British Telecommunications plc plant. If scaffolding is erected, please ensure that our equipment is not enclosed, blocked, covered or otherwise obstructed by the scaffolding.

In the event of BT apparatus being in the area of works we recommend that your plant/vehicle crossing is either resited, or apply for a budget estimate by submitting detailed plans to the above address, these will be forwarded to the appropriate department for their comments.

Please ensure you quote our reference on any future correspondence.

Yours faithfully,

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

DIAL BEFORE YOU DIG FOR PROFESSIONAL ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS

ADVANCE NOTICE REQUIRED
(Office hours: Monday-Friday 08.00 to 17.00)

Tel: 0800 9173993
E-mail: dbyd@openreach.co.uk
Website: www.dialbeforeyoudig.com

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KEY TO BT SYMBOLS

	UNDERGROUND PLANT		POLE
	OVERHEAD PLANT		CABINET
	JOINT BOX		BURIED JOINT
	DISTRIBUTION POINT		JOINTING POST
	MANHOLE		PROPOSED U/G
	DP BOUNDARY		PROPOSED O/H
	OTHER BT BOUNDARY		PROPOSED BOX

Other proposed plant is shown using dashed lines. BT symbols not listed above may be disregarded. Existing BT plant may not be recorded. Information valid at the time of preparation.

openreach
a BT Group business

BT ref: MBO10546U

Map reference (centre): NJ9713831661

Issued: 03/07/08 10:57:37



Search Results

Thank you for your enquiry: LS-080703-PC-716-VJF

Subject always to our standard terms and conditions, this enquiry result is valid for 28 days only from the date of enquiry and is based on the confirmed information you entered. If the location of the work changes then a further enquiry must be made. Should the work not be undertaken within 28 days of the enquiry then a further enquiry must be made.

ENQUIRER DETAILS

Name: [REDACTED]

Comp: [REDACTED]

Email: [REDACTED]

ENQUIRY DETAILS

Your reference: EQ/WRVWC575 A948 Nth of

lon, Aberdeenshire

Your location: NJ972316

Confirmed location: OS grid reference (397138 831661)

Estimated start date: 20-07-2008

Type of work: Development projects - Commercial/Industrial

Distance covered: 150 metres

NOT IN THE ZONE OF INTEREST

BP Exploration Purbeck Southampton Pipeline
BPA
BT GEO Network
Centrica Energy
ConocoPhillips (UK) Ltd
ConocoPhillips Ltd Humber Refinery
Coryton Energy Co Ltd (Gas Pipeline)
E-on UK Plc (Gas Pipelines Only)
Esso Petroleum Company Limited
Government Pipelines & Storage System

Ineos TSEP (formerly BP TSEP)
Mainline Pipelines Limited
Manchester Jetline Limited
NPower CHP Pipelines
National Grid (National Gas and Electricity Transmission Networks)
Premier Transmission Ltd (SNIP)
Sabic UK Petrochemicals (formerly Huntsman)
Scottish Power Generation Ltd
Shell UK Ltd
Total Pipeline Operations

Thank you for your enquiry, there is no further action necessary.

Please note that the Linesearch.org system only contains information on National Grid - (National Gas and Electricity Transmission Networks) This does not include National Grid's or others local high pressure (above 7 bar) gas pipelines and lower pressure gas pipelines. Details of who to contact for National Grid's distribution assets, including their local high pressure pipelines, can be found via <http://www.nationalgrid.com/uk/LandandDevelopment/DPC/GasElectricNW>

For other energy network operators' contact details see <http://2008.energynetworks.org/>

Please quote the Linesearch enquiry reference number in *all* correspondence

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Search Results



Thank you for your enquiry: LS-080703-PC-716-VJF

Subject always to our standard terms and conditions, this enquiry result is valid for 28 days only from the date of enquiry and is based on the confirmed information you entered. If the location of the work changes then a further enquiry must be made. Should the work not be undertaken within 28 days of the enquiry then a further enquiry must be made.

ENQUIRER DETAILS

Name: Mr McMaster

Company: PlanToDig

Email: brian.mcmaster@national-one-call.co.uk

ENQUIRY DETAILS

Your reference: EQ/WRVWC575 A948 Nth of Ellon, Aberdeenshire

Your location: NJ972316

Confirmed location: OS grid reference (397138 831661)

Estimated start date: 20-07-2008

Type of work: Development projects - Commercial/industrial

Distance covered: 150 metres

NOT IN THE ZONE OF INTEREST

BP Exploration Purbeck Southampton Pipeline
BPA
BT GEO Network
Centrica Energy
ConocoPhillips (UK) Ltd
ConocoPhillips Ltd Humber Refinery
Coryton Energy Co Ltd (Gas Pipeline)
E-on UK Plc (Gas Pipelines Only)
Esso Petroleum Company Limited
Government Pipelines & Storage System

Ineos TSEP (formerly BP TSEP)
Mainline Pipelines Limited
Manchester Jetline Limited
NPower CHP Pipelines
National Grid (National Gas and Electricity Transmission Networks)
Premier Transmission Ltd (SNIP)
Sabic UK Petrochemicals (formerly Huntsman)
Scottish Power Generation Ltd
Shell UK Ltd
Total Pipeline Operations

Thank you for your enquiry, there is no further action necessary.


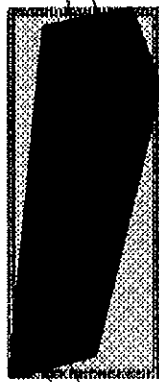
Please note that the Linesearch.org system only contains information on National Grid - (National Gas and Electricity Transmission Networks) This does not include National Grid's or others local high pressure (above 7 bar) gas pipelines and lower pressure gas pipelines. Details of who to contact for National Grid's distribution assets, including their local high pressure pipelines, can be found via <http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW>

For other energy network operators' contact details see <http://2008.energynetworks.org/>

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7 - JUL 2008

National One Call Enquiry EQ/WRVWC575		 national-one-call.co.uk PlanToDig	
Site: Bridge north of A948, Ellon, Aberdeenshire, UK			
Details: Structure crossing dismantled railway north east of Ellon at Grid ref NJ972316			
To: Scotland Gas Networks (Distribution), Scotia Gas Networks Plant Location Department 95 Kilbirnie Street Glasgow G5 8JD			
Documents / Responses Requested from			
Scotland Gas Networks (Distribution)			
Requests are made for the following documents.			
Document	Respond Online	By Email	By Fax
Gas Plan	AssetGuard Service	Click here to email	0845 280 2040
See our PlanBroker Service to see how we can help to ensure you receive all appropriate enquiries and apply your rules and prices to help protect your plant and aid co-ordination.			
 Map data ©2008 Tele Atlas - Terms of Use			
Required Date	17/07/2008	Response Deadline 16/07/2008	
Client	Structural Soils Ltd		
Contact	Retriever from National One Call		
Email address	retriever@national-one-call.co.uk Click this address to respond by email.		
Postal Address	National One Call, 1 Mill Place, Mill Road Industrial Estate, Linlithgow Bridge, West Lothian, EH49 7TL		
Phone	0844 800 9957	Fax 0845 280 2040	
Work Intention	Works Intended		
Created Date	02/07/2008		
Notice given	15 Days (11 Workdays)		
Location Address	Bridge north of A948, Ellon, Aberdeenshire, UK		
Site Description	Structure crossing dismantled railway north east of Ellon at Grid ref NJ972316		
Comments			
Approximate OS Centre Point	NJ 97037 31585 : Easting 397037 , Northing 831585		
Bounding Box	397062,831523 to 397012,831647		
Information in this enquiry is as supplied by the enquirer and there may be differences or errors within textual descriptions and the map and coordinates quoted. Asset Owners are commended to cross check location details before responding to the enquiry. National One Call is not responsible for any damaged, outcomes, delays or any other liabilities arising from errors or omissions in enquiries or responses however caused. Please contact National One Call with any issues or difficulties regarding this enquiry.			
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Squance, Andrew

From: retriever@national-one-call.co.uk
Sent: 02 July 2008 11:02
To: National Plant Enquiry's
Subject: Cable & Wireless - EQ/WRVWC575
Follow Up Flag: Follow up
Flag Status: Red

NEW ROADS AND STREET WORKS ACT - 1991
PLANT ENQUIRY
CABLE AND WIRELESS PLANT IS
NOT AFFECTED
TEL: 01454 288808 FAX: 0870 240 9013

623002
45.

National One Call Enquiry EQ/WRVWC575

Documents / Responses Requested from

Cable & Wireless

Requests are made for the following documents.

Click the document to see the Plan

Use this section only for marking up to fax /Email

Document	Affected	Action Taken / Required / Comments	Charge
Telecoms. Plan	Yes / No		£

Click here to see the marked-up plan

If you prefer, you can print this form, mark it up and fax it back to us on 0845 280 2040
If you are faxing this form to us and are not affected, simply highlight 'No'. If you are affected, tell us what action you have taken, or that we should take to obtain the document and if there is a charge made for you providing the document.

Required Date	17/07/2008	Response Deadline 16/07/2008
Organisation	Structural Soils Ltd	
Contact	Retriever from National One Call	
Email address	retriever@national-one-call.co.uk Click this address to respond by email.	
Postal Address	National One Call, 1 Mill Place, Mill Road Industrial Estate, Linlithgow Bridge, West Lothian, EH49 7TL	
Phone	0844 800 9957	Fax 0845 280 2040
Work Intention	Works Intended	
Created Date	02/07/2008	
Notice given	15 Days (11 Workdays)	
Location Address	Bridge north of A948, Ellon, Aberdeenshire, UK	
Site Description	Structure crossing dismantled railway north east of Ellon at Grid ref NJ972316	
Comments		
Approximate OS Centre Point	NJ 97037 31585 : Easting 397037 , Northing 831585	
Bounding Box	397062,831523 to 397012,831647	

Click here to see the marked-up plan

This message has been scanned for viruses by MailControl

14/07/2008

Appendix C - Trial Pit Log



STRUCTURAL SOILS

TRIAL PIT LOG

Contract: BE4 Bridge Assessments		Client: Jacobs		Trialpit: EBD/56 TP01
Contract Ref: 760464	Date: 11.08.08	Ground Level: ---	National Grid Co-ordinates: E:3972.0 N:8316.0	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Grass over brown slightly clayey slightly silty gravelly fine to medium SAND. Gravel is angular fine to coarse granite.		
						MADE GROUND: Tar Coating	0.37	
						MADE GROUND: Moderately strong grey CONCRETE. Cast Iron Girder encased in concrete at 0.38m depth	0.38	
						Trial pit terminated at 0.54m depth.	0.54	

Plan (Not to Scale) 		General Remarks 1. Prior to excavation location was CAT Scan and underground plant drawings consulted. 2. On completion trial hole was reinstated to local authorities specifications.	
Method Used: Hand dug		Plant Used: Hand tools	
Logged By:		Checked By:	
All dimensions in metres		Scale: 1:6	

Appendix D - Form AA

FORM 'AA' (BRIDGES)**GC/TP0356**

ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT**Bridge/Line Name:** Balmacassie Bridge, Ellon / Ellon to Boddam**ELR/Bridge No.** EBD/756**Brief Description of Existing Bridge:****(a) Span Arrangement**

A single span simply supported overbridge with clear square span of 4.52m (14'-10").

(b) Superstructure Type

The deck consists of six longitudinally spanning cast iron girders at approximately 4'-2" centres. There is brick jack arch construction between the girders supported on the girder bottom flanges. The edge girders support cast iron parapets.

(c) Substructure Type

The abutments are constructed from squared off granite blocks laid to courses. The curved wingwalls are similar granite construction.

(d) Planned highway works/modifications at this site

None

(e) Road designation class and whether classed as a heavy load route

The bridge carries an unclassified single carriageway road, 3.0 m (9'-10") wide with 1.7m (5'-7") wide grass verges on each side of the carriageway. Overall width between the parapets is 6.4m (21'-0"). It is not a heavy load route.

(f) Any other requirements

None

FORM 'AA' (BRIDGES)**GC/TP0356**

ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT**Assessment Criteria****(a) Loadings and Speed**

Section sizes used to calculate dead loads obtained from site measurements. (See Jacobs report "VAR9-2005 Assessment Programme – Assessment and Inspection Report – Bridge Ref.: EDB/756 – August 2008). Vehicle loading obtained from and applied in accordance with BE4. Standard BE4 loading representative of 24 ton vehicles will be assessed.

(b) Codes to be used

BE4 - "The Assessment of Highway Bridges for Construction and Use Vehicles" Ministry of Transport, 1967 (with amendments to 1969).

(c) Proposed Method of Structural Analysis

The deck loading is amenable to analysis by the quick assessment method outlined in Part 2 of BE4. The edge girders will be unaffected by live loads applied in accordance with BE4 as internal girders are positioned between them and the near-side line of wheels. The edge girders will be checked under dead and superimposed dead load only.

Capacities will be calculated using measurements of reduced section sizes where corrosion is present, as identified in the Inspection Report. Consequently, a general condition factor is not applied.

With concrete surround to the girders, enhancement of the section modulus for live load in accordance with BE4 Part I: 305 b ii 1 (D/d) will be used.

Review of the adequacy of the jack arches and tie-rods will be based upon the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties.)

FORM 'AA' (BRIDGES)

GC/TP0356

ELR/ Bridge No. EBD/756

Appendix: 4

Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT**Senior Civil Engineer's Comments**


None

Proposed Category for Independent Check ... *Cat. I*Superstructure ... *Cat. I*Substructure ... *Cat. I*

Name of Checker suggested if Cat 2 or 3

Category 1

The above assessment, with amendments shown, is approved in principle:

Signed Title *Civil Engineer*Date *26/1/98***Category 2 and 3**

The above assessment, with amendments shown, is approved in principle:

Signed

Title

Date

Signed

Title

Date

Appendix E - Form BA

FORM 'BA' (BRIDGES)**GC/TP0356**

ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: A (Dec 2005)

CERTIFICATION FOR ASSESSMENT CHECK**Assessment Group:** Jacobs Engineering UK Ltd**Bridge/Line Name:** Balmacassie Bridge, Ellon / Ellon to Boddam**Category of Check:** 1**ELR/ Bridge No:** EBD/756

We 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 as recorded on Form AA approved on 26 November 2008
- (2) It has been checked for compliance with the following principal British Standards, Codes of Practice, BRB (Residuary) Limited technical notes and Assessment standards:

BE4 - "The Assessment of Highway Bridges for Construction and Use Vehicles" Ministry of Transport, 1967 (with amendments to 1969).

List any departures from the above and additional methods or criteria adopted, with reference and justification for their acceptance.

None

Category 1

Name _____ Signature _____ Date _____

Assessor

Assessment Checker

Authorised signatory of
the firm of Consulting
Engineers to whom
Assessor/Checker is
responsible.

FORM 'BA' (BRIDGES)**GC/TP0356**

ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: A (Dec 2005)

CERTIFICATION FOR ASSESSMENT CHECKCategory 2 and 3 (Note: Category 1 check must also be signed)(a) AssessmentNameSignatureDate

Assessor

Assessment Checker

Authorised signatory of
the firm of Consulting
Engineers to whom
Assessor/Checker is
responsible.

(b) CheckNameSignatureDate

Assessor

Assessment Checker

Authorised signatory of
the firm of consulting
engineers to whom
Assessor/Checker is
responsible.

This Certificate is accepted by..



FORM 'BAA' (BRIDGES)**GC/TP0356**

ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: A (Dec 2005)

CERTIFICATION FOR ASSESSMENT CHECK**Notification of Assessment Check**

Assessment Group	Jacobs Engineering UK Ltd
Bridge Name/Road No.	Balmacassie Bridge, Ellon / unclassified
Line Name	Ellon to Boddam
ELR Code/Structure No.	EBD/756

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

Internal girders:	Full C& U loading 24 tons
Edge girders:	8 x dead load. No BE4 live load applied.
Jack arches and tie bars	Dead load only
Abutments (qualitative assessment)	Full C&U loading

Recommended Loading Restrictions

Theoretical rating of dead load only due to corroded tie bars. In practice, with no BE4 live load imposed on the edge bays, normal traffic may be permitted on the carriageway. The installation of temporary barriers to prevent loading of the verges is recommended as an interim measure.

Full C&U (24 tons) if the tie bars are replaced

Description of Structural Deficiencies and Recommended Strengthening

To achieve full 24 ton C&U capacity, it will be necessary to replace the tie bars with suitable tensioned bars between the bottom flanges of the girders in the outer bays.

No other maintenance is required in the short term.

FORM 'BAA' (BRIDGES)

GC/TP0356

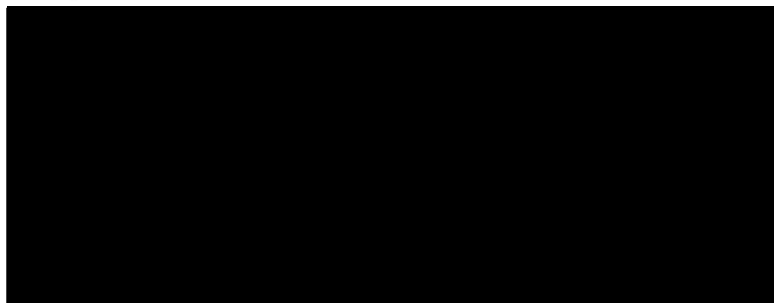
ELR/ Bridge No EBD/756

Appendix: 4

Issue: 1

Revision: A (Dec 2005)

CERTIFICATION FOR ASSESSMENT CHECK



te

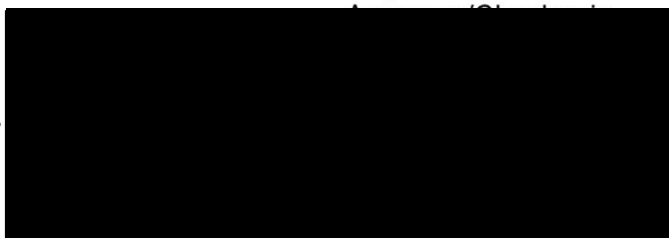
12/08 Assessor

12/08 Assessment Checker

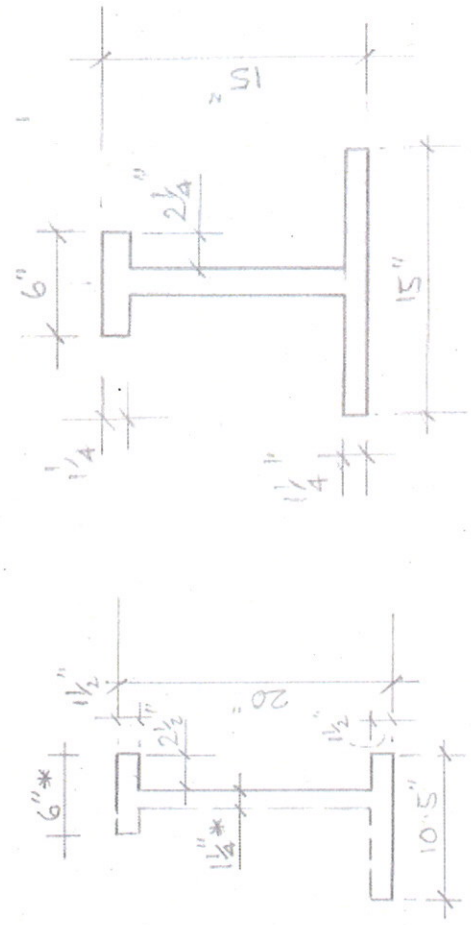
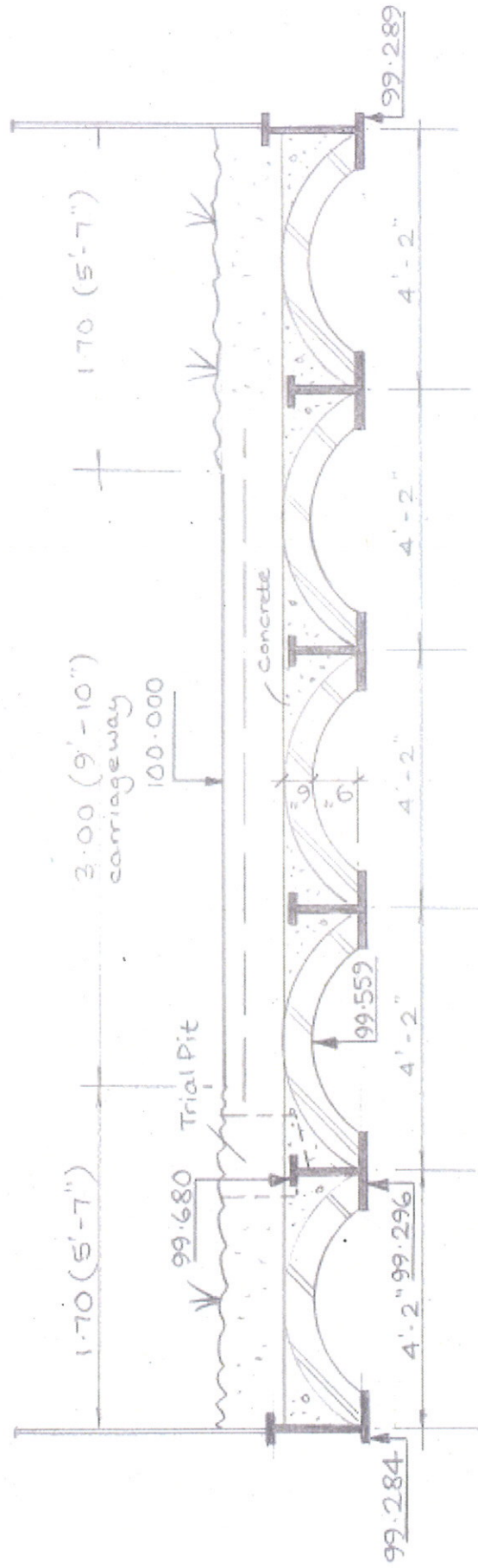
12/08

Authorised signatory of
the firm of Consulting
Engineers to whom

This Certificate is accepted by....



Appendix F - Calculations



CALCULATION COVER SHEET

**Jacobs
Reading**

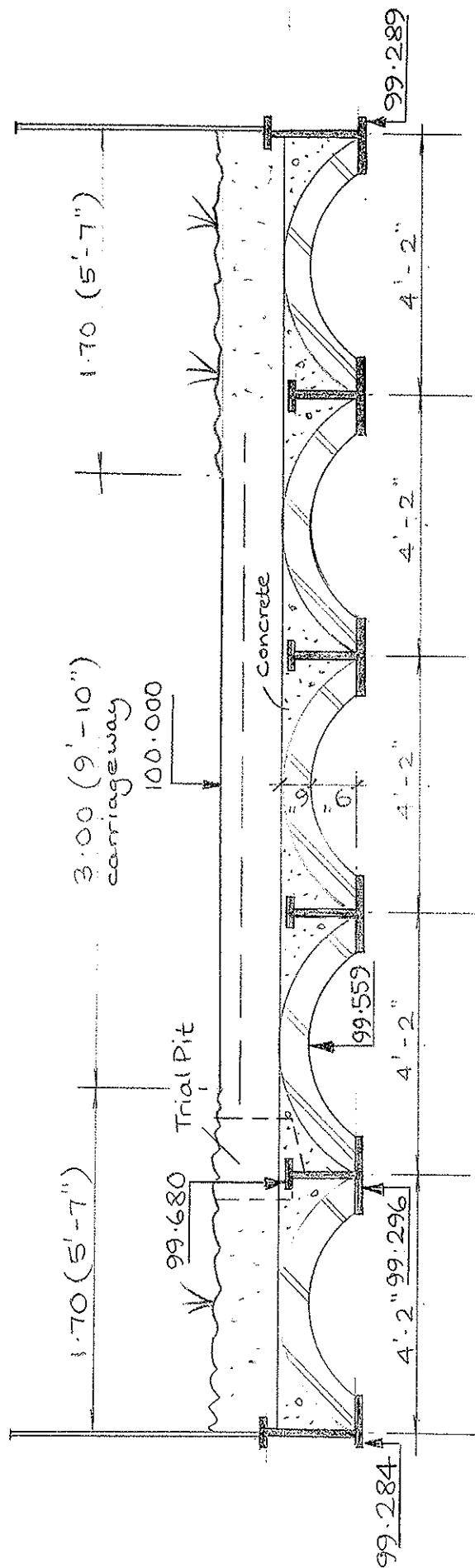
Project Title: BRB (Residuary) Ltd - Major Works 2004/2009		Calc. No.: 144
Job No: J24110PI		File: R13
Project Manager	[REDACTED]	Subject: Balmacassie Bridge, Ellon, Aberdeenshire EBD/756 BE4 Assessments
Designer		
Project Group		
31400		

	Total Sheets	Made by	Date	Checked by	Date	Reviewed by	Date		
Original	14	ME	Dec-08	JLR	Dec-08				
Rev									
Rev									
Rev									
Rev									
Rev									

Superseded by Calculation No.

Date

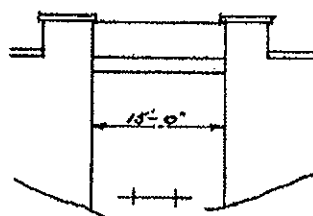
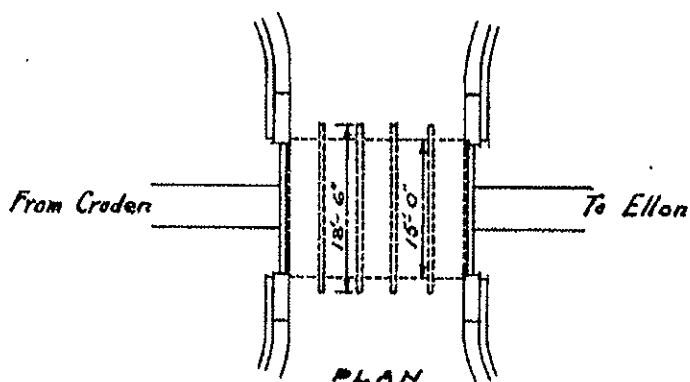
For design criteria, refer to Approval in Principle (Form AA) document



Aug. 2008

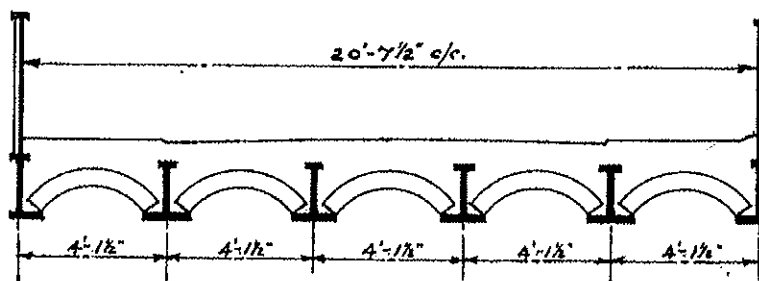
Levels in metres

BALMACASSIE
756.

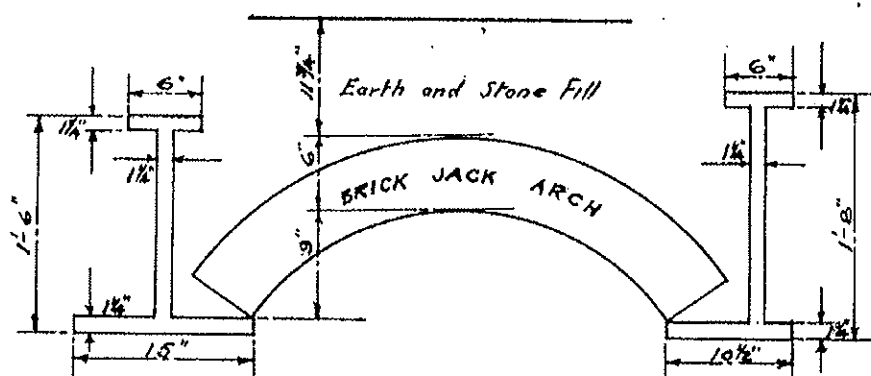


ELEVATION
Scale - 1" = 16'

SHEET No. 2
CALC No. 144
FILE R13
JOB No. J324110 PI
MADE BY ME
CHECKED BY JLR



CROSS SECTION
Scale - 1" = 4'



**INSIDE
GIRDER**

MATERIAL - C.I.

OUTSIDE
GIRDER

CALCULATION SHEET

JACOBS™

Project Title: <u>VAR 9/2005</u>		Sheet No: <u>3</u>	
Subject: <u>EBD 1756</u>		Calc No: <u>144</u>	
Job No: <u>J24110 P1</u>		File: <u>R13</u>	
Made By: <u>ME</u>	Date: <u>12/08</u>	Revised By:	Date:
Checked By: <u>JFR</u>	Date: <u>12/08</u>	Checked By:	Date:

Internal Girder EBD/756

Element	Dimension		Area	y from top	Ay	A(y-y1)^2	I=bd^3/12
	b	d					
Top flange	6	1.25	7.50	0.625	4.69	522.31	0.98
Web	1.5	12.5	18.75	7.50	140.63	40.52	244.14
Bottom flange	15	1.125	16.88	14.31	241.52	481.63	1.78
NET AREA			43.13		386.84		
GROSS AREA			43.13				
Depth to Neutral Axis y1		8.97					
Sum						1044.46	246.90

Bottom flange thickness

with considering corrosion = $1.25" \times 0.9 = 1.125"$ ✓

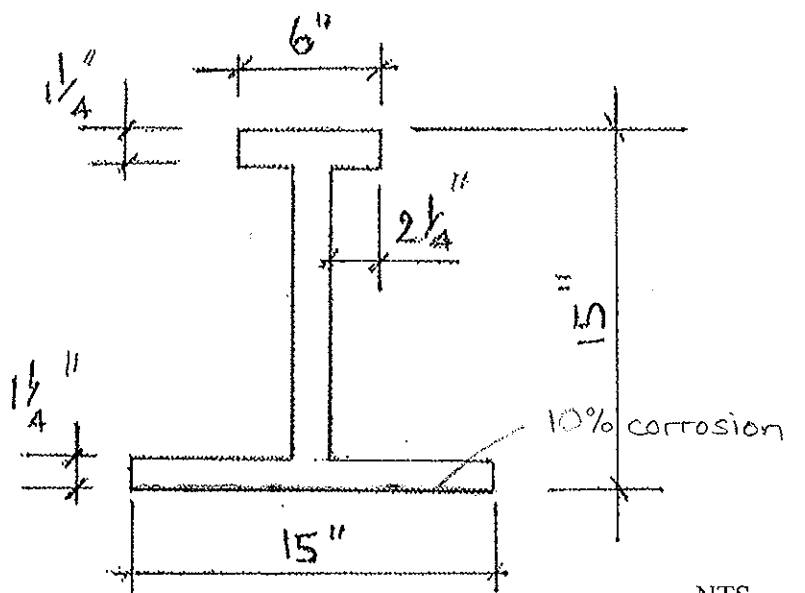
Ixx= 1291.36

Ztop= 143.96

Zbot= 218.69

Girder area without corrosion=

$43.13 + 15 \times 1.25 \times 0.1 = 45.01$ sqin ✓



NTS

CALCULATION SHEET

JACOBS™

Project Title: VAR9/2005		Sheet No: 4	
Subject: EBD/756		Calc No: 144	
Job No: J24110 P1			File: R13
Made By: ME	Date: 12-08	Revised By:	Date:
Checked By: JLR	Date: 12/08	Checked By:	Date:

INTERNAL BEAMS

Dead load

Girder self weight:

$$\text{Girder area} = 45.01 \text{ sqin} = 0.313 \text{ sqft}$$

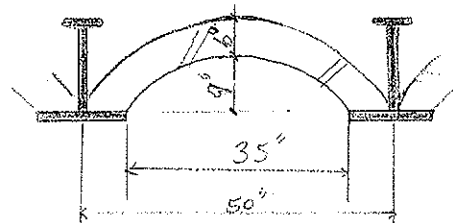
$$\begin{aligned} \text{Self weight} &= 450 \text{ lb/cu ft} \times 0.313 \text{ sqft} \times 1.1 \text{ ft} \quad \text{stiffeners etc.} \\ &= 155.0 \text{ lb/ft} \end{aligned}$$

Jack arches:

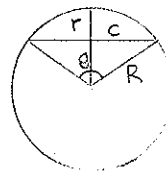
$$\text{Jack arch thickness} = 6''$$

$$\text{Jack arch rise} = 9''$$

$$\text{Jack arch internal span} = 35''$$



$$R = \frac{(35/2)^2 + 9^2}{2 \times 9} = 21.5''$$



$$\begin{aligned} \text{Subtended angle} &= 2 \times \sin^{-1}((35/2)/21.5) \\ &= 109^\circ \end{aligned}$$

Area of jack arch brickwork

$$= \pi [(21.5'' + 6'')^2 - 21.5'^2] \times 109/360$$

$$= 279.7 \text{ sqin} = 1.942 \text{ sq.ft}$$

CALCULATION SHEET

JACOBS

Project Title: VAR 9 / 2005		Sheet No: 5	
Subject: EBD 1756		Calc No: 144	
Job No: J24110 PI		File: R13	
Made By: ME	Date: 12-08	Revised By:	Date:
Checked By: JLR	Date: 12/08	Checked By:	Date:

$$\text{Segment area} = r \times 21.5^2 \times \frac{109}{360} - \frac{35}{2} (21.5 - 9)$$

$$= 220.9 \text{ sq. in.} = 1.534 \text{ sq. ft}$$

Jack arch self weight:

$$= 144 \text{ lb/cuft} \times 1.942 \text{ sq. ft}$$

$$= 280 \text{ lb/ft}$$

$$\text{Fill area} = \left[(100.000 - 99.296) \times \frac{1000}{25.4} - 1.25'' \right] \times 50'' - 279.7'' - 220.9 - 43.13$$

$$= 796.5 \text{ sq. in.} = 5.53 \text{ sq. ft}$$

Jack arch area
 Girder area
 Segment area
 Bottom flange

Fill self weight:

$$= 135 \text{ lb/cuft} \times 5.53$$

$$= 747 \text{ lb/ft}$$

Total dead load

$$= 155 + 280 + 747$$

$$= 1182 \text{ lb/ft} = 0.528 \text{ ton/ft}$$

CALCULATION SHEET

JACOBS™

Project Title: VAR9-2005		Sheet No: 6	
Subject: EBD1756		Calc No: 144	
Job No: J24110 PI		File: R13	
Made By: ME	Date: 12-08	Revised By:	Date:
Checked By: JLR	Date: 12/08	Checked By:	Date:

BE4 Part I

Effective span:

303(A)

$$\text{clear span} = 14'-10" = 14.833'$$

$$\text{Effective span} = 14.833 + \left(\frac{1}{3} \times 1.25' \times 0.5 \times 2\right) = 15.25' \quad \text{stone bearing}$$

carriage way width = 9'-10" \Rightarrow Single lane loading ✓

Dead load moment at midspan

$$= \frac{wL^2}{8} = \frac{0.524 \times 15.25^2}{8} = 15.23 \text{ ton.ft} = 183 \text{ ton.in}$$

$$f_d = \frac{8M}{L^2} = \frac{183}{218.69} = 0.837 \text{ ton/in}^2$$

304(C)

$$f_l = \frac{8 - 2.2 f_d}{5} = \frac{8 - 2.2 \times 0.837}{5} = 1.23 \text{ ton/in}^2$$

$$\text{check: } 0.837 + 1.23 = 2.07 < 3.0 \text{ ton/in}^2 \quad \text{OK} \checkmark$$

\therefore Permissible live load moment:

$$M_L = \frac{2}{3} \times f_l \times L^2 = 218.69 \times 1.23 = 268.99 \text{ ton.in} = 22.42 \text{ ton.ft}$$

Graph NO 1
P. 7

$$K = 0.34$$

$$M_{LL} = \frac{22.42}{0.34} = 65.94 \text{ ton.ft}$$

Graph NOS
P. 8

Bridge capacity is adequate for 24 ton Vehicle without considering enhancement factor.

CALCULATION SHEET

JACOBS

Project Title: VAR9 - 2005		Sheet No: 6A	
Subject: EBD1756		Calc No: 144	
Job No: J2411001		File: R13	
Made By: ME	Date: 12-08	Revised By:	Date:
Checked By: JLR	Date: 12/08	Checked By:	Date:

As concrete fill is approximately at top flange level: -

BE4 Part I
305/11

D/d enhance factor:

D = depth of concrete, hence $D \approx d \Rightarrow$

$$\therefore D/d \approx 1$$

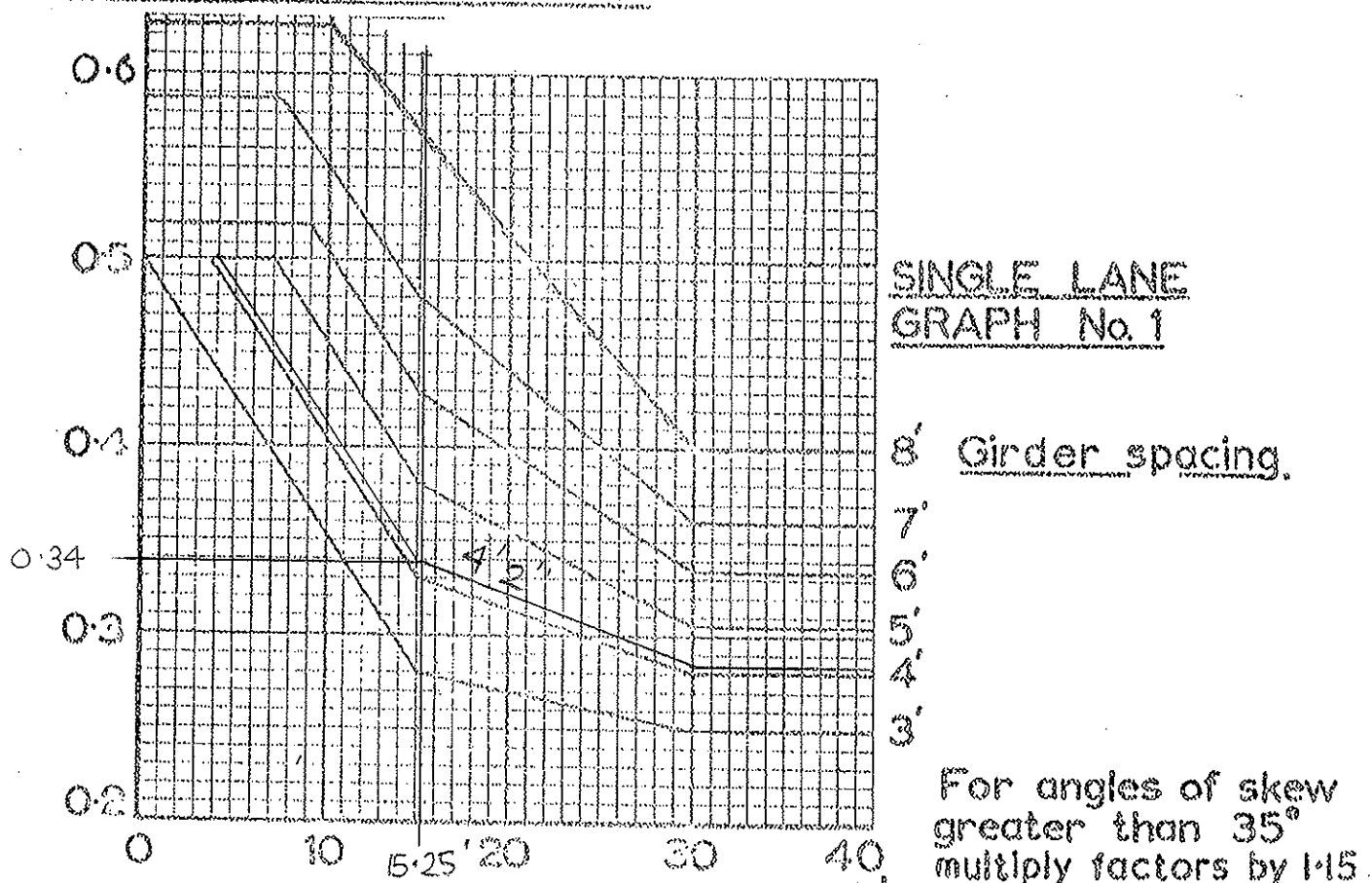
The effect of D/d enhance factor is negligible.

CALCULATION SHEET

JACOBS™

Project Title: <i>VAR9/2005</i>		Sheet No: <i>7</i>	
Subject: <i>EBD1756</i>		Calc No: <i>144</i>	
Job No: <i>324110P1</i>		File: <i>R13</i>	
Made By: <i>ME</i>	Date: <i>12-08</i>	Revised By:	Date:
Checked By: <i>JLR</i>	Date: <i>12/08</i>	Checked By:	Date:

PROPORTION FACTORS FOR INTERNAL LONGITUDINAL GIRDERS.

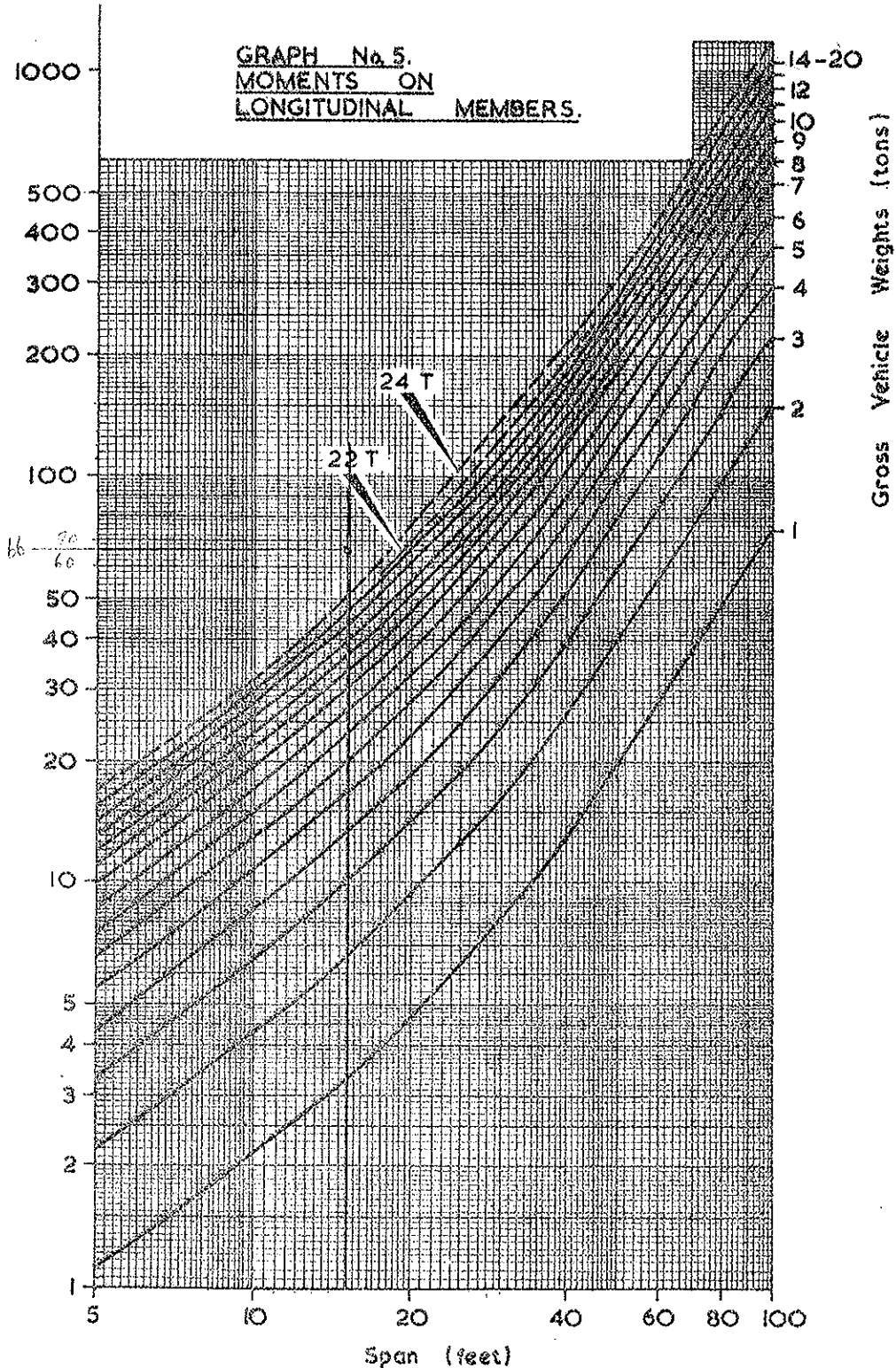


CALCULATION SHEET

JACOBS™

Project Title: VAR 9 / 2005		Sheet No: 8	
Subject: EBD1756		Calc No: 144	
Job No: J2440 P1		File: KB	
Made By: ME	Date: 12-08	Revised By:	Date:
Checked By: JLR	Date: 12/08	Checked By:	Date:

Bending Moment (tons feet) due to one lane of vehicles including 25% impact on one axle



CALCULATION SHEET

JACOBS

Project Title: <i>VAR 9/2005</i>	Sheet No: <i>9</i>		
Subject: <i>EBD/756</i>	Calc No: <i>144</i>		
Job No: <i>J24110 P1</i>	File: <i>R13</i>		
Made By: <i>ME</i>	Date: <i>12-08</i>	Revised By:	Date:
Checked By: <i>JLR</i>	Date: <i>12/08</i>	Checked By:	Date:

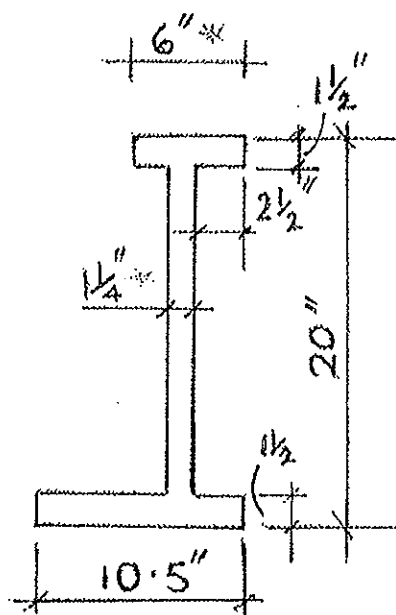
Edge Girders EBD/756

Element	Dimension		Area	y from top	Ay	A(y-y1)^2	I=bd^3/12
	b	d					
Top flange	6	1.5	9.00	0.750	6.75	1012.64	1.69
Web	1.25	17	21.25	10.000	212.50	39.15	511.77
Bottom flange	10.5	1.5	15.75	19.250	303.19	981.13	2.95
NET AREA			46.00		522.44		
GROSS AREA			46.00				
Depth to Neutral Axis y1		11.36					
Sum						2032.92	516.41

Ixx= 2549.33

Ztop= 224.47

Zbot= 294.97



NTS

CALCULATION SHEET

JACOBS

Project Title: VAR 9 / 2005			Sheet No: 10	
Subject: EBD / 2005			Calc No: 144	
Job No: J24 HOP1		File: R13		
Made By: ME	Date: 12-08	Revised By:		Date:
Checked By: JLR	Date: 12/08	Checked By:		Date:

EDGE GIRDERS

Dead loads

$$\begin{aligned} \text{Parapet dead load} &= 480 \text{ lb/ft} \times (0.25' \times 34') / 12^2 \\ &= 28.0 \text{ lb/ft} \end{aligned}$$

$$\begin{aligned} \text{Edge girder self weight} &= 450 \text{ lb/ft} \times 46.0' / 12^2 \times 1.1 \\ &= 158.0 \text{ lb/ft} \end{aligned}$$

P.5

$$\begin{aligned} \text{Jack arch dead load} &= 280 \text{ lb/ft} / 2 \\ &= 140 \text{ lb/ft} \end{aligned}$$

$$\begin{aligned} \text{Fill dead load} &= 719' / 2 \\ &= 360 \text{ lb/ft} \end{aligned}$$

$$\begin{aligned} \text{Total dead load} &= 28 + 158 + 140 + 360 \\ &= 686 \text{ lb/ft} = 0.306 \text{ ton/ft} \end{aligned}$$

Since the carriage way edge located inside the intermediate beams live load is ignored for the edge beam.

$$\begin{aligned} \therefore \text{Max bending moment} &= wL^2/8 = 0.306 \times 15.25^2 / 8 \\ &= 8.90 \text{ ton.ft} = 106 \text{ ton.in} \end{aligned}$$

$$f_D = \frac{M}{Z_{bot}} = \frac{106}{294.97} = 0.36 < 3.0 \text{ OK } \checkmark$$

$$\text{Edge girder capacity} = 3.0 \times 294.97 = 885 \text{ ton.in} = 73.7 \text{ ton.ft}$$

**PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK
ARCHES AND ASSOCIATED TIES**
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Balmacassie Bridge, Ellon, Aberdeenshire
RAILTRACK NO:	EBD/756

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 1 CHECKS FOR COMPLIANCE WITH 24 T CONFIGURATION REQUIREMENTS

	Compliant Yes/No
What is maximum clear span of the arch <i>Non-compliant if greater than 2.0m</i>	0.889m <u>Yes</u>
Do jack arches spring from bottom flanges of beams? <i>If not, non compliant</i>	<u>Yes</u>
What is the beam spacing? What is the rise of the arch? Gross aspect ratio <i>Non-compliant if greater than 10</i>	b=1.270m r _c =0.229m b/r _c =5.5 <u>Yes</u>
What is the arch barrel thickness (including concrete fill above) and how is it derived ie from record drawings or site investigation? <i>Non-compliant if thickness less than 220</i>	d := 152 mm <u>Yes</u>

SHEET No. 11
CALC No. 144
FILE R13
JOB No J24110 PI
MADE BY ME
CHECKED BY JLR

**PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK
ARCHES AND ASSOCIATED TIES**
(To be included with the Assessment Report Calculations)

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

[illegible]

2	<p>Do jack arches span longitudinally (eg in half through girder construction) or transversely between longitudinal girders? <u>-Transversely-</u></p> <p>For longitudinal spanning jack arches, ignore following questions on ties/lateral restraint and state N/A.</p> <p>Are ties provided in edge bays of transversely spanning jack arches? yes</p> <p>If yes, go to 3a/3b If not, fail unless edge bay is 'hard' (see 5)</p>	pass
3a	<p>What is the cross sectional area of one tie? (allowing for corrosion losses) Diameter of tie $\text{Dia} := 0 \text{ mm}$</p> <p style="text-align: center;">Therefore Area $A := \pi (\text{ })^2$ $A := 0 \text{ mm}^2$</p> <p>What is number of ties per beam length? $n := 0$</p> <p>What is the clear skew span? $L := 0 \text{ m}$</p> <p>Specific area of tie $A_s := \frac{(n+1) \cdot A}{L}$ $A_s := 0 \frac{\text{mm}^2}{\text{m}}$</p> <p style="text-align: center;"><i>Non-compliant if less than 260mm²/m</i></p> <p>What is maximum tie spacing? $S := 0 \text{ m}$</p> <p style="text-align: center;"><i>Non-compliant if greater than 2.5m for cast iron</i></p>	Fail
3b	<p>What is the cross sectional area of one tie? (allowing for corrosion losses) Dimensions of the tie $\text{dt1} := 1 \text{ mm}$</p> <p style="text-align: center;">Therefore Area $A := \text{dt1} \cdot \text{dt2}$ $A = 0 \text{ mm}^2$</p> <p>What is number of ties per beam length? $n := 1$</p> <p>What is the clear skew span? $L := 1 \text{ m}$</p> <p>Specific area of tie $A_s := \frac{(n+1) \cdot A}{L}$ $A_s = 0 \frac{\text{mm}^2}{\text{m}}$</p> <p style="text-align: center;"><i>Non-compliant if less than 260mm²/m</i></p> <p>What is maximum tie spacing? $S := 1 \text{ m}$</p> <p style="text-align: center;"><i>Non-compliant if greater than 3.0m for wrought iron/steel</i></p>	
4	<p>Are ties located within crown of external arch? <u>No</u></p> <p style="text-align: center;"><i>If so, then fail CI or possible fail for WI/steel</i></p>	Pass
5	<p>Does external bay construction provide alternative lateral restraint? (ie not soft edge)?</p> <p style="text-align: center;"><i>If so, pass. If not, are ties provided in first Jack Arch bay? if yes treat as 3a (or 3b), otherwise fail.</i></p>	Fail

Notes: (1) Results also in loss of D/d (composite action) for cast iron beams

(4) A trial hole should be undertaken to confirm the existence of structural backing if there is any doubt.

SHEET No. 14
 CALC No. 144
 FILE R13
 JOB No. J24 110 P1
 MADE BY ME
 CHECKED BY gfr

**PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK
 ARCHES AND ASSOCIATED TIES**

(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Balmacassie Bridge, Ellon, Aberdeenshire
RAILTRACK NO:	EBD/756

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 3 CHECKS FOR DEFICIENCY

Type No	Defect	Empirical Assessment		Pass/Fail
		CI Decks	WI/Steel Decks	
6	Rotation of supporting beam? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
7	Horizontal displacement of supporting beam? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
8	Inadequate support to springings eg corrosion of bottom flange of supporting beam over a significant length, missing bedding mortar? <u>No</u>	Possible Fail	<u>NA</u>	<u>Pass</u>
9	Transversely bowed bottom flange of supporting beam? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
10	Cracking at crown of arch owing to spreading of springings (other than 12, 13)? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
11	Distortion and any associated cracking of jack arch barrel? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
12	Arch crack resulting in substructure crack? <u>No</u>	Fail	<u>NA</u>	<u>Pass</u>
13	Substructure crack or other distress resulting in crack to jack arch? <u>No</u>	Possible Fail	<u>NA</u>	<u>Pass</u>

Notes: