PROFESS 0900/03
R/2/111

MABEY SUPPORT SYSTEMS

BRIDGE INSPECTION REPORT

Client:
Moray Council

Site:
Broom of Moy

Date of Inspection: 15th January 2004
Report Date: 11th February 2004

Mabey Support Systems Ltd.
Bridge House, Strange Road, Garswood
Ashton-in-Makerfield, Lancs. WN4 0RX

Mabey Support Systems Ltd

Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**

BRIDGE INSPECTION REPORT

For: Moray Council

Bridge Site: Broom of Moy

CONTENTS

Exclusions

Please note that this report is based on a visual inspection of the steelwork only and excludes:-

i) Foundations and approaches.

ii) Detailed checks on steel thicknesses and welds etc.

iii) Areas not accessible at the time of inspection.

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Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**

SECTION 1

INSPECTOR'S REPORT

Mabey Support Systems Ltd

Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**

Bridge Identification

Trusses: Original Bailey Bridge
Double Double construction
Inner truss centres 3937mm
Truss line at 457 from inner truss line
Span – 18 bays (54.86m)

Orientation: Female End to East

Deck: Standard Bailey Timber Deck
Transoms measured at approx. 254mm x 114mm
Timber chesses 225 x 50 (approx.)

Bearing: Each corner supported by a double bearing

General comment on condition

Bridge looks to be in a reasonable condition, there are no major signs of corrosion on the steelwork and all major components are still present.
Some of the timber decking has rotted away leaving holes in the timber chesses.
A sag of 300mm approx is present in the bridge.

Limitations of inspection

Bridge inspected visually as far as practicable, i.e.

a) All accessible areas from top of deck.
b) Bridge was inspected from below in the last 5 bays only.
c) Remnants of fill at ends of bridge prevented full inspection.

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Site: Broom of Moy **Date: 21 January 2004**

Bridge Condition

1) Trusses

a) Panels:

All panels look to be generally in a good condition. The surface coating has been applied fairly thickly and is protecting most of the steelwork. Where the surfacing coating has been chipped off ie at the junction where the chords of the double story panels meet, there has been some corrosion.

b) Truss bracing:

All bracing members are present and there are no visual signs of damage or corrosion.

c) Tie Beams:

Not Applicable.

d) Rakers:

All present and in a good condition.

e) Pins/Bolts:

All but one panel pin is in position, although no safety clips are present throughout the bridge. One pin on the outside North truss has not been fully inserted. All pins are coated in paint and are in a good condition.

All bolts are present and are completely seized. Nuts and bolts are completely covered in paint.

Surface rust is present in several locations but there is little sign of loss of section.

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2) Transoms:

a) Excluding ends of bridge

All transoms look to be in a reasonable condition. There is no significant loss of section at panel to transom interface or at the stringer locations on the top flange of the beam. The paintwork is still present over the majority of the beam and only slight signs of corrosion are visible where the paint has flaked off.

b) End Transoms:

The 1st transom on the West side has a bent top flange that has resulted in the web bending slightly at the top. This was probably done while the transom was in service on another bridge or during erection.

c) Transom Clamps:

3 No. transom clamps are missing off of the South truss (Bay 1, 8 and 18.) Remaining clamps are in position and are tight.

3) Swaybraces:

The swaybraces are all present and most are tight. The turnbuckles which allow adjustment of the braces are likely to be completely seized.

Mabey Support Systems Ltd

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Site: Broom of Moy **Date: 21 January 2004**

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4) Deck

a) Stringers:

The stringers look to be in a reasonable condition from the sample seen at one end of the bridge. There is little sign of corrosion but it may be wise to remove one or two bays of the timber decking at random to have a closer look at the stringers to try and gauge for any loss of section at the transom positions.

One middle stringer has been removed at the East (female) end to allow a steel post to be welded onto the transom.

b) Timber chesses:

The chesses are deteriorating and need to be individually assessed for condition, and replaced as necessary. All chesses are splitting horizontally at the ends and some have quite sizable holes through the decks.

c) Timber Ribands (kerbs):

These also are deteriorating and need to be individually assessed for condition, and replaced as necessary.

5) Bearings/End Posts:

There is not too much debris present around the two ends of the bridge. This has allowed the air to flow around the bearings/lower part of the panels and along with the surface coating has resulted in little corrosion.

Debris prevented an assessment of the likely movement of bearings due to temperature effects.

5) Side Mesh:

The existing side mesh is coming away in places and should be replaced.

Inspected By: C M'S
Date Inspected: **15th January 2004**

(GAVIN M°SWEENEY
ASST. PROJECT ENGINEER)

SECTION 2

ENGINEERING ASSESSMENT

Loading

The loads considered in the assessment were: -

5kN/m^2 Pedestrian loading to BD 37/01

Decking

- Timber decking and stringers
- Transoms

The original design of Bailey Timber Deck, with 2 transoms per 10' bay was to suit a maximum of 9 tons axle weight (or a 2-axle bogey of 18 tons with axles at 4' centres), and a maximum wheel load of 4.5 tonnes.
As the bridge is now only a footbridge, the transoms and stringers are well within their reduced capacity to take the above loading.

Please note that we have down rated the tabulated capacities as follows –

Deck Stringers – Taken 80% of capacity due to uncertainties in stringers that could not be inspected.

Transoms – Taken 85% capacity due to age, condition and unknown history.

Trusses and Bearings

Considering the age and condition of the equipment, and without any history of usage, a reduction of 10% on the published capacity data has been used.

- Shear: It is found that, after the above reduction factor is applied, the concentration of loadings at the ends of the bridge does not exceed the bridge capacity (73% utilisation). This is based on the current condition of the bridge, as inspected.

- Bending: The bending capacity is more critical. The maximum applied bending moment of the bridge is over 1.5 times the factored bending capacity. (Please refer to the details on the next page)

Mabey Support Systems Ltd

Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**

Deflection

The theoretical dead load deflection of a 55m span Bailey bridge with a DD construction is approximately **225mm**

The actual dead load deflections of the trusses are – North Truss – **267mm**
South Truss – **296mm**

This would indicate that there has been some pin hole wear in the panels, probably due to the bridge or equipment being heavily used or overloaded at some point in its life.

The values are not excessive and are not a cause for concern if considering future use as a footbridge.

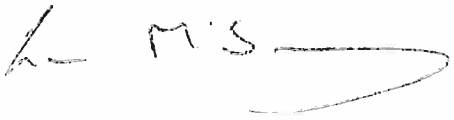
Calculations

Calculation sheet No's INSPCTBOM-01 & -02 are attached.

Engineering Assessment – Conclusions.

The bridge would not carry a live loading of $5kN/m^2$ and maintain the recommended 1.7 factor of safety (as assumed in the Bailey Manuals.) Bending is critical.

From the calculations it can be seen that the available live load bending moment is 106tm. This equates to a uniform load of 15.4 tonnes or 151 kN spread over the length of the bridge.

Engineering Assessment by: 

SECTION 3

CONCLUSIONS AND RECOMMENDATIONS

a) General Conclusions

The bridge is at present in a reasonable condition but does require some repair and a review of the maximum loading allowed on the bridge to maintain a useful life, particularly with respect to timber decking and stringers.

b) Recommendations to maintain reasonable condition

In order to maintain the bridge in a useable state, the following should be carried out:

i) Replacement of timber chesses and ribands as necessary.

ii) A visual inspection of the stringers when replacing timber chesses.

iii) Fully clear all bearings of debris, clean and check for excessive rusting. Apply a surface protection.

iv) Clean all surfaces of the bridge and apply a protective coating to minimise further deterioration of the structure.

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c) Recommendations with respect to Pedestrian Use.

Our calculations are based on using a 5kN/m^2 live loading for a footway/cycle bridge with the relevant reductions for span as illustrated in BD 37/01

This loading could be excessive when compared to the actual loads being applied to the bridge. It is essential that Moray Council come up with a suitable loading (see engineering assessment) and then find a way to enforce it. One way of doing this may be to reduce the pedestrian walkway width thus reducing the maximum live load being applied to the bridge, although additional dead load may need to be taken into consideration.

It has also been noted that on the rare occasion there may be a chance of crowd loading due to sporting activities in the River Findhorn. The bridge should be closed in advance of such an event, or at the very least, should be manned to ensure that the weight limit imposed by Moray Council is not exceeded.

The side mesh should be either patched up or completely replaced to ensure the safety of the pedestrians on the bridge.

d) Inspections and Maintenance

(See Section 4)

SECTION 4

RECOMMENDATIONS FOR INSPECTIONS & MAINTENANCE

Inspection Regime

Once the bridge has been refurbished, we would recommend the following

(A) Annual Inspection

Check each component visually for damage and surface condition and the security of all pins and bolts. Tighten bolts as required. Work through all components using a suitable check list and record findings. Lift timbers over transoms to assess transom/stringer/bracing condition.

The frequency of these inspections may be varied to suit the findings.

(B) Every 5 years

Bridge to be inspected by a Mabey Support Systems Engineer.

Maintenance

General bolt checking and tightening should be carried out at the time of inspections. The deck and bearings should be cleared of any debris at appropriate intervals. Pins and bolts will require cleaning and painting/greasing every few years. The frequency will be dependant upon specific site conditions (eg atmospheric conditions and frequency of use).

SECTION 5

EXTRACTS FROM RELEVANT BRIDGE MANUAL

Bailey Bridge – Basic Components

Each bay is composed of PANELS, which form the main girders, TRANSOMS, connected across the bottom chords of the panels to carry the roadway, RAKERS, connected between panels and transoms to provide stability, and SWAYBRACES connected diagonally between the panel bottom chords to form, with the transoms a lateral bracing system. This is the basic structure. BRACING FRAMES and TIEPLATES are used to connect together panels in multiple-truss side girders.

To carry the roadway, PLAIN and BUTTON STRINGERS are placed on top of the transoms. The Button Stringers, in the two outer positions, having a series of buttons which locate timber CHESSES which form the actual roadway. RIBANDS, acting as kerbs at either side of the deck, are anchored to the Button Stringers, retaining the Chesses in position.

At each end of the bridge END POSTS are attached to the panels to transfer the loads through the BEARINGS to the BASEPLATES, and the roadway deck may be continued down to ground level: instead of stringers, PLAIN and BUTTON RAMPS are used to support the chesses. These have tapered ends to accommodate changes in gradient. Where such ramps are more than one bay long, intermediate supports are provided by transoms sitting in RAMP PEDESTALS.

Transoms are available in various lengths, enabling bridges to be built with different roadway widths, as set out in Table 1, page BI.1.

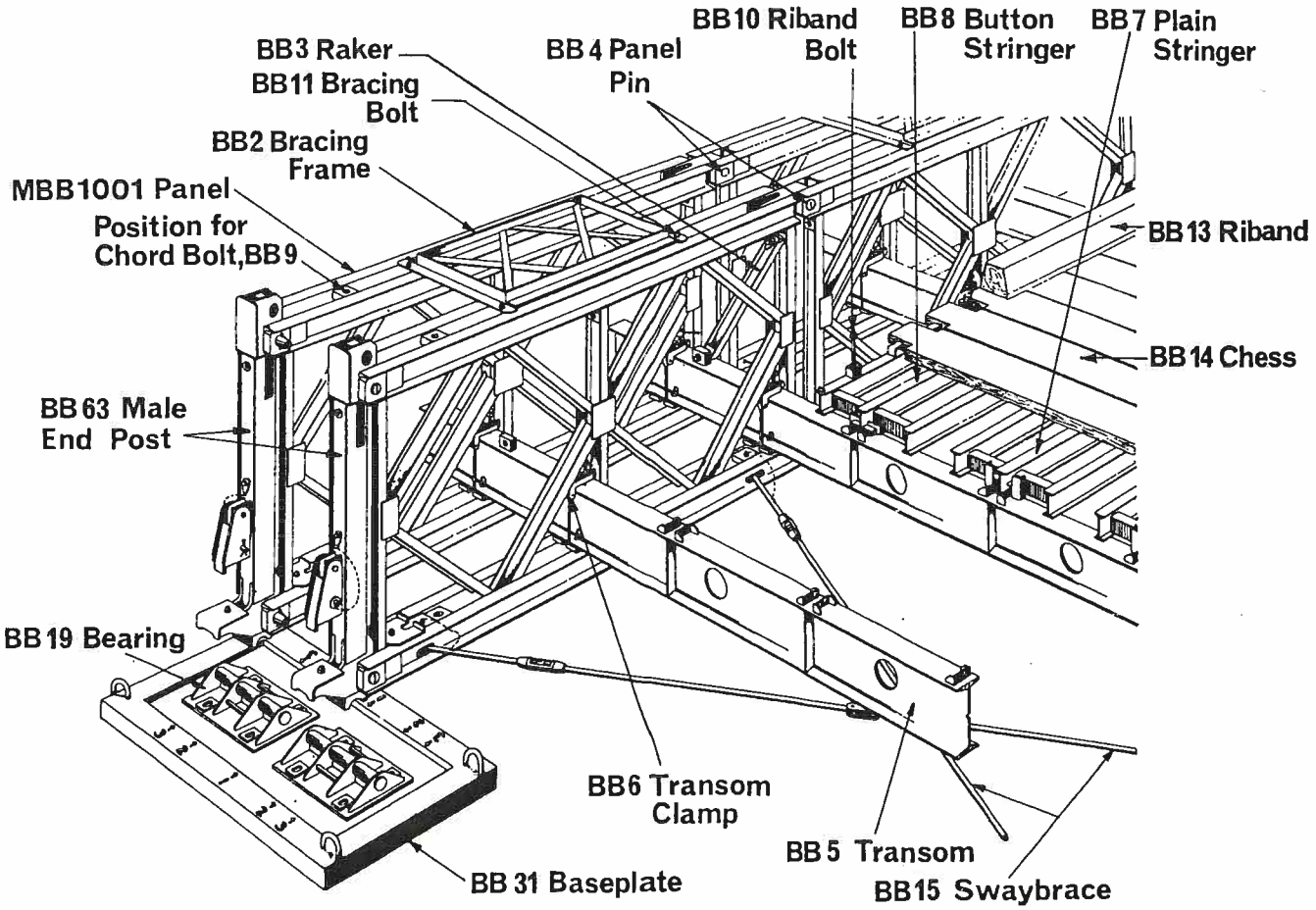

Fig. 2

Standard Bailey, in addition to 2 Button Stringers, requires 3 Plain Stringers per bay. Standard widened requires 4 Plain Stringers per bay and Extra Wide, 5 Plain Stringers per bay

In the Mabey Super Deck Bridge the transoms and plain and button stringers are of stronger construction, designed to carry the new generation of heavy earthmoving vehicles. Each bay of decking requires 2 Button Stringers and 8 Plain Stringers.

The footbridge may also be used as a conveyor bridge, or to carry pipelines and similar services. No stringers are required – the decking sitting directly on the transoms.

Standard, Standard Widened and Extra Wide Bailey Bridges may be built with either 2 or 4 transoms per bay, in all constructions except Single Single, which can only be fitted with 2 transoms per bay. With 2 transoms per bay construction (i.e. with transoms at approximately 1.5 m. (5' 0") centres) the maximum axle load which may be carried is 12.7 tonnes, or twin axles at not less than 1.22 m. (4' 0") centres sharing a load of 20.3 tonnes. Constructed with 4 transoms per bay, the maximum axle load is 20.3 tonnes, and such axles may not occur at less than 1.22 m. (4' 0") centres. These loads are the absolute maximum which may be used for emergency bridges. For more permanent installations where continuous traffic is to be expected, the question of fatigue must be considered, and the maximum permissible loads reduced accordingly. The Mabey Super Bailey Bridge is built with 2 transoms per bay; the transoms are positioned in the end seatings of the panels and thus occur in pairs at 3.05 m. (10' 0") centres throughout the bridge. This decking system will accept British Ministry of Transport Type HA Loading, or axle loads of 54 tonnes at not less than 3.05 m. (10. 0") centres.

Bailey Bridge – Main Girders

The two main girders of a Bailey Bridge span between the foundations on one bank and those on the other and therefore, between them, carry the total weight of the bridge and the traffic loads on it. For bridges of different spans, carrying different forms of loading, girders of various strengths are required. Because of the unit construction principle adopted in Bailey, wherein the main girders are composed of a series of identical panels, the strength of the girders may be varied by varying the numbers of panels from which they are constructed.

In the simplest, and lightest form, the main girders consist of a single truss on either side of the bridge. Each truss is formed by pinning together end-to-end a number of identical panels; each panel being one bay (3.05 m. or 10' 0") long. This construction is known as Single Single. Adding a second, and similar, truss either side of the bridge doubles the strength of the main girders. This is Double Single construction.

Similarly a third and in some cases a fourth truss can be added to give Triple Single and Quadruple Single construction.

Girders may be further increased in strength by making them twice as deep. Such girders are formed by bolting panels together on top of each other (in addition to pinning them together end-to-end) to form double storey girders. The minimum construction for such trusses is known as Double Double - that is two double storey trusses each side of the bridge. A single truss two storeys high is not sufficiently stable. Triple Double girders - and in some cases Quadruple Double girders are similarly formed.

Both single and double storey girders can be further strengthened by the addition of chord reinforcements top and bottom.

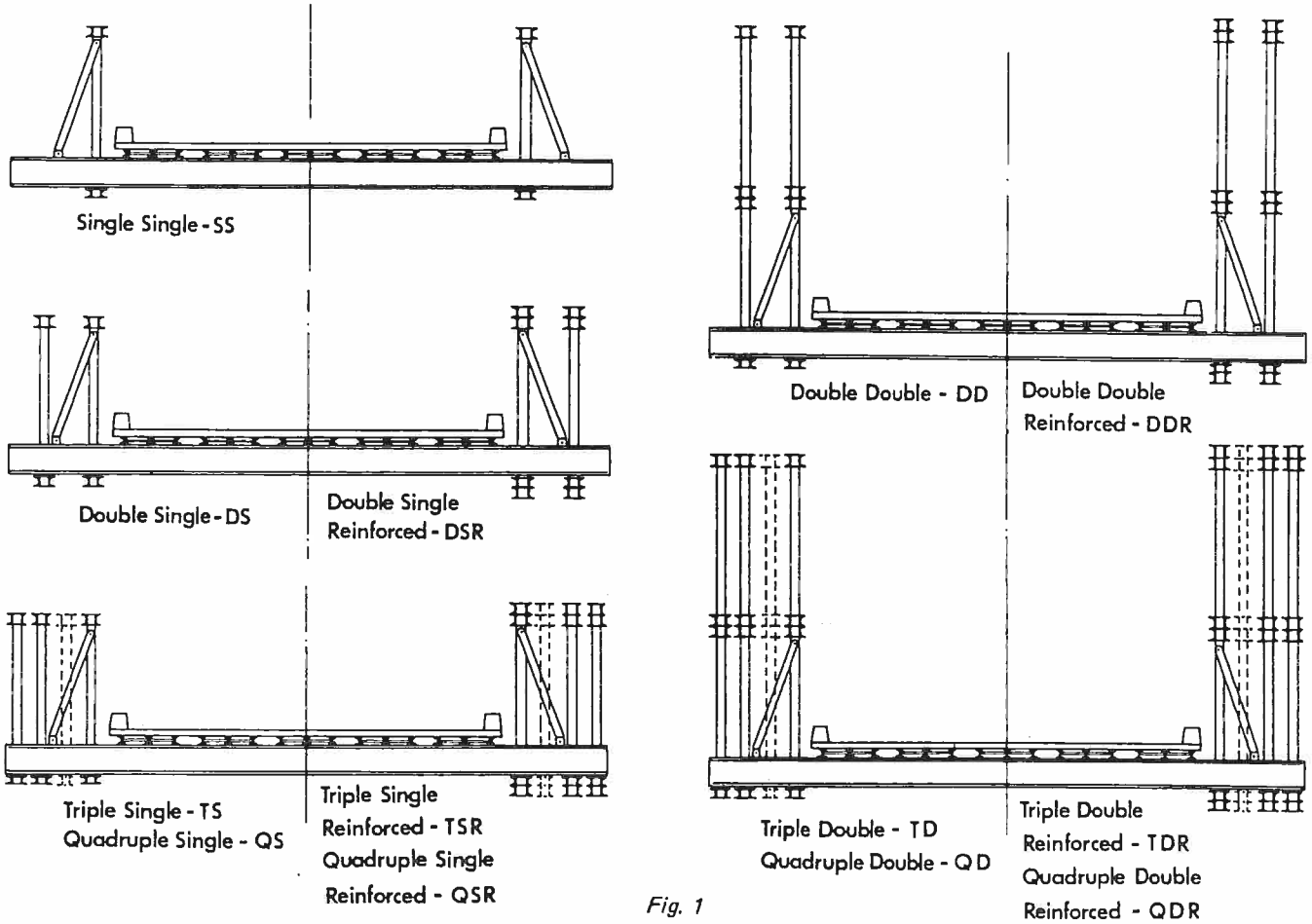

Fig. 1

NOTE Quadruple Single and Quadruple Double constructions (shown dotted) apply only to Standard Widened and Mabey Super Bailey type bridges

The thirteen possible constructions for main girders are illustrated in Fig. 1. These are theoretical diagrams since they show both reinforced and un-reinforced girders in the same bridge. In practice it is very rare for bridges to be built with girders of unequal strength; one such special case is the centre girder of a dual carriageway bridge, which has to carry approximately twice the load of either of the two outer girders.

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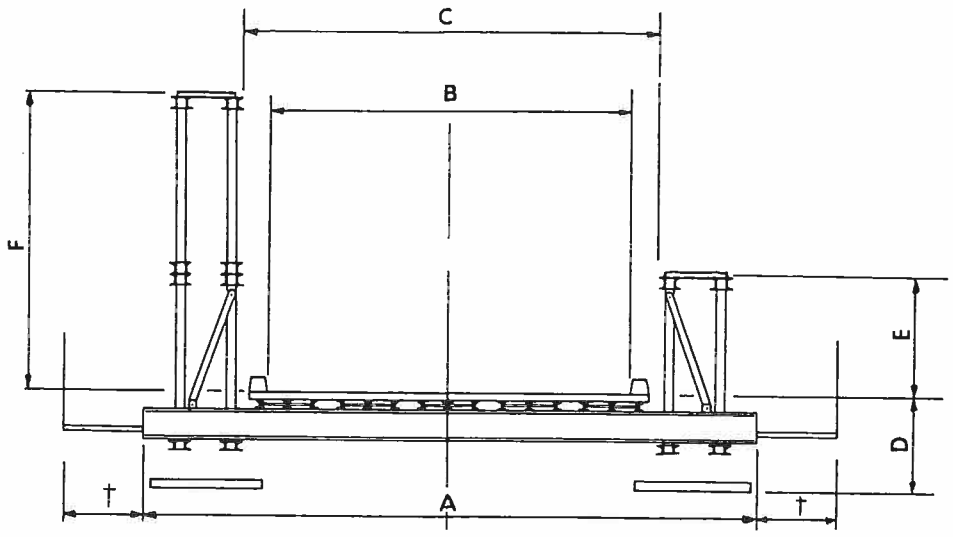
Basic Dimensions



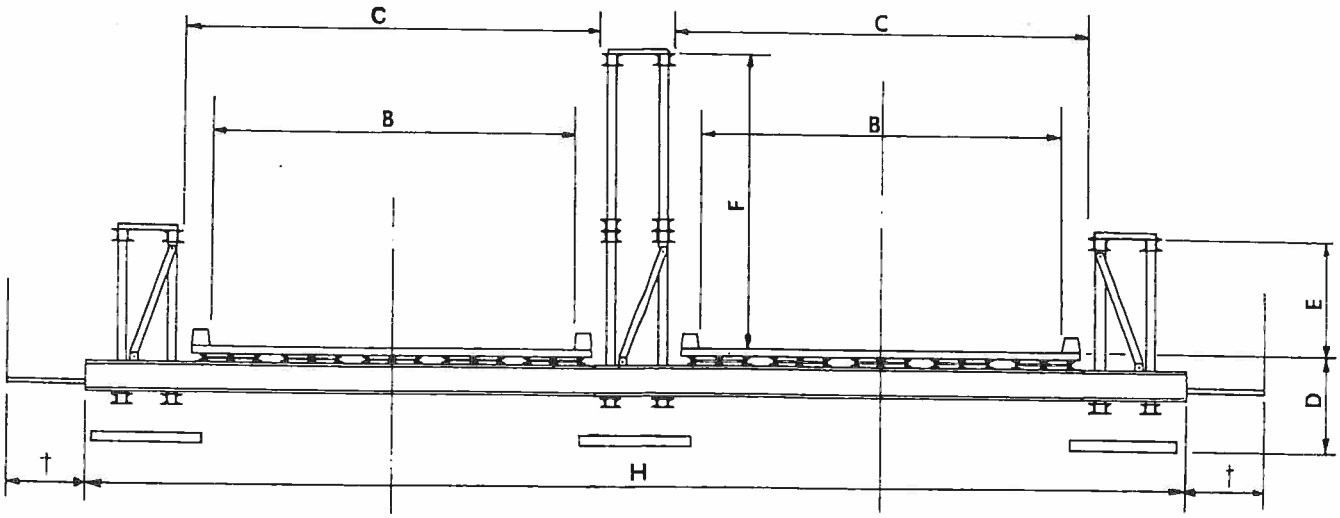
Imperial Units						Type	Metric Units					
A	B	C	D	E*	F*		A	B	C	D	E*	F*
18'-0"	10'-9"	12'-4"	2'-4"	3'-6¼"	8'-7¼"	Standard Bailey	5486	3277	3759	711	1073	2622
20'-0"	12'-6"	14'-3"	2'-6"	3'-4¼"	8'-5¼"	Standard Widened Bailey	6096	3810	4343	762	1022	2571
20'-0"	13'-9"	15'-8"	2'6"	3'-4¼"	8'-5¼"	Extra Wide Bailey	6096	4190	4775	762	1022	2571
21'-5"	14'-1"	15'-8"	3'-5¾"	2'-3⅞"	7'-4⅞"	Mabey Super Bailey Bridge	6528	4293	4775	1067	708	2257
10'-6"	6'-7"		1'-11¾"	4'-1"	–	Mabey Footbridge	3200	2000		590	1248	–

* If bridge is Chord Reinforced add 4" to this dimension

* If bridge is Chord Reinforced add 102 to this dimension.

† Footwalks: For each Footwalk, 1m (3' 3-3/8") wide, add to Dimension 'A' 1375 (4' 6").
" " " 1.5m (4' 11") " " " " 'A' 1911 (6' 3").

Dual Carriageway Bailey Bridge



Dimensions B, C, D, E & F as in above table.

With two Roadways, each 3227 (10' 9") wide, dimension H = 9880 (32' 5")
" " " " 3810 (12' 6") " " H = 11070 (36' 4")
" " " " 4190 (13' 9") " " H = 11500 (37' 9")

† Footwalks: For each Footwalk 1m (3' 3-3/8") wide, add to Dimension 'A' 1375 (4' 6")
" " " 1.5m (4' 11") " " " " 'A' 1911 (6' 3")

TABLE 1.

BAILEY BRIDGE DESIGN DATA

Properties of the various Bailey constructions

Given in units of Tonnes (1000 kg) and metres

Construction	Allowable Bending Moment	Allowable End Reaction							Construction
		Using Panels BB1			Using Super Panels MBB 1001				
		Standard	Standard Widened	Extra Wide	Standard	Standard Widened	Extra Wide	Super Deck	
	Tonnes Metres	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	
SS	155	30.5	30.5	30.5	40.6	40.6		40.6	SS
DS	310	61.0	61.0	61.0	81.3	81.3	81.3	81.3	DS
DSR	620	61.0	61.0	61.0	81.3	81.3	81.3	81.3	DSR
TS	465	81.3	81.3	91.5	107.7	107.7	121.9	121.9	TS
TSR	930	81.3	81.3	91.5	107.7	107.7	121.9	121.9	TSR
QS	620	–	106.7	–	–	128.0	–	162.6	QS
QSR	1240	–	106.7	–	–	128.0	–	162.6	QSR
DD	620	101.6	101.6	101.6	121.9	121.9	121.9	121.9	DD
DDR	1240	101.6	101.6	101.6	121.9	121.9	121.9	121.9	DDR
TD	930	137.2	137.2	152.4	162.6	162.6	182.9	182.9	TD
TDR	1860	137.2	137.2	152.4	162.6	162.6	182.9	182.9	TDR
QD	1240	–	172.8	–	–	207.3	–	243.9	QD
QDR	2480	–	172.8	–	–	207.3	–	243.9	QDR

Weight per bay of Bailey Bridges - Metric Tonnes

(One bay = 10 feet = 3.04 m)

Construction		Standard		Standard Widened		Extra Wide		Super Deck	Construction
		No. of Transoms per bay		No. of Transoms per bay		No. of Transoms per bay			
		2	4	2	4	2	4		
	SS	1.82	–	2.49	–	2.64	–		SS
These	DS	2.43	2.85	3.08	3.68	3.25	3.85	4.40	DS
weights	DSR	3.27	3.68	3.92	4.62	4.06	4.66	5.23	DSR
include	TS	3.00	3.43	3.66	4.26	3.84	4.45	4.96	TS
Timber Deck	TSR	4.25	4.68	4.90	5.51	5.08	5.69	6.21	TSR
Roadway	QS	–	–	4.31	4.93	–	–	5.51	QS
but	QSR	–	–	5.95	6.60	–	–	7.18	QSR
NO Footwalks	DD	3.61	4.03	4.26	4.87	4.42	5.02	5.66	DD
	DDR	4.45	4.86	5.09	5.69	5.24	5.84	6.48	DDR
	TD	4.76	5.19	5.40	6.01	5.59	6.19	6.78	TD
	TDR	6.01	6.44	6.66	7.27	6.84	7.46	8.03	TDR
	QD	–	–	6.65	7.27	–	–	7.92	QD
	QDR	–	–	8.32	8.94	–	–	9.58	QDR
	SS	1.34	–	1.34	–	1.34	–	–	SS
Add for Extra	DS (R)	1.72	2.01	1.72	2.41	1.72	2.41	1.50	DS (R)
components	TS (R)	2.00	2.28	2.00	2.69	2.00	2.69	1.76	TS (R)
at 2 ends	QS (R)	–	–	2.27	2.95	–	–	2.02	QS (R)
of bridge –	DD (R)	1.76	2.05	1.76	2.46	1.76	2.46	1.50	DD (R)
but NO Ramps	TD (R)	2.04	2.32	2.04	2.73	2.04	2.73	1.76	TD (R)
	QD (R)	–	–	2.33	3.01	–	–	2.02	QD (R)
ONE Bay of Chesses		0.35		0.74		0.80		1.01	
" " " Stringers		0.42		0.50		0.58		1.01	
" " " Deck		0.78		1.25		1.39		2.03	
LAUNCHING	SS	0.84		0.94		0.94		0.94	SS
NOSES	DS	1.44		1.54		1.54		1.76	DS
	DD	2.62		2.69		2.69			DD
with bottom	SS	1.04		1.14		1.14		1.14	SS
chord	DS	1.86		1.95		1.95		2.18	DS
reinforced	DD	3.04		3.13		3.13			DD

MABEY

The Super Panel has been designed and developed by Mabey Group engineers

SECTION 6

CALCULATIONS

Client: Moray Council

Site: Broom of Moy

Job No.: INSPCT

Description: Bailey Std Width

File Ref : Br-Calc-Footbridge

Mabey Support Systems Ltd.

Tel : (01942) 725343

Date: 21/01/2004

By: *GMc*

Sheet No. INSPCTBOM -1

DETAILS OF BRIDGE

Span: 54.86 m. Bridge type : Bailey Std Width

Bay length = 3.048 m

Loading: Pedestrian Loading to BD37/01

No. of bays: 18

Width between kerbs : 3.277 m. Deck Type: Footwalk Type

SELF WEIGHT EFFECTS - MAIN BRIDGE

Truss Construction: DD
(No high shear panels)

	Wt./bay	Total Wt	
Self weight of bridges:	3.61	64.98	
Self weight of side screens:	0.05	0.90	1.5 kN/m run
Other: (eg. Services)	0.00	0.00	
TOTALS:	3.66	65.88	

Wt. of bridging equipment 64.98 T plus 1.0 T for EOB = **65.98** Tonnes

Bending Moment = **451.81** Tm. End Reaction = **32.94** T

LIVE LOAD EFFECTS - 5.00 kN/m^2 x k

UDL = 12.17 kN/m k = 0.74 C'way = 3.277 m.

Bending Moment = 4577 kNm = **467** Tm.

End Reaction = 333.7 kN = **34.0** T

SUMMARY OF LOAD EFFECTS

	Load Factor	**Bending** Tonnes m	**Reaction** Tonnes
Self wt. - bridge	1.00	451.8	32.9
Live Loading	1.00	466.6	34.0
Totals :-			
Total - All Loading :		918	67.0
Allowable :	90%	**558**	**91.4**
		Try Again	*(O K)*

Client: Moray Council

Site: Broom of Moy

Job No.: INSPCT

Description: Bailey Std Width

File Ref : Br-Calc-Footbridge

Mabey Support Systems Ltd.

Tel : (01942) 725343

Date: 21/01/2004

By: *GMc* Sheet No. INSPCTBOM -1

MAXIMUM LIVE LOAD ALLOWED ON THE BRIDGE

Live load capacity = 106.2 tm

Total UDL (w) = $\frac{106.2 \times 8}{54.86}$

= 15.485 t

= 0.84 kN/m^2 Reduction factor due to span is 0.74, therefore the maximum loading = **1.138 kN/m^2**

LIVE LOAD EFFECTS - 1.14 kN/m2 x k

UDL = 2.77 kN/m k = 0.74 C'way = 3.277 m.

Bending Moment = 1042 kNm = **106** Tm.

End Reaction = 76.0 kN = **7.7** T

SUMMARY OF LOAD EFFECTS

	Load Factor	**Bending** Tonnes m	**Reaction** Tonnes
Self wt. - bridge	1.00	451.8	32.9
Live Loading	1.00	106.2	7.7
Totals :-			
Total - All Loading :		558	40.7
Allowable :	90%	**558** *(OK)*	**91.4** *(OK)*

Client: Moray Council
Site: Broom of Moy
Job No.: INSPCT
Description: Bailey Std. Width
File Ref : INSPCTBOM -2

Mabey Support Systems Ltd.
Tel : (01942) 725343

Date: #######
By: *GMc* Sheet No.

CALCULATE DEFLECTION

Bridge Data Type : C200 No. of Bays : 18 Bridge wt. Per bay : 3.6 tonnes

Bay length = 3.048 m Span = 54.86 metres Construction : DD

Total Live UDL : 0.0 tonnes = 0.0 kN Total Live KEL : 0.0 tonnes = 0.0 kN

Pinhole Deflection

Bridges with even bays : Dph = cn2 / 8

'n' = no. of bays

Sag Code 'c'	MU		C200	
	Unreinf.	Reinf.	Unreinf.	Reinf.
Single storey	3.05	2.75	2.45	2.3
Double storey	1.49	1.41		

Pinhole deflection = Dph Therefore c = 1.61

Dph = 1.61 x 324 / 8 = **65.2 mm**

Dead Load Deflection

$$D_{DL} = \frac{5}{384} \times W \times \frac{L^3}{EI}$$

L = 54.864 m
W = 64.98 tonnes = 637.45 kN
E = 210 kN/mm2
I = 47.8 x 10 9

Dead load deflection = **136.6 mm**

Live Load Deflection

$$D_{LL} = \underbrace{\frac{5}{384} \times W \times \frac{L^3}{EI}}_{(UDL)} + \underbrace{\frac{W \times L^3}{48\ EI}}_{(KEL)} = \underbrace{0.0}_{(UDL)} + \underbrace{0.0}_{(KEL)}$$

Live load deflection = **0.0 mm**

Shear Deflection

Increase deflections due to UDL by 15% = (136.6 + 0.0) x 0.15 = 20.5 mm

Increase deflections due to KEL by 30% = 0.0 x 0.30 = 0.0 mm

Total shear deflection = **20.5 mm**

TOTAL DEFLECTION = 65.2 + 136.6 + 0.0 + 20.5 = **222.2 mm**

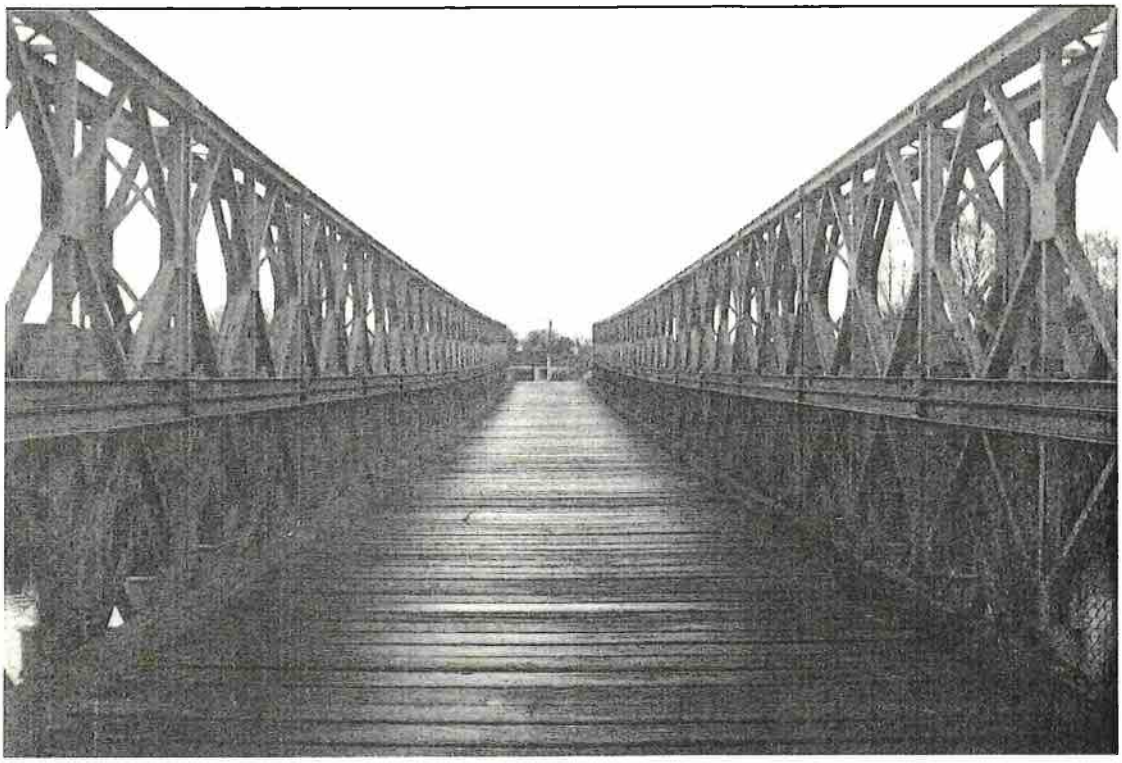
SECTION 7

PHOTOGRAPHS

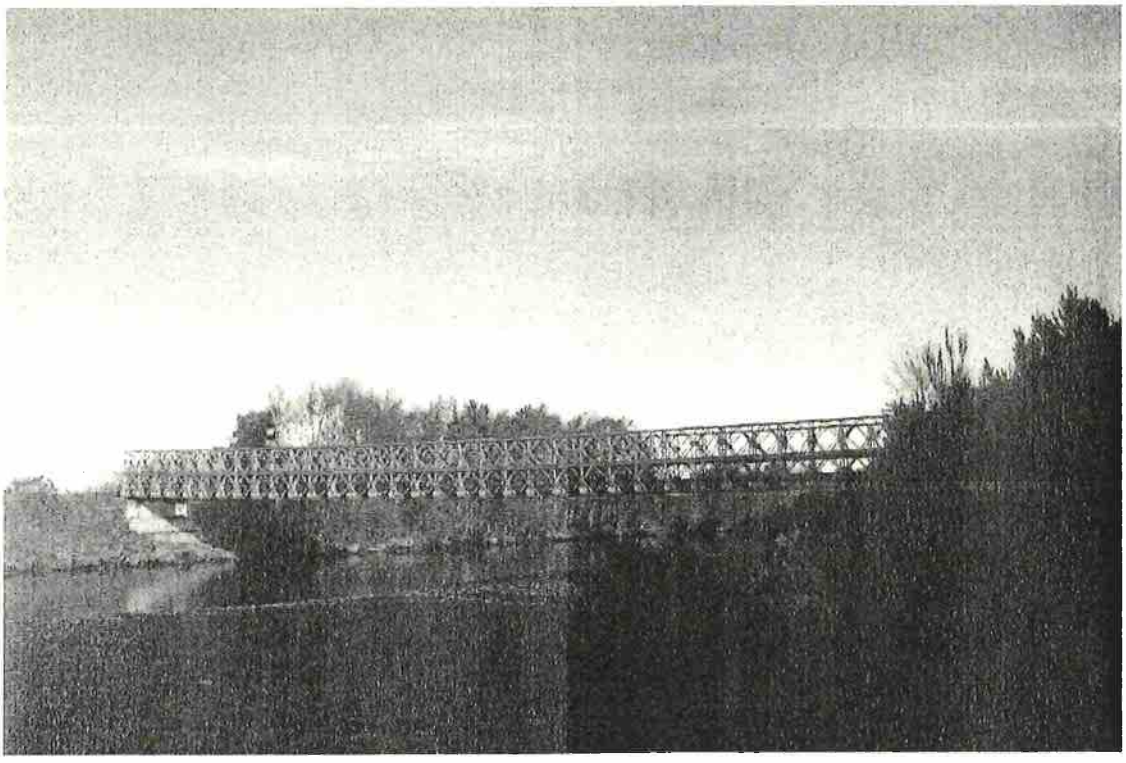
Mabey Support Systems Ltd

Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**



Showing deflection of the bridge



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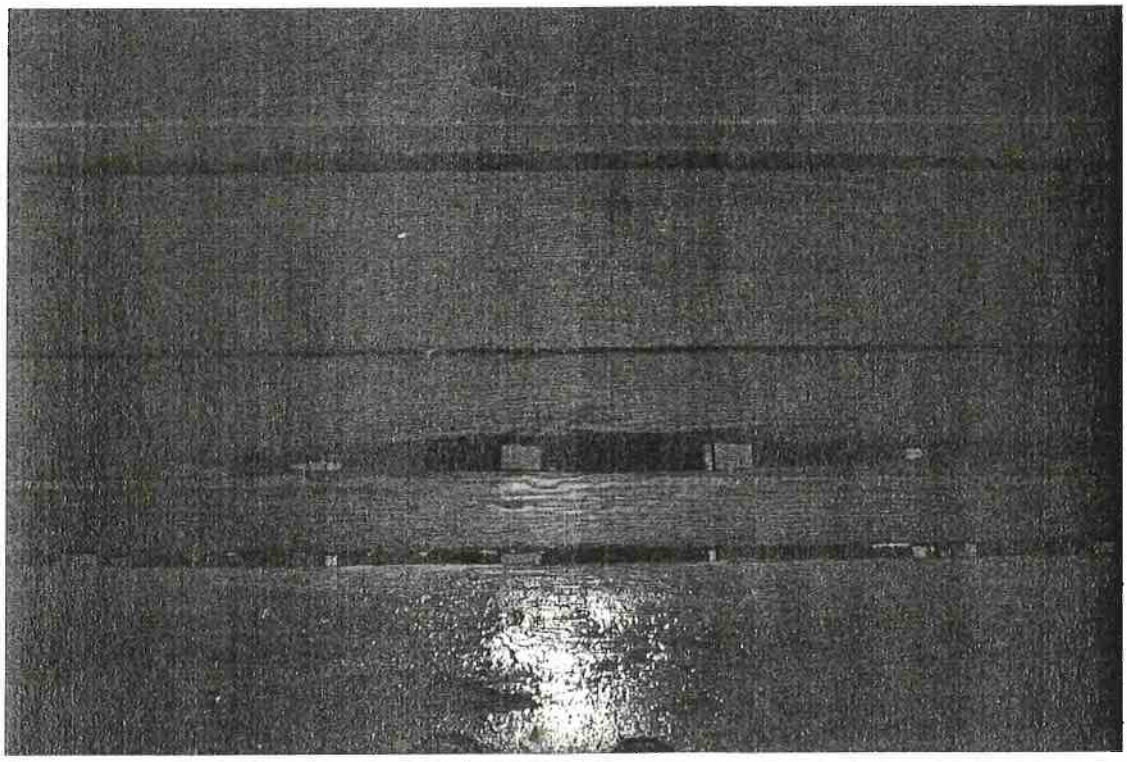
Site: Broom of Moy **Date: 21 January 2004**

Showing condition of the ribands and the timber chesses



Showing holes in the timber chesses

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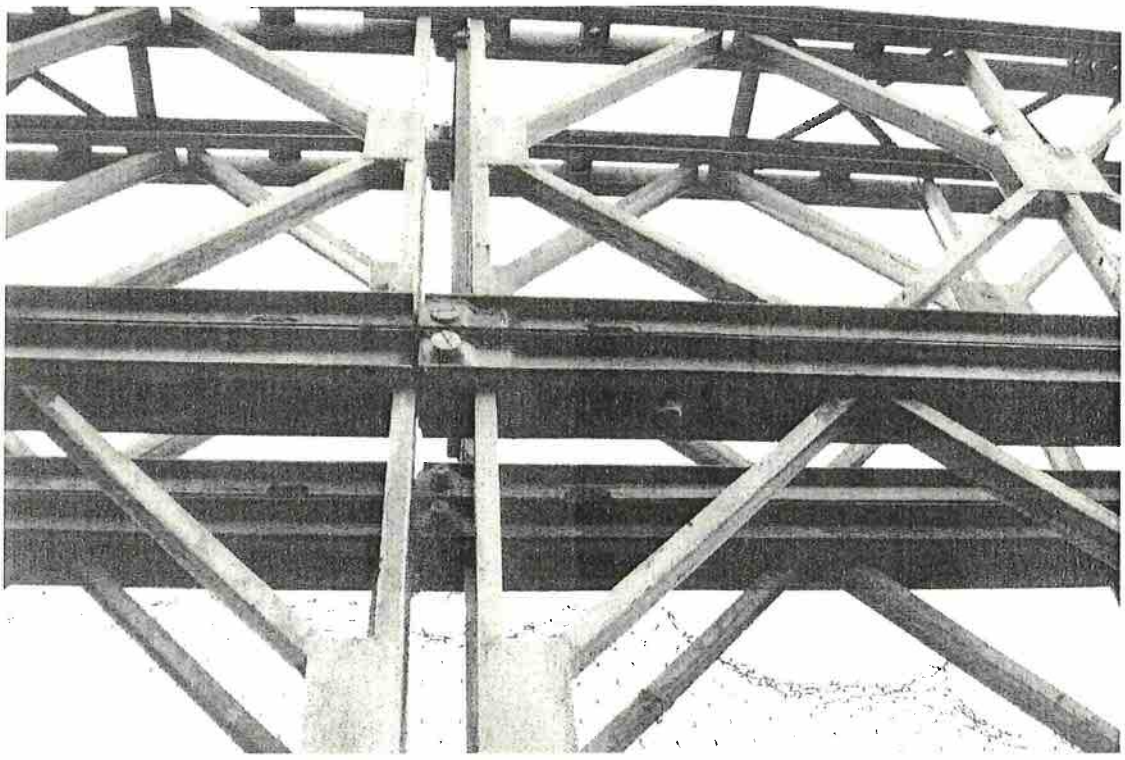
Site: Broom of Moy **Date: 21 January 2004**

Showing horizontal splits in the end of the timber chesses



Showing pin not fully inserted on North truss

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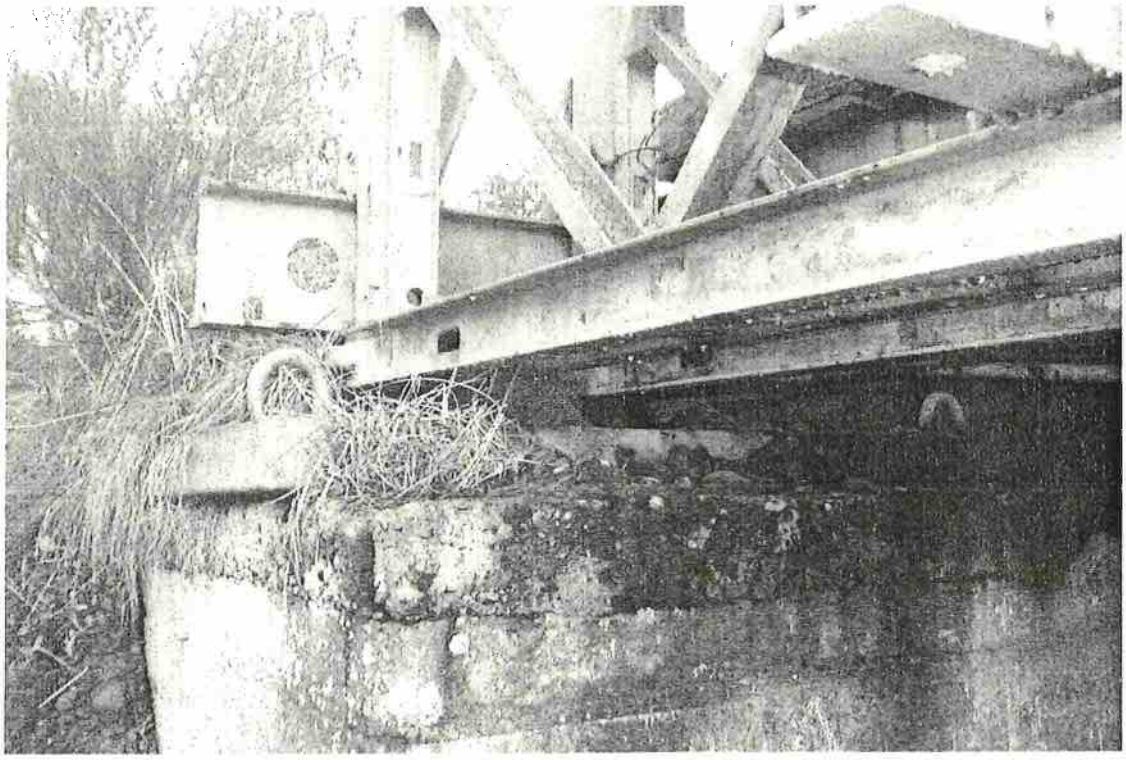
Site: Broom of Moy **Date: 21 January 2004**

Showing extent of corrosion where the bottom panel meets the top panel.



Showing bearingsa

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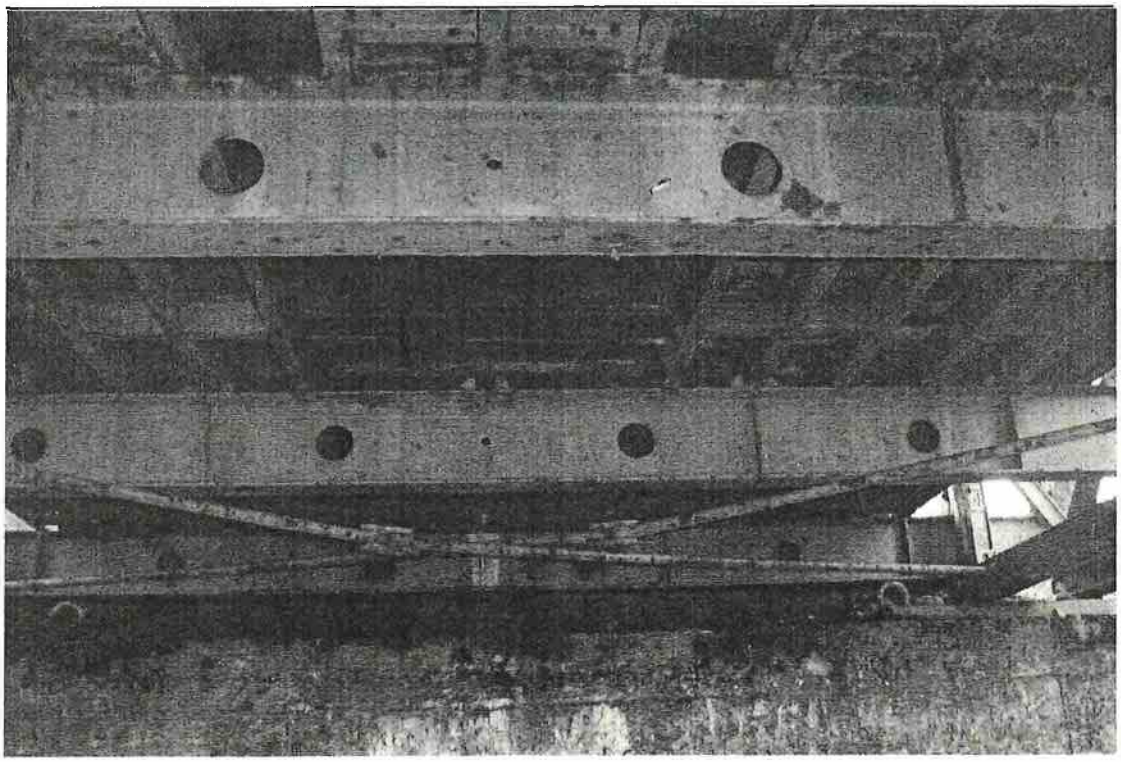
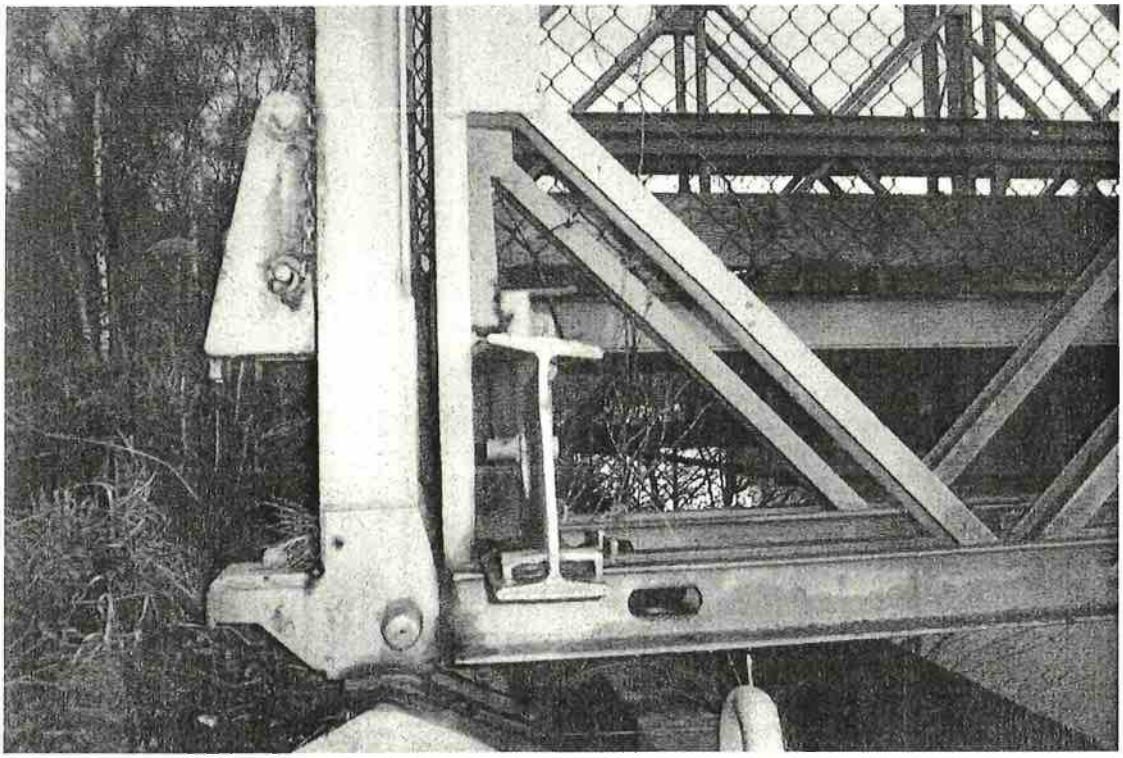
Client: Moray Council **Ref: INSPECT**

Site: Broom of Moy **Date: 21 January 2004**



Showing missing stringer and transom/swaybrace condition



Showing bent top flange of the male end transom