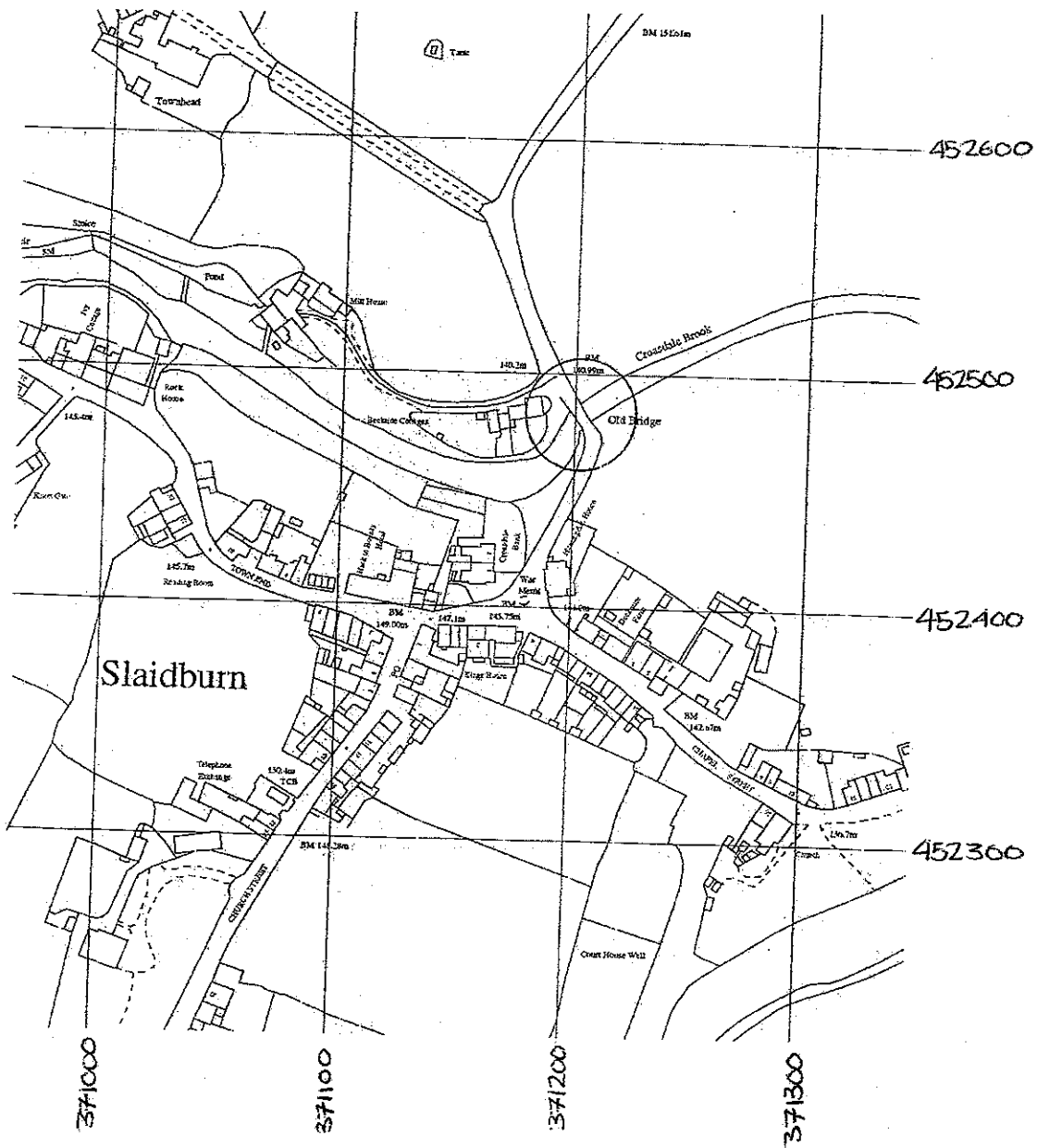


Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

CONTENTS

	PAGE NO:
1. LOCATION PLAN	1
2. BRIDGE ELEVATIONS	2
3. BRIDGE APPROACHES	3
4. INSPECTION PROCEDURE	6
5. INSPECTION RESULTS - TABULAR	7
6. INSPECTION RESULTS - PHOTOGRAPHS	14
7. INSPECTION RESULTS - SKETCHES	34
 APPENDIX A SPECIAL INSPECTION	39
 APPENDIX B CONCRETE TESTING	42

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI



1. LOCATION PLAN

Lancashire County Council
Croasdale Bridge (No. 4301) - PBI

2. BRIDGE ELEVATIONS



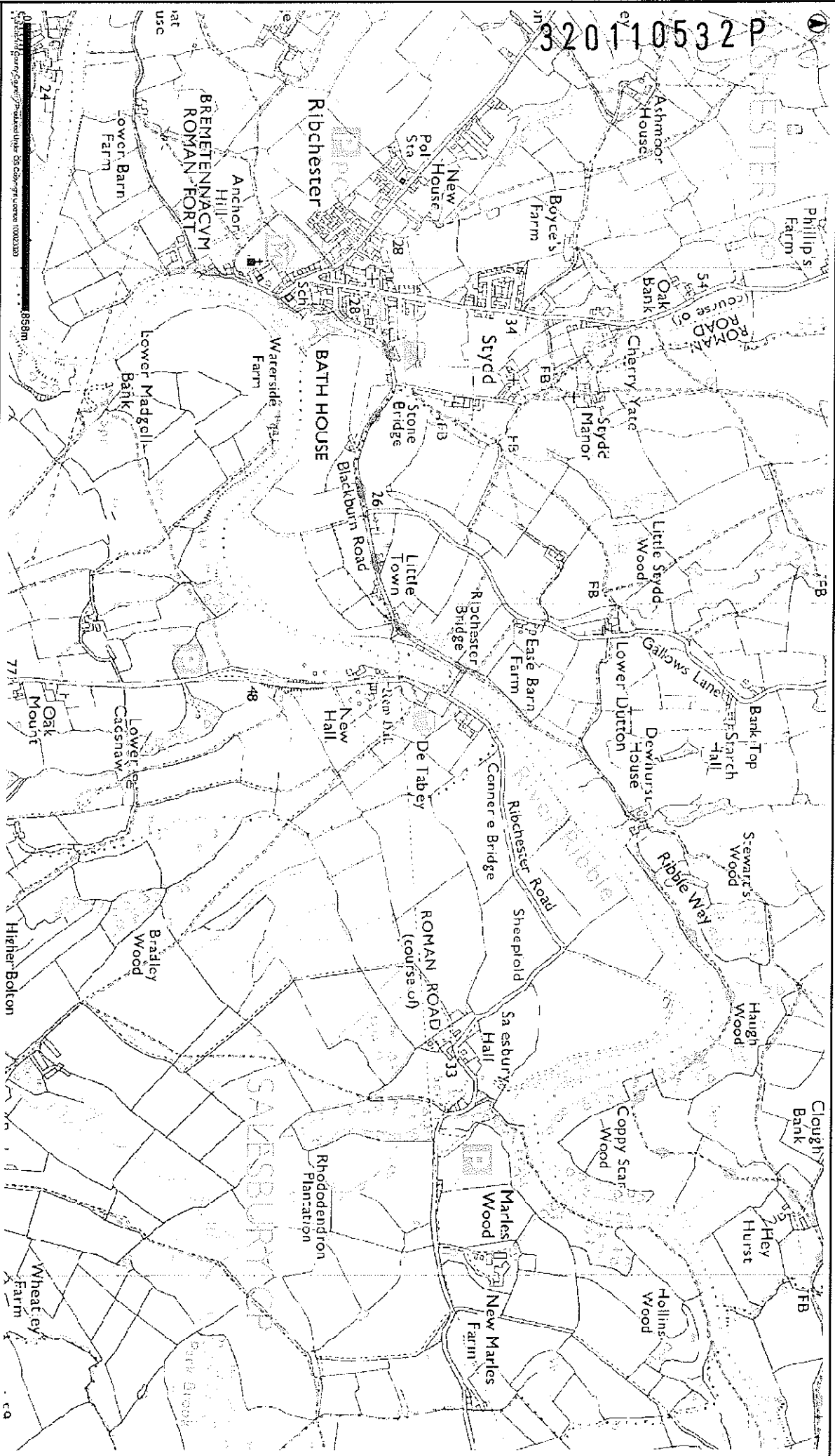
2.1 EAST ELEVATION

19677 A



2.2 WEST ELEVATION

29677/X2/14A



Ribchester Bridge

*Lancashire County Council
Croasdale Bridge (No: 4301) - PBI*

3. BRIDGE APPROACHES



3.1 APPROACH FROM THE SOUTH

29677.B



3.2 APPROACH FROM THE NORTH

29677/3/34

**4. INSPECTION PROCEDURE
CROASDALE BRIDGE (NO: 4301/B1/B2)**

4.1 DESCRIPTION

The Principal Inspection was carried out by Thorburn Colquhoun on 24 January 1997. The weather conditions during the inspection were overcast with sunny spells and occasional light rain showers. The depth of Croasdale Brook passing under the main arch of the structure ranged from an average of 0.5m (downstream) to 1.0m (upstream), only surface water runoff (<50mm) was noted under the relief arch of this structure. It was not necessary to effect any traffic management measures in order to carry out the inspection.

All of the bridge could be inspected by foot from the road, banks or stream bed. The only access equipment required were waders and a ladder.

All structural items were closely inspected for deterioration of the masonry, loss of mortar, and water seepage through the walls and arch ring. All elements were visually checked for alignment, distortions and deformations.

The carriageway surfacing, kerbs, footways and parapets were inspected for signs of deterioration.

Scour was checked for by probing below the waterline.

4.2 COMPONENTS NOT INSPECTED

The foundations were not exposed for the purpose of a visual inspection, but some indication of their performance and integrity was obtained by carrying out a visual check on alignment and plumb of the parapets and wingwalls.

4.3 EXPLANATORY NOTES ON PRINCIPAL INSPECTION REPORT

The inspection results are presented in tabular form using the component headings given in BE11/94. The suggested timescale for any recommendations/actions are based on the priorities given in Appendix A of Departmental Advice Note BA63/94.

4.4 SPECIAL INSPECTION

A Special Inspection was undertaken with the Principal Inspection, and in the form of a Special Investigation by Test Consult Limited on 14 October 1997, to enable the bridge to be assessed in accordance with BD21/93 and BA16/93, and to enable a general arrangement drawing to be produced. See Appendix A for results of the Special Inspection.

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
1	Foundation	1A	No apparent signs of distress.			No Action	
2	Inverts	2A	At the time of inspection the Brook was flowing (from West to East) through the South arch, surface water runoff only was noted under the smaller relief arch. The bed of the Brook consists of exposed rock with deposits of stone and boulders. The water depth at the time of the inspection varied from an average of 300 to 500mm, but increased upto 1000mm towards the upstream end of the South abutment.			No Action	
4	Pier	4A	The central pier is constructed of coursed masonry, a cutwater is present to the upstream side of the bridge.	2.1 2.2	2 4	---	
		4B	There is evidence of movement at the upstream cutwater - a vertical crack (1.0mm wide) and an area of drummy masonry.	P1 SK3		Repoint and Monitor	L

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
		4C	On both the South and North pier elevations there are areas of joint loss, both horizontal and vertical. Joint loss varies between 50 and 100mm in depth.	P2, P3, P4 SK1 SK2	17, 18 36 37	Rake out and repoint joints	L
		4D	Both faces of the pier exhibit extensive areas of green staining from previous lichen/algae growth, with localised areas of leached deposits and efflorescence.	P2, P3, P4 SK1 SK2	17, 18 36 37	No Action	
		4E	Active seepage was noted towards the upstream end of the South pier face.	P5 SK1	19 36	Provide effective waterproofing membrane.	L
5	Abutments	5A	The abutments are constructed of coursed masonry.			---	
		5B	On the main arch abutment there are extensive areas of joint loss, both horizontal and vertical. Joint loss generally in the region of 50 mm deep.	P6, P7 SK1	20, 21 36	Rake out and repoint joints	L
		5C	Both abutments exhibit extensive areas of green staining, from previous lichen/algae growth. In addition, localised areas of leached deposits are visible.	P6, P7 SK1, SK2	20, 21 36, 37	No Action	
		5D	An area of drummy and spalling masonry is located at the downstream end of the main arch abutment. (Spalling 30 mm deep)	P6 SK1	20 36	Remove and replace defective masonry.	L

4/8/24S/1M
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November 1997

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
		5E	Exposed rebar and spalling concrete - Downstream end of south abutment	P8 SK1	21 36	Break out spalled concrete, expose rebar and make good with repair mortar/concrete	L
6	Wingwalls	6A	The wingwalls are constructed of random rubble masonry.				
		6B	Throughout the North East wingwall there is extensive joint loss. The mortar is generally loose and friable with loss up to 40 mm deep.	P9 SK3	22 38	Repoint joints	L
		6C	The North West wingwall exhibits signs of structural movement - in the form of diagonal cracking with steps (up to 20 mm) between adjacent masonry faces. These defects are currently being monitored by Lancashire County Council (monitoring commenced 1993).	P10 P11 P12 SK3	22 23 24 38	Monitor	
		6D	There are several areas of joint loss and open joints, up to 230 mm in depth, on the South West wingwall. Teltails have been installed by Lancashire County Council to monitor movement. The teltails are dated December 1993 and only one exhibits any defect (i.e. a hairline crack).	P13 P14 P15 SK3	25 25 26 38	Rake out and repoint joints, Monitor	L
		6E	The South East Wingwall exhibits open joints/joint loss (up to 150mm deep) and apparent movement.	P16 SK3	26 38	Repoint and Monitor	L

4/8/245/J/M
29677MA
November 1997

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Croasdale Bridge (No: 4301) - PBI

COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
16	Arch Ring - Main Arch	16A	The West section of the main arch is constructed from coursed dressed masonry. The courses are orientated perpendicular to the bridge elevation.				
		16B	Extensive staining is present to the arch rings. This includes black type deposits, white leached deposits, and green deposits resulting from lichen/algae growth.	P17, P18 SK1	26, 27 36	Provide effective waterproofing membrane.	L
		16C	At the upstream end of the arch ring active seepage was noted from the quarter points to the springings at both the North and South sides of the barrel.	P17 SK1	26 36	Provide effective waterproofing membrane.	L
		16D	There is joint loss to the rear of 50% of the voussoirs, up to 120 mm in depth. Other localised areas of joint loss were noted.	P17 SK1	26 36	Rake out and repoint	L
		16E	The East section of the main arch is reinforced concrete. This is generally in good condition with the only defects including a small number of hairline cracks and spalling concrete/exposed rebar.	P18, P19 SK1	27, 28 36	Break out spalled concrete, expose and clean rebar, make good with repair mortar/concrete	L
	Arch Ring - Minor Arch	16F	The Relief arch is constructed of coursed masonry, with the courses orientated perpendicular to the bridge elevation.				

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
		16G	Open joints/joint loss to the rear of the voussoirs are present to the downstream end of the arch ring. (up to 260mm deep and between 50-60mm wide)	P20, P21 SK2	28, 29 37	Rake out and repoint. Monitor	L
		16H	Extensive staining is present to the arch ring, including block deposits, which leached deposits and green deposits from algae/lichen growth.	P21 SK2	29 37	Provide effective Waterproofing membrane.	L
		16I	Localised area of spalling/eroded masonry, 40 to 50 mm deep, towards the upstream elevation.	SK2	37	Remove and replace defective masonry	L
17	Spandrels	17A	The spandrels to the structure are constructed of random rubble masonry.				
		17B	Extensive friable mortar and joint loss, up to 40 mm deep, was noted to the northern end of the East Elevation and to the rear of the main arch concrete ring.	P23, P24 SK3	30 38	Rake out and repair	L
		17C	Nominal joint loss, leaching and spalling concrete is present on the east elevation, in the vicinity of the main arch springings.	P22, P29 SK3	29, 33 38	Repoint and repair areas of spalling concrete	L
		17D	Active seepage to the south end of main arch spandrel - East elevation	P29 SK3	33 38	Provide effective waterproofing membrane	L

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Croasdale Bridge (No: 4301) - PBI*

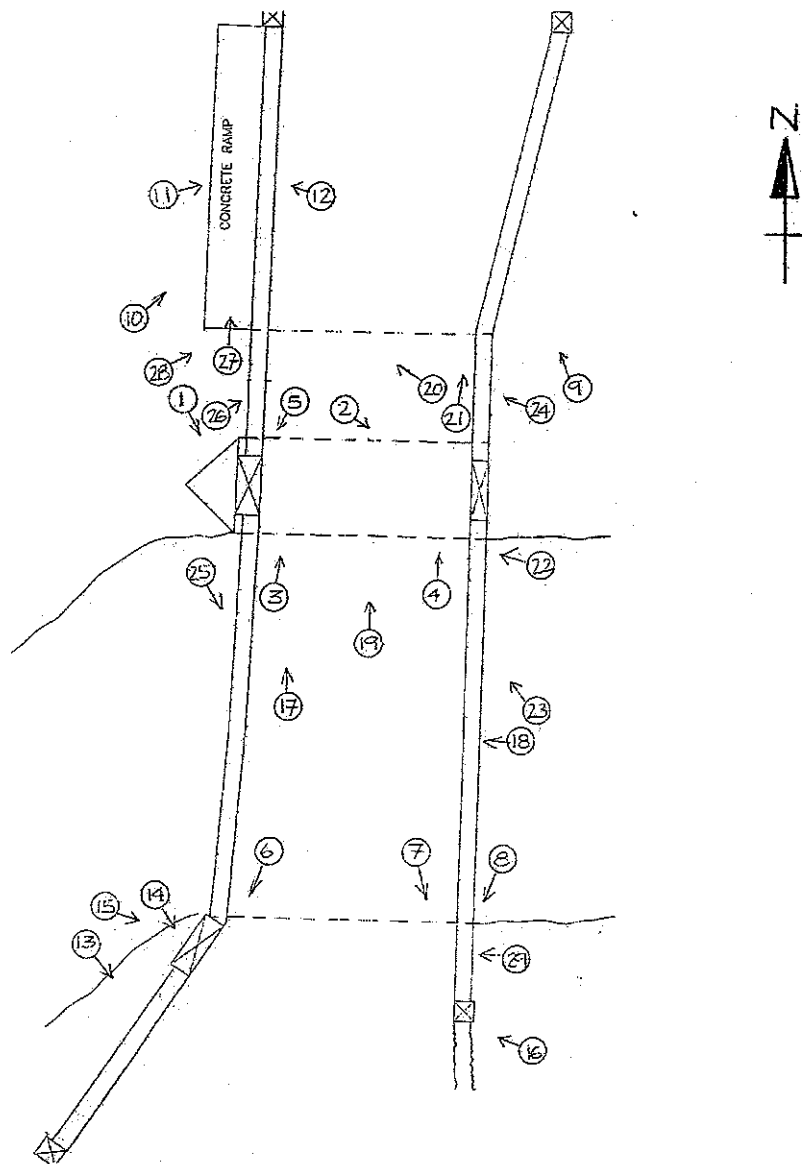
COMPONENT		INSPECTION RESULT		PHOTO/ SKETCH	PAGE No.	RECOMMENDATIONS/ACTION	TIME SCALE
No.	LOCATION	No.	DESCRIPTION				
		17E	On the west elevation localised areas of joint loss and open joints were noted particularly at the rear of both the main and relief arch rings (step of up to 30 mm) - the former having mortar telltails dated December 1993.	P25, P26, P27 SK3	31 32 38	Rake out and repoint - Monitor	L
19	Drainage System	19A	There are no indications that any drainage systems are employed within the structure. There is a recently constructed concrete ramp and what would appear to surround a surface water outlet (functioning) adjacent to the North West wingwall. Holes within the South West wingwall apparently to drain surface water directly from the carriageway are not functioning.	P28, P13 SK3	32, 34 38	Investigate drain holes in wing wall	L
20	Waterproofing	20A	The arch staining indicates that if any waterproofing system exists, it has broken down.			Provide effective waterproofing membrane	L
21	Surfacing	21A	The carriageway surfacing to the structure is in fair condition, in places there are areas of poor surface texture and low skid resistance.	3.1 3.2	15 5	Monitor	L
		21B	Vegetation growth is present adjacent to the parapet walls, this may provide a path for the ingress of water to the structure.	3.2	15	Remove vegetation	L

4/8/24SJ/IM
29677MA
November 1997

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Croasdale Bridge (No: 4301) - PBI

6. INSPECTION RESULTS - PHOTOGRAPHS



PHOTOGRAPH
LOCATION PLAN

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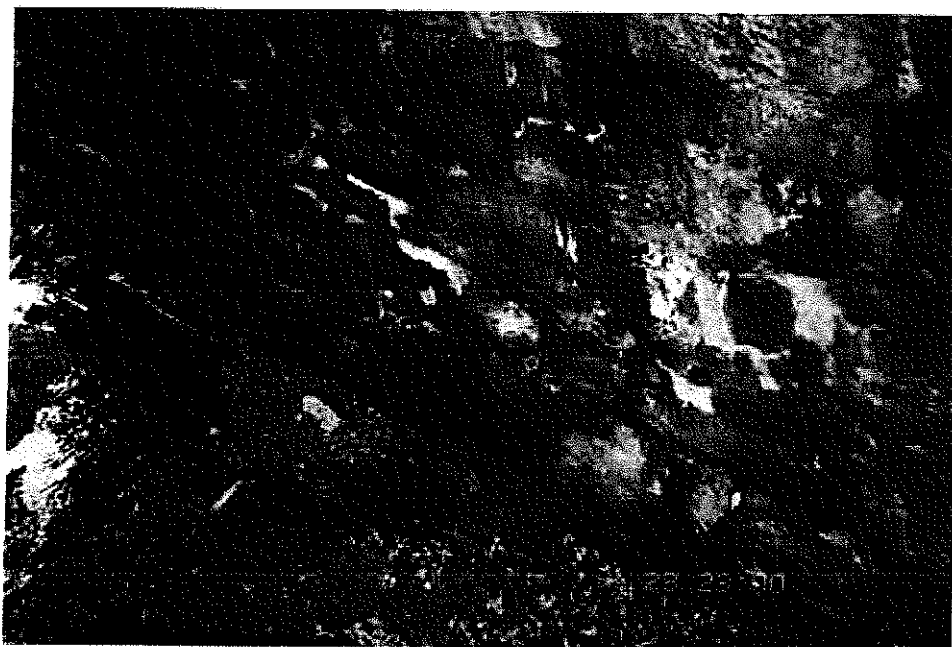
*Lancashire County Council
Croasdale Bridge (No. 4301) - FBI*



P1 UPSTREAM CUTWATER - VERTICAL CRACK

29677-X2/16A

2/6/248J/1M
29677MA
November 1997



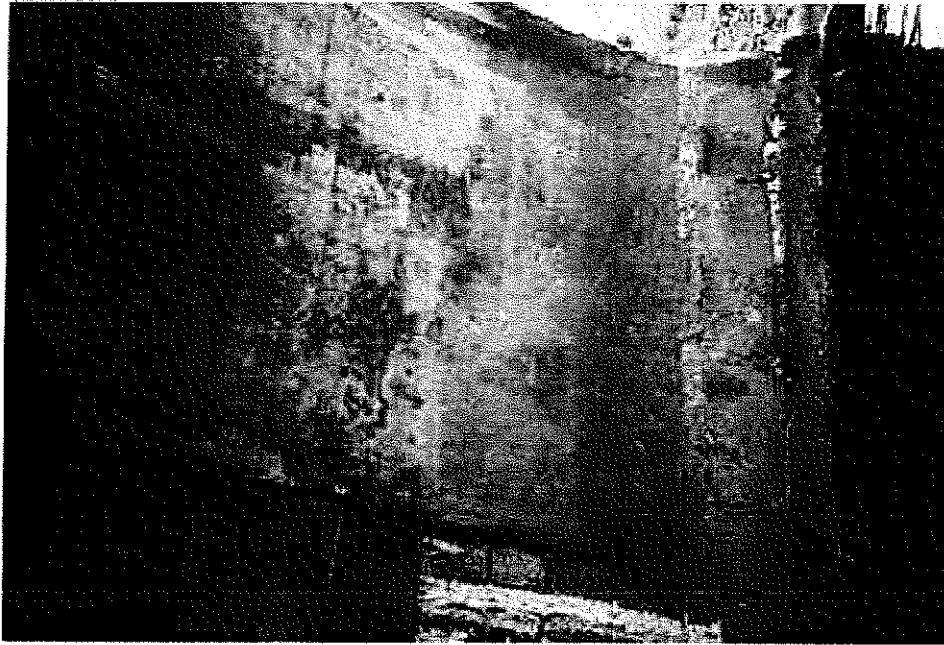
P2 STAINING TO NORTH FACE OF PIER

29677/3/13

Lancashire County Council Croasdale Bridge (No. 4301) - PBI



P3 PIER - UPSTREAM END OF SOUTH FACE 29677/2/27



P4 PIER DOWNSTREAM END OF SOUTH FACE 29677/2/30

482450134
29677MA
November 10/97



P5 ACTIVE SEEPAGE - UPSTREAM END OF PIER (SOUTH FACE)

29677 3 14

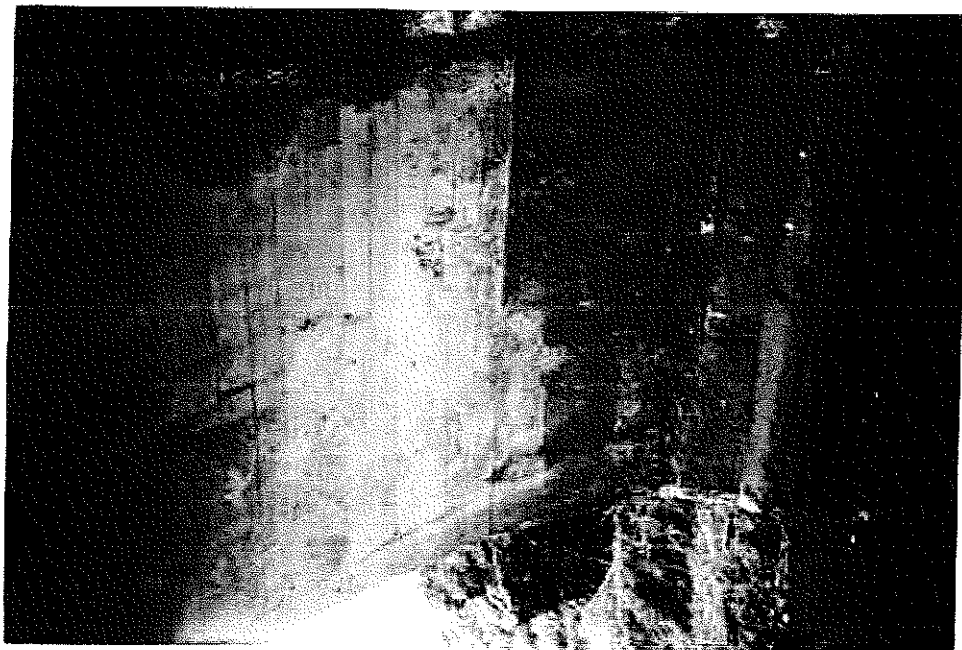
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Lancashire County Council
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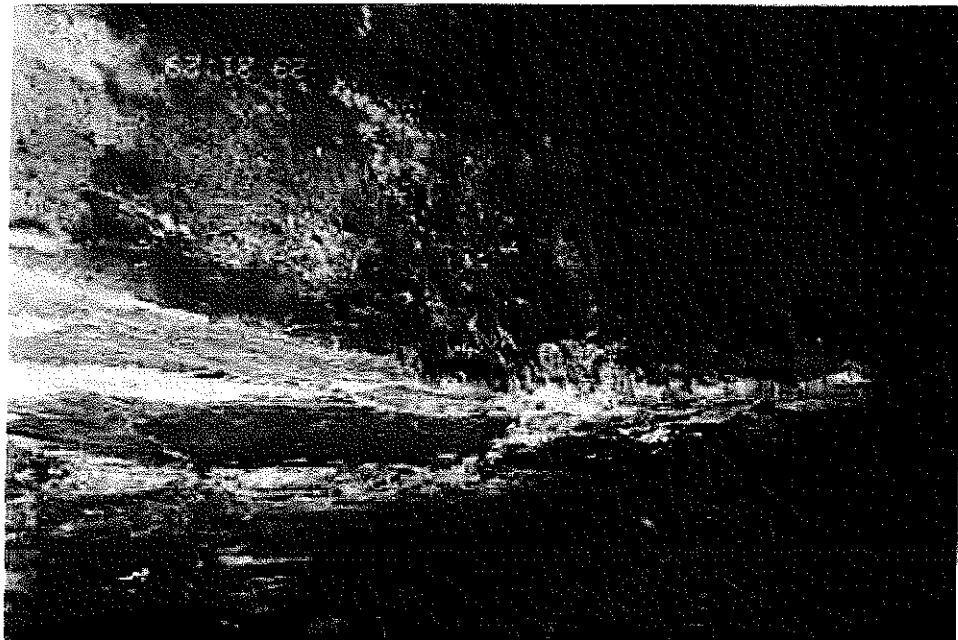


P6 GENERAL VIEW OF UPSTREAM END OF MAIN ARCH ABUTMENT

29677/233

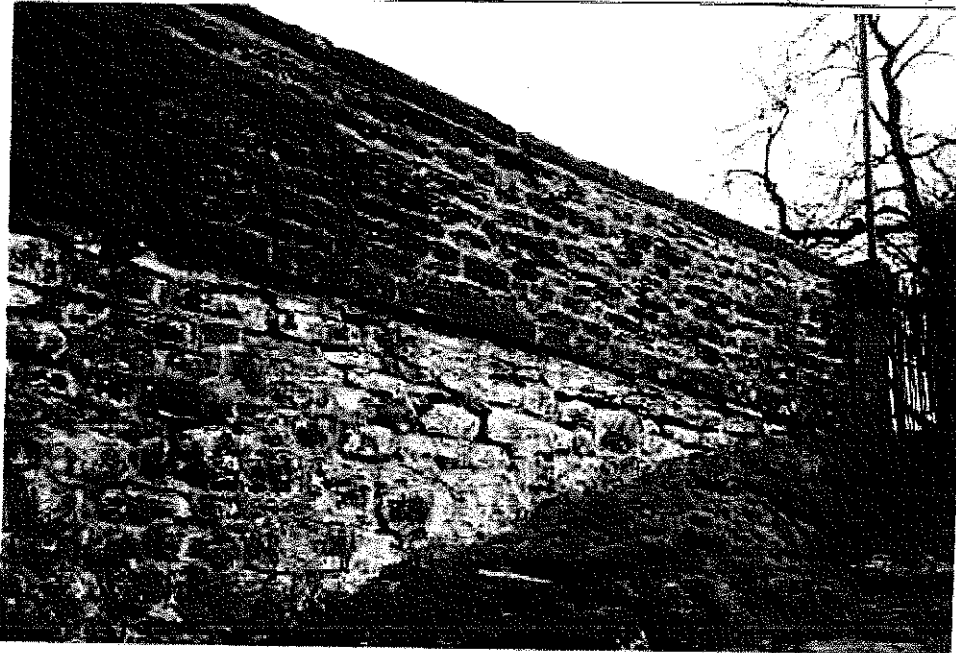


P7 DOWNSTREAM END - MAIN ARCH ABUTMENT 29677/2/29



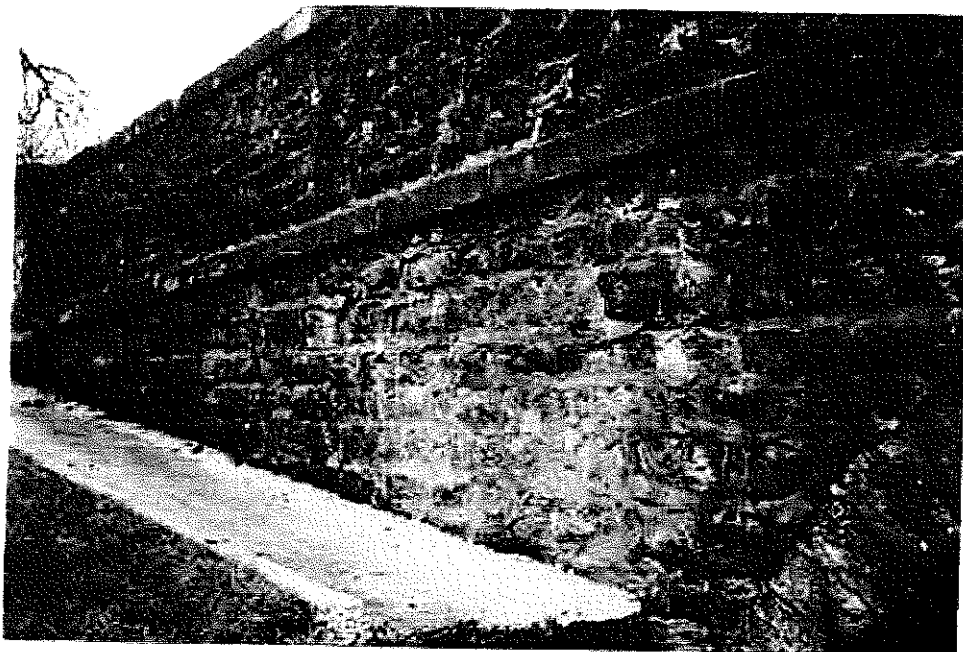
P8 EXPOSED REDAR - DOWNSTREAM. S. ABUTMENT 29677/3/1

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Croasdale Bridge (No. 4301) - PBI*



P9 GENERAL VIEW OF JOINT LOSS TO NORTH EAST WINGWALL

296773.12

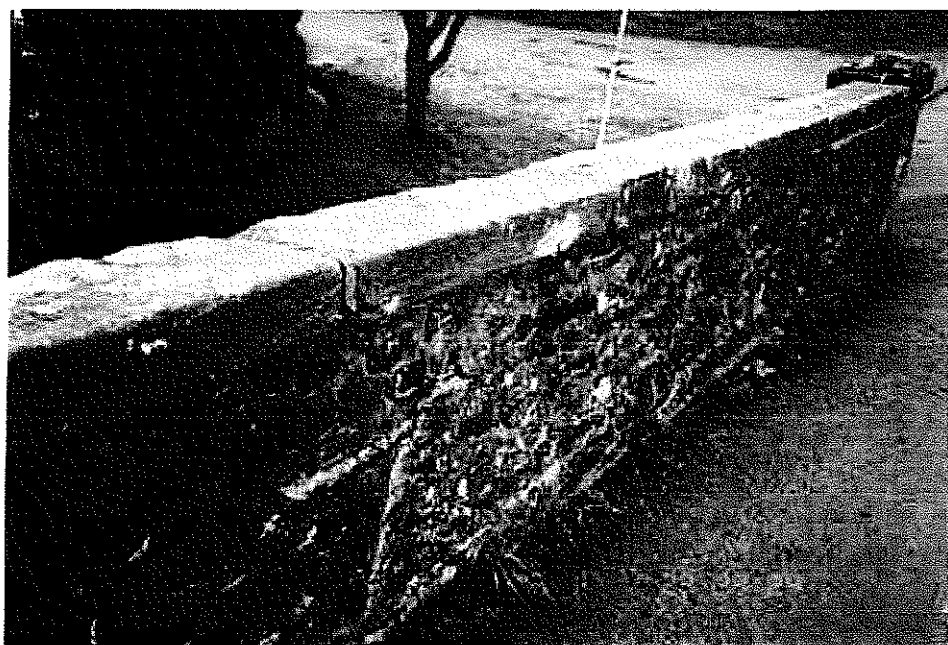


P10 GENERAL VIEW OF NORTH WEST WINGWALL

296773.33



P11 DIAGONAL CRACKING TO OUTER FACE OF NORTH WEST WINGWALL - CRACK ALIGNS WITH THAT IN PHOTO P12 20677 332



P12 DIAGONAL CRACKING IN INNER FACE OF NORTH WEST WINGWALL - CRACK ALIGNS WITH THAT IN PHOTO P11 20677 336

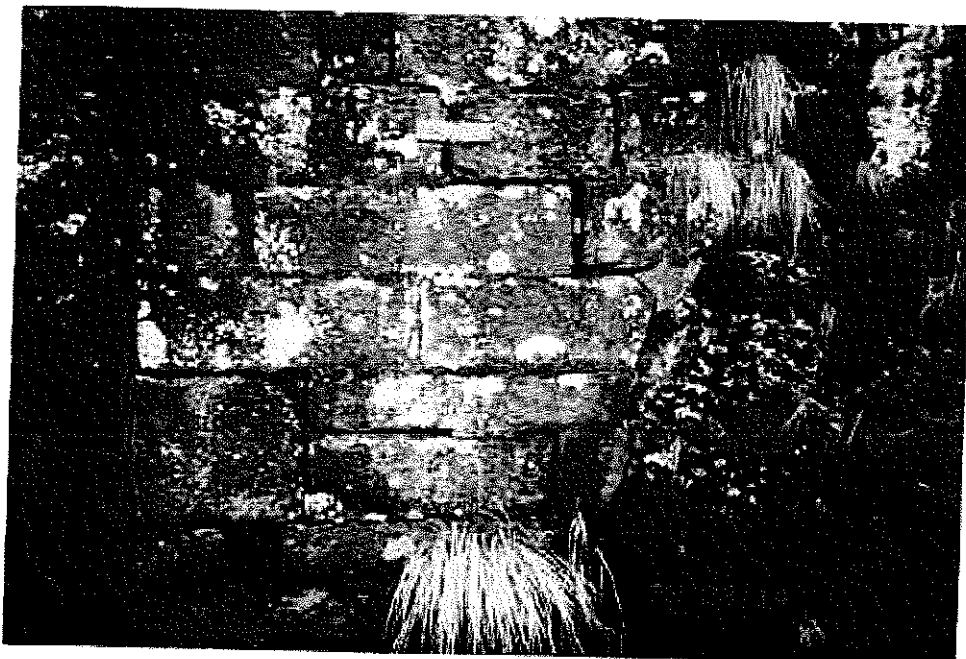
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Lancashire County Council
Crosdale Bridge (No. 4301) - PBI



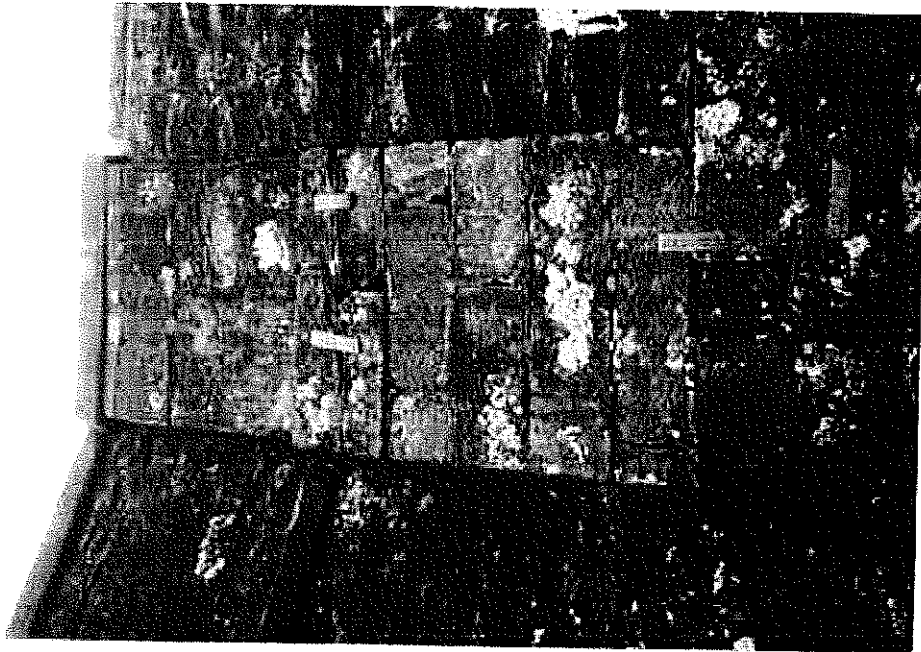
P13 GENERAL VIEW OF SOUTH WEST WINGWALL

29677/3/27



P14 OPEN JOINTS TO SOUTH WEST WINGWALL

29677/3/29



P15 OPEN JOINTS/TEL.TAILS ON S.W. WINGWALL 29677/3/30
29677/3/5



P16 S.E. WINGWALL - REPOINTING/MOVEMENT

4/9/24SLAM
29677/6A
November 1997

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Lancashire County Council
Croasdale Bridge (No: 4301) - PBI



P17 GENERAL VIEW OF MAIN ARCH RING - TOWARDS NORTH

29677/2/32



P18 GENERAL VIEW OF MAIN ARCH RING - TOWARDS WEST

20677/3/2

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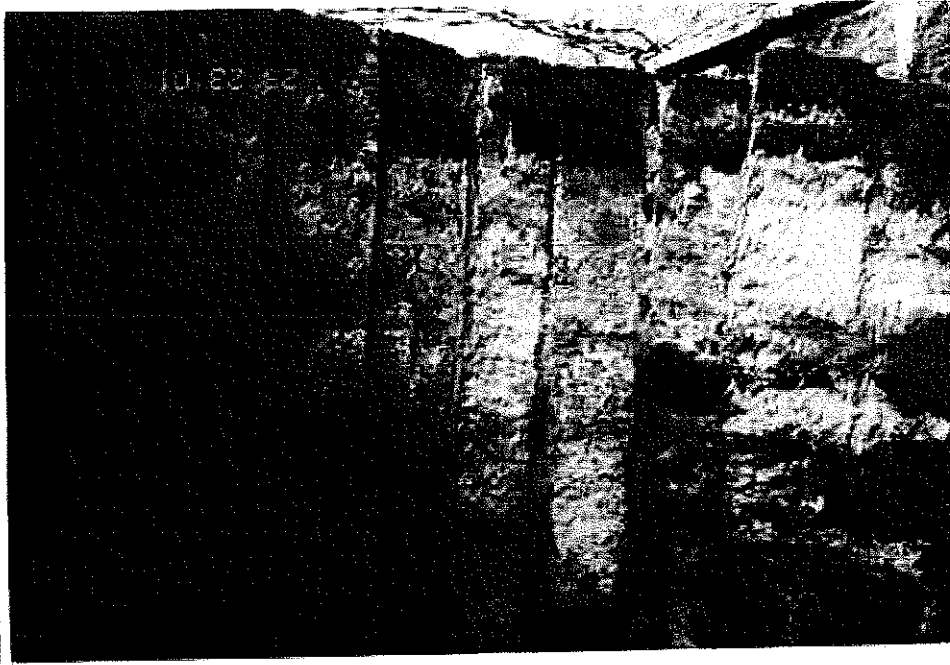


P19 MAIN ARCH BARREL - EXPOSED REBAR 29677/2/31

48245/AM
29677/MA
07/11/97



P20 RELIEF ARCH - OPEN JOINTS 29677/3/16



P21 RELIEF ARCH - STAINING AT NORTHEAST END 29/6/77/15

48025531M
29/7/18A
4811047



P22 SPALLING CONCRETE - NORTH SPRINGING 29/6/77/10

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P23 CRACKED MORTAR - EAST ELEVATION MAIN SPAN

29677/306



P24 EAST ELEVATION OF RELIEF ARCH

29677/311



P25 CRACKING/MOVEMENT - WEST ELEVATION OF MAIN ARCH (TELL TAIL NO 1) 29677.3/24



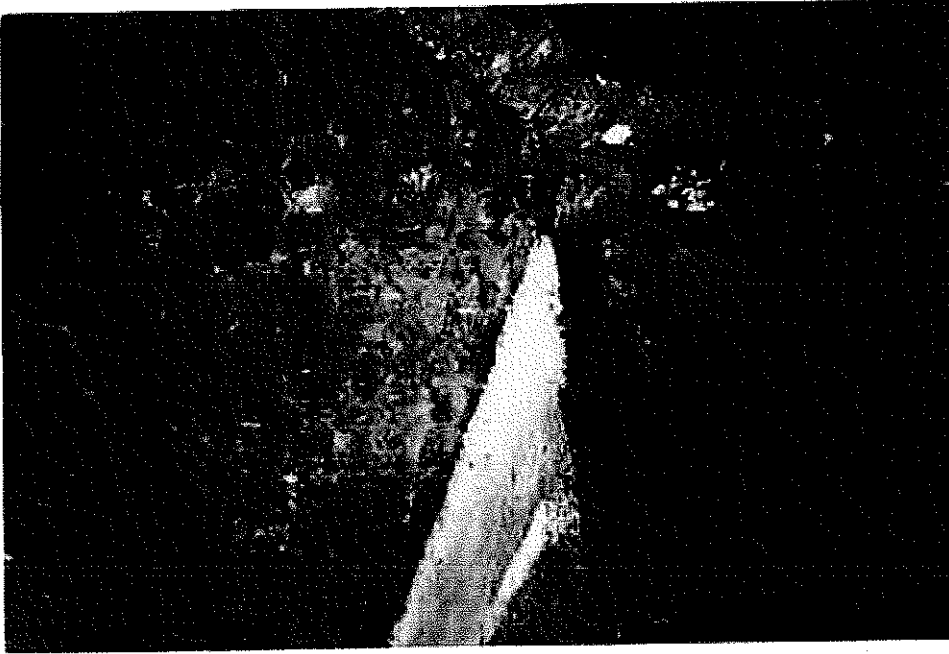
P26 CRACKING/MOVEMENT - WEST ELEVATION OF RELIEF ARCH (@ CROWN) 29677.3/10

320110532 P

Laurelshire County Council Crasdale Bridge (No: 4301) - PBI



P27 MOVEMENT AT UPSTREAM END OF RELIEF ARCH 29/07/20



P28 CONCRETE RAMP AND DRAIN 29/07/21

40028511M
3963781A
4711197



P29 JOINT LOSS AND STAINING - DOWNSTREAM END OF MAIN ARCH

29677/3/3

320110532 P

Lancashire County Council
Croasdale Bridge (No: 4301) - PBI

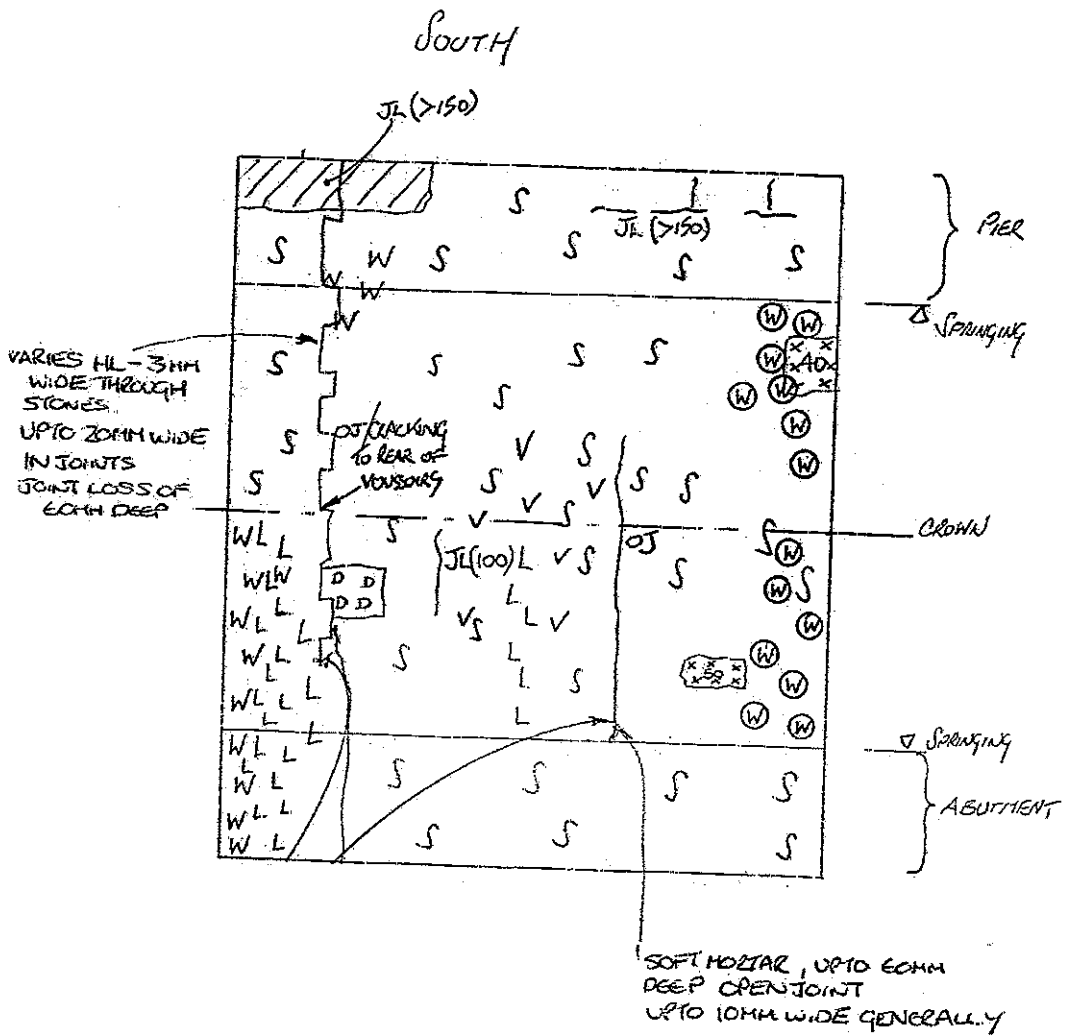
7.0 INSPECTION RESULTS - SKETCHES

	Butting
	Drummy
	Efflorescence
	Erosion depth of erosion (mm)
	Fractures and cracks hairline or dimension (mm) 5/9 denotes step between planes of fracture (mm)
	Joint loss (mortar) depth (mm), friable
	Leached deposits calcium carbonate silicate and gels ST denotes stalactites
	Missing brickwork or missing masonry
	Repairs
	Spalling and depth (mm)
	Surface deposits (dirt soot etc)
	Vegetation
	Active water seepage
	Wet and damp areas
	Open joints depth (mm)

STANDARD DEFECT NOTATION

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Croasdale Bridge (No. 4301) - PBI*





SK2 RELIEF ARCH

APPENDIX A
SPECIAL INSPECTION REPORT

APPENDIX A : SPECIAL INSPECTION REPORT

A1. INTRODUCTION

- A1.1. The Special Inspection was undertaken by Thorburn Colquhoun on the 24 January 1997 and by Test Consult on 14 October 1997, on behalf of Lancashire County Council.
- A1.2. The inspection was undertaken to enable the bridge to be assessed in accordance with BD21/97 Chapter 2, and was carried out at the time of the Principal Inspection.
- A1.3. This Report refers to the Principal Inspection Report dated November 1997 and should be read in conjunction with it.

A2. OBJECTIVES

- A2.1. The objectives of the Special Inspection were:
- i. Produce General Arrangement Drawing Number 4301/01
 - ii. To determine strength of concrete arch.
 - iii. To determine Carbonation and Chloride Ion content
- A2.2. The objectives were achieved by:
- i. Checking dimensions on site by taping.
 - ii. Undertaking a topographical survey.
 - iii. Testing to concrete arch including core samples.

A3. RESULTS

- A3.1. Results of Dimensional Surveys.
- i. Production of General Arrangement Drawing Number 4301/01.
 - ii. See A3.4 and attached concrete testing report (Appendix B).
- A3.2. Defect Assessment:
- i. Loss of section or other structural defect.
 - Extensive joint loss to abutments.
 - Mortar loss to rear of voussoirs in main arch, upto 120mm deep.
 - Mortar loss to rear of voussoir on minor arch, upto 260mm deep.

ii Recommended Condition Factors (BA16/93 Chapter 3).

	Main Arch (B1)	Minor Arch (B3)
• Condition Factor, Fc	0.8	0.7
• Barrel Factor, Fb	1.4	1.4
• Fill Factor, Ff	0.7	0.7
• Joint Factor, Fw	0.9	0.8
• Mortar Factor, Fmo	0.9	0.9
• Depth Factor, Fd	0.8	0.7

- Condition Factor (Concrete Arch) = 1.0 (B2)

A3.3. Comments on elements to be subjected to qualitative assessment only (as BD21/93 Chapter 8).

- i. No direct signs of scour or settlement.
- ii. The substructure is considered to be showing no signs of structural distress, and there is no increase of fill or other dead load, therefore the abutments are assumed to be adequate as BD21/93 Section 8/5.

iii. Wing Walls

There is extensive joint loss (up to 40mm) throughout the North East wing wall and the mortar is generally loose and friable. It is recommended to repoint the joints. There is indication of structural movement in the North West wing wall in the form of diagonal cracking and such defects are currently being monitored by Lancashire County Council. There are several areas of joint loss and open joints on the South West wing wall and tell-tails have been installed by Lancashire County Council to monitor movement. The South East wing wall exhibits open joints/joint loss and apparent movement - it is recommended to repoint the joints and monitor the assessment.

Spandrels

Extensive friable mortar and joint loss was noted to the northern end of the East elevation and the rear of the main arch concrete ring - it is recommended to rake out and repair. Nominal joint loss, leaching and spalling concrete is present on the East elevation, in the vicinity of the main arch springings - it is recommended to repoint and repair areas of spalling concrete. There is active seepage to the South end of the main arches spandrel on the East elevation - it is recommended to provide effective waterproofing membrane. On the West elevation localised areas of joint loss and open joints were noted particularly at the rear of both the main and relief arch rings with the former having mortar tell-tails dated December 1993 - it is recommended to rake out and repair with monitoring to take place.

Lancashire County Council
Croasdale Bridge (No. 4301) - PBI

A3.4. Concrete Testing

Concrete tests were carried out to determine the compressive strength of the arch concrete, the general quality of the concrete, and to assess the potential for future corrosion of embedded reinforcement. A full set of results is given in Appendix B; a summary and interpretation is given below:

- Estimated insitu cube strengths 27, 21 N/mm² (a low grade structural concrete).
- Concrete density 2,200, 2,230 kg/m³ (rather low and consistent with poor compaction, hence observed honeycombing in cores).
- Cement content 18.6% (indicative (surprisingly) of a high cement content).
- Chloride Ion content 0.03 - 0.16% W/W cement (based on a assumed cement content of 14% but nevertheless significantly less than the level at which there would be a risk of corrosion).
- Carbonation 1mm (minimal, hence no de-passivation at level of reinforcement).
- Cover 18 - 65mm (variable, but of minor concern given carbonation depths and chloride ion concentrations).
- Reinforcement - none found in either core.

A4. RECOMMENDATIONS

- No further investigations are needed, unless the bridge fails the initial assessment, in which case, in accordance with BCI 9.1E, consideration will be given as to whether a Special Investigation to determine the barrel thickness and depth of fill at crown is required.

A5. FURTHER INFORMATION

- None required to carry out initial assessment

APPENDIX B
CONCRETE TESTING

CONTENTS

- 1 INTRODUCTION
- 2 SITE DETAILS
- 3 METHODOLOGY
- 4 INTERPRETATION
- 5 RESULTS

APPENDICES

- 1 Laboratory Test Certificates
- 2 Location Plans

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1. INTRODUCTION

Testconsult Limited were instructed by Thorburn Colquhoun Consulting Engineers Limited, to carry out concrete testing on the following structure:

Croasdale Bridge, Slaidburn

This report describes the results of the work carried out, on the structures concrete arch, during October 1997, the methodology used on this investigation and presents the result of the site and laboratory testing.

2. SITE DETAILS

Croasdale Bridge is situated on the outskirts of Slaidburn, near Clitheroe. It spans over Croasdale Brook.

3. METHODOLOGY

The concrete arch was tested for depth of cover. The instrument used was a Protoval CM5 conforming to BS 1881: Part 204 : 1988.

Two number core samples were extracted from each side of the concrete arch and returned to our laboratory for analysis.

The following tests were carried out.

Carbonation: The depth of carbonation of the concrete was measured within each test area. Measurements were made in accordance with the guidance given in the BRE information paper IP/81. This involves spraying phenolphthalein indicator solution onto freshly exposed surfaces and noting the depth at which the colour change occurs.

Chloride ion content: The concrete cores were divided, by diamond cutting into the following sections, 5-20mm, 20-35mm, 35-75mm, 50-75mm. Each concrete sample was analysed in the laboratory to determine the chloride ion content in accordance with BS1881: Part 124: 1988.

Cement Content: The cement content of the core sample was determined in accordance with BS 1881 : Part 124 : 1988.

Compressive Strength: The compressive strength of the core samples was carried out in accordance with BS 1881 : Part 120.

4. INTERPRETATION

Chloride Ion Content

Where chloride ions penetrate to the level of reinforcing steel, the passivating layer is broken down locally and 'pitting corrosion' may occur. With sufficient available moisture and oxygen, corrosion may be rapid and severe, leading to local loss in section. Corrosion products may not initially be expansive and thus there is no visual evidence of corrosion. In the presence of oxygen the corrosion products turn to expansive rust and thus lead to cracking/spalling of the concrete cover.

In addition to uptake from de-icing salts, chlorides may be present in concrete via sea-dredged aggregates, exposure to marine conditions or calcium chloride admixtures.

The depth/concentration profile for chloride which has penetrated hardened concrete will show levels decreasing further from the surface. Chlorides present in the fresh concrete will tend to be evenly distributed throughout the concrete. The effect of carbonation is to displace the chloride ahead of the carbonation front and to sweep chloride inward towards the reinforcement.

BA 35/90 states that where chloride ion content at the level of reinforcement exceeds 0.3% (total chloride ion content) by weight of cement, there is a risk of corrosion occurring. BS 8110 limits the permitted chloride content from all sources to 0.35% by weight of cement for reinforced concrete structures. Concrete Society Technical Report No 32 suggests that the risk of chloride induced corrosion is significant for levels greater than 0.6%.

There is little published data on the accuracy and precision of the methods for chloride analysis.

4.3 Carbonation

Carbonation of the concrete is caused by carbon dioxide from the atmosphere forming a dilute carbonic acid with rain or other sources of moisture. This reacts with the cement paste with the carbonation of the concrete causing the reduction of the alkalinity of the concrete from approximately pH 13 to below pH 11.5. If this penetrates to the level of the reinforcement steel then depassivation of the protective oxide layer occurs and corrosion may commence. Corrosion can occur over a large area and is known as 'general corrosion', producing expansive rust which may lead to cracking or spalling. Usually the rate of corrosion is low with slow reduction in section. The change in colour of phenolphthalein occurs as the alkalinity decreases to about pH 9, indicating that the concrete has ceased to be protective.

5. RESULTS

The laboratory test certificates for both chemical analysis determinations and the compressive strength results can be found in appendix 1



Gary Foy

Laboratory Manager

For and on behalf of TESTCONSULT LIMITED



Fiona Pepper

Senior Technician

320110532 P

APPENDIX 1

Job No I.3882

CONCRETE NON-DESTRUCTIVE TESTING

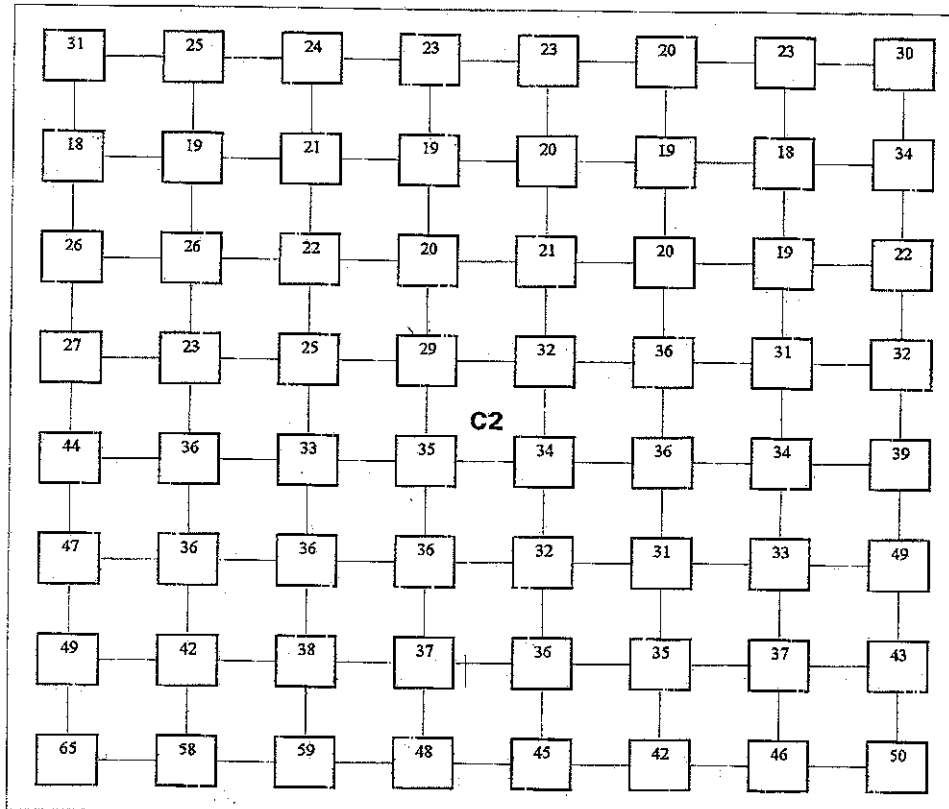
Project: Croasdale Bridge

Panel Reference:

1

Date of Investigation:

14/10/97



Cover Survey

2m x 2m Panel - 250mm grid

Location

Concrete Arch B2

200mm in from parapet wall

Croasdale Brook

Direction of Flow



KEY:



DEPTH OF COVER (mm)

C2

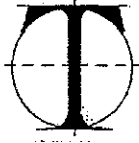
CORE LOCATION

TESTCONSULT LTD

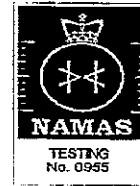
Fax: (01925) 830037

Tel: (01925) 830036

320110532 P



TESTCONSULT LTD
 11, Trinity Court, Risley, WARRINGTON, WA3 6QT
 Tel (01925 830036) Fax (01925 830037)



LABORATORY TEST REPORT
CONCRETE CORE COMPRESSIVE STRENGTH - BS 1881 : PART 120

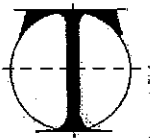
Project : Croasdale Bridge	Job No	L3882
Client : Thorburn Colquhoun	Lab Ref No	SA3052/1
Elisabeth House, St Peter's Square	Date Received	14/10/97
Manchester M2 3DF	Date Reported	03/11/97
Originator : S Clare	Material	Concrete Core
Client Ref No	Specification	BS 1881

Sample Details		
Testconsult Ref.		SA3052/1
Client Ref		-
Date of Drilling		14/10/97
Direction		Vertical
Length (mm)	max	227
	min	220
Aggregate		
Size (mm)		14
Content		60%
Visual Excess Voidage		3.0%
Reinforcement		none
Test Section		110-210
Method of end preparation		Mortar Capping
Test Results		
Date Tested		23/10/97
Length of time cured after preparation		24 hours
Length of uncapped specimen (mm)		95
Length of capped specimen		100
Diameter (mm)		99
Length/Diameter Ratio		1.01
Saturated Density (kg/m ³)		2200
Max. Load (kN)		220.8
Compressive Strength (N/mm ²)		28.7
Estimated In-situ Cube Strength (N/mm ²)		27
Failure Type		Normal
Remarks		Honeycombing 85-100 mm

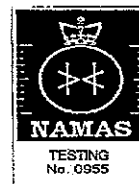
Cores cured since receipt at 20+/- 2°C

Tested In Accordance With BS 1881: Part 120 & C.S.T.R. No 11


GARY FOY
 Laboratory Manager
 TESTCONSULT LTD



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LABORATORY TEST REPORT
CONCRETE CORE COMPRESSIVE STRENGTH - BS 1881 : PART 120

Project : Croasdale Bridge	Job No	L3882
Client : Thorburn Colquhoun	Lab Ref No	SA3052/2
Elisabeth House, St Peter's Square	Date Received	14/10/97
Manchester M2 3DF	Date Reported	03/11/97
Originator : S Clare	Material	Concrete Core
Client Ref No	Specification	BS 1881

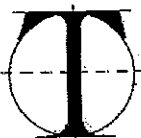
Sample Details	
Testconsult Ref	SA3052/2
Client Ref	-
Date of Drilling	14/10/97
Direction	Vertical
Length (mm) max	227
min	206
Aggregate	
Size (mm)	14
Content	60%
Visual Excess Voidage	4.0%
Reinforcement	none
Test Section	110-210
Method of end preparation	Mortar Capping
Test Results	
Date Tested	23/10/97
Length of time cured after preparation	24 hours
Length of uncapped specimen (mm)	95
Length of capped specimen	100
Diameter (mm)	99
Length/Diameter Ratio	1.01
Saturated Density (kg/m3)	2230
Max. Load (kN)	175.1
Compressive Strength (N/mm2)	22.8
Estimated In-situ Cube Strength (N/mm2)	21
Failure Type	Normal
Remarks	Honeycombing 60-90 mm

Cores cured since receipt at 20+/- 2°C

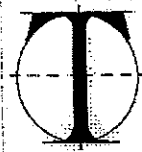
Tested In Accordance With BS 1881: Part 120 & C.S.I.R. No. 11


GARY FOY
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**LABORATORY TEST CERTIFICATE****DETERMINATION OF CEMENT CONTENT - BS 1881 : Part 124 : 1988 : 5**

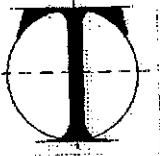
Project	Croasdale Bridge	Job No	L3882
Client :	Thorburn Colquhoun	Lab Ref No	SA3052
	Elisabeth House	Date Received	14/10/97
	St Peter's Square	Date Reported	03/11/97
	Manchester, M2 3DF	Material	Concrete
Originator :	S Clare	Specification	BS 1881

<i>Sample Ref.</i>	<i>Cement Content (%)</i>
Croasdale Bridge	18.6

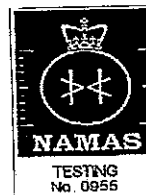
- 1 Analysis for cement content was based on the Soluble Silica (SiO_2) and Soluble Lime (CaO) content of the sample, and assumes the cementitious material to be OPC with a Silica content of 20.2% and a Lime content of 64.5%.
- 2 Where the two determinations differ by more than 1%, the lower figure is taken as the cement content and reported for the dry sample.
- 3 Without specific data on the aggregate used, or separate samples available for analysis, no corrections are possible for the Silica or Lime content of the aggregates. The affect of any corrections, if available, would be to reduce the calculated cement content, and the reported value should therefore be regarded as a maximum.

GARY FOY
Laboratory Manager
TESTCONSULT LTD

3052CC.XLS



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LABORATORY TEST REPORT

CHLORIDE ION CONCENTRATION - BS 1881 : PART 124 : 1988 (Potentiometric)

Project : Croasdale Bridge	Job No L3882
Client : Thorburn Colquhoun	Lab Ref No SA3052
Elisabeth House, St Peter's Square	Date Received 14/10/97
Manchester M2 3DF	Date Reported 03/11/97
Originator : S Clare	Material Concrete Drillings
Client Ref No	Specification BS 1881

Date Tested: 20/10/97

Reference:	Increment	Chloride Ion Content	
		% w/w sample	% w/w cement*
3052/1	5-20	0.023	0.16
3052/1	20-35	0.016	0.11
3052/1	35-50	0.015	0.11
3052/1	50-75	0.013	0.09
3052/2	5-20	0.004	0.03
3052/2	20-35	0.012	0.09
3052/2	35-50	0.015	0.11
3052/2	50-75	0.004	0.03

Tested In Accordance With BS 1881 : Part 124 : 1988 (Potentiometric Method)
Estimated Accuracy of Test Results +/- 0.003 % w/w Sample
*Assumed Cement Content - 14%

Additional Results:

Carbonation is less than 1mm

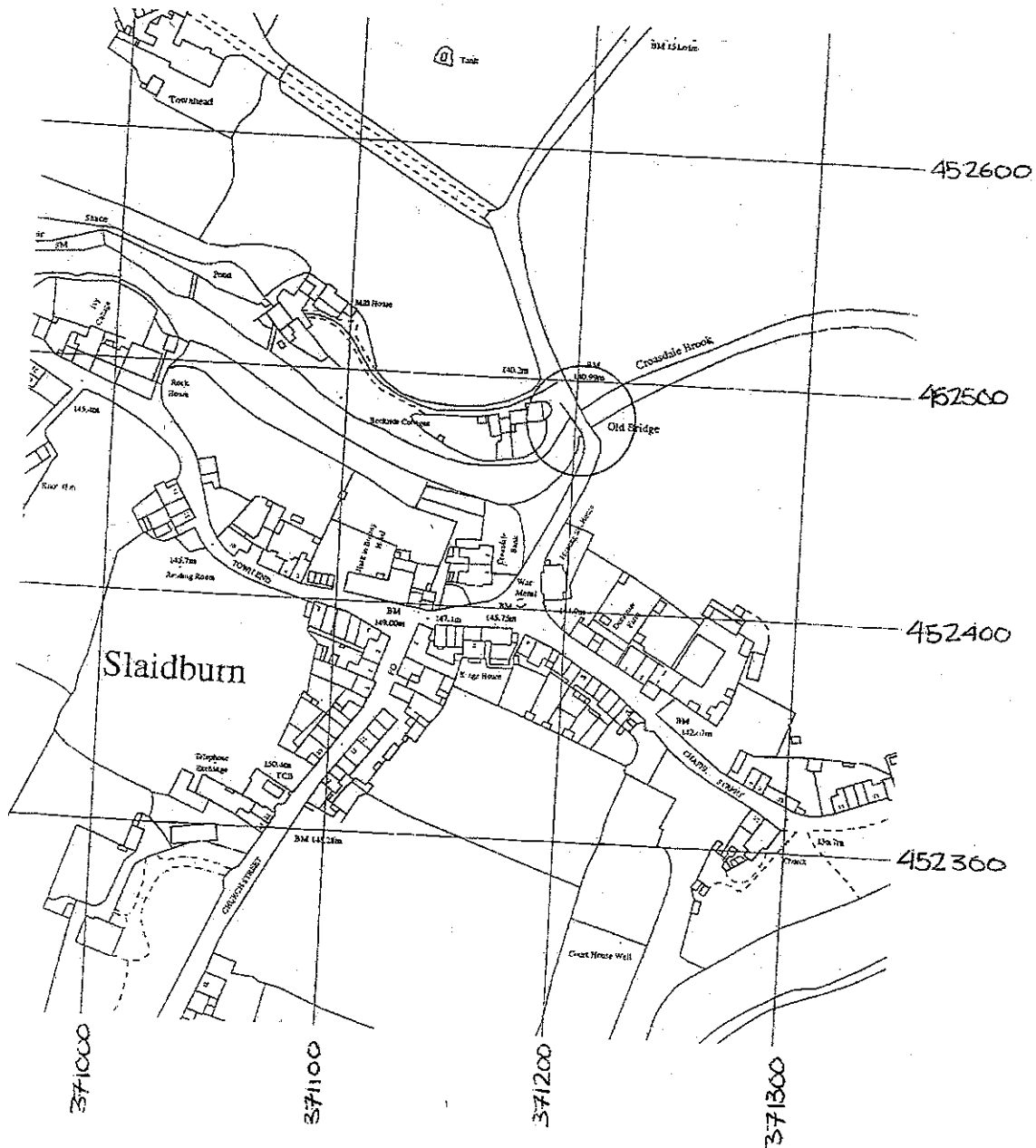
GARY FOY
Laboratory Manager
TESTCONSULT LTD

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APPENDIX 2



SCALE 1 TO 50



1. LOCATION PLAN

320110532 P

Lancashire County Council
Croasdale Bridge (No. 4301) - PBI

3. BRIDGE APPROACHES



3.1 APPROACH FROM THE SOUTH

29677/B



3.2 APPROACH FROM THE NORTH

29677/3/34

LCC Structure No: Croasdale Bridge No: 4301/B1/B2

Date: December 1997

LANCASHIRE COUNTY COUNCIL

TECHNICAL APPROVAL FOR THE ASSESSMENT OF HIGHWAY STRUCTURES
FORM TA1 (APPROVAL IN PRINCIPAL)

1. AUTHORITY/FIRM CARRYING OUT THE ASSESSMENT:

Thorburn Colquhoun Consulting Engineers

2. NAME OF STRUCTURE AND NUMBER:

Croasdale Bridge No: 4301/B1/B2

2.1 Highway Carried: *C519, The Skaithe*

2.2 Obstacle Crossed: *Croasdale Brook*

3. EXISTING STRUCTURE:

3.1 Description of Structure:

4301/B1

Two square span coursed masonry arch carrying C519 over the Croasdale Brook (see General Arrangement Drawing 4301/02).

4301/B2

Concrete arch extension to major arch (see General Arrangement Drawing 4301/02).

3.2 Structural Type:

4301/B1 - Superstructure

Masonry arch with masonry spandrels and parapets

4301/B1 - Substructure

Masonry abutments and wing walls.

4301/B2 - Superstructure

Reinforced concrete arch extension with masonry spandrels and parapets

3.3 Articulation Arrangements:

No joints or bearings, fully fixed arch.

3.4 Date Constructed/Reconstructed/Widened:

Date of construction not known. Date of concrete widening to major arch unknown.

LCC Structure No: Croasdale Bridge No: 4301/B1/B2

Date: December 1997

4. **ASSESSMENT CRITERIA:**

4.1 **Loading for assessment:**

4.1.1 **Assessment live loading to BD21/93:**

4.1.2 **HB live loading to BD37/88:**
Permissible No. of units to be determined.

4.1.3 **Other exceptional abnormal loads:**

None

4.1.4 **Any special loading not covered in 4.1.1 to 4.1.3:**

None

4.2 **LCC Schedule TAS (Appendix A):**

4.2.1 **Additional relevant standards not included in the LCC Schedule TAS:**

None

4.3 **Proposed departures from standards given in 4.2 and 4.2.1:**

Lancashire County Council Bridge Client Instruction No. BCI9 1E to be used for assessment of arch.

4.4 **Proposed methods of dealing with aspects not covered by the standards given in 4.2 and 4.2.1:**

None

5. **STRUCTURAL ANALYSIS:**

5.1 **Methods of analysis proposed for superstructure, substructure and foundations:**

(a) *The masonry piers are to be checked in the first instance to ensure requirements of BD21/93 Clause 6.26 are satisfied. (See attached document on 'Analysis of Pier Stability in Multi Span Arch').*

(b) *Arch barrel to be assessed using the modified MEXE method in accordance with BCI9 1E.*

(c) *Reinforced concrete arch assessed by elastic plane frame analysis using the STRAP computer programme. Dispersal of loads shall be in accordance with BD21/93 Clause 6.7.*

(d) *Spandrels, substructure and foundations to be subjected to a qualitative assessment based on the findings of the Principal and Special Inspections.*

LCC Structure No: Croasdale Bridge No: 4301/B1/B2
 Date: December 1997

5.2. Description and diagram (if necessary) of idealised structure to be used for analysis:

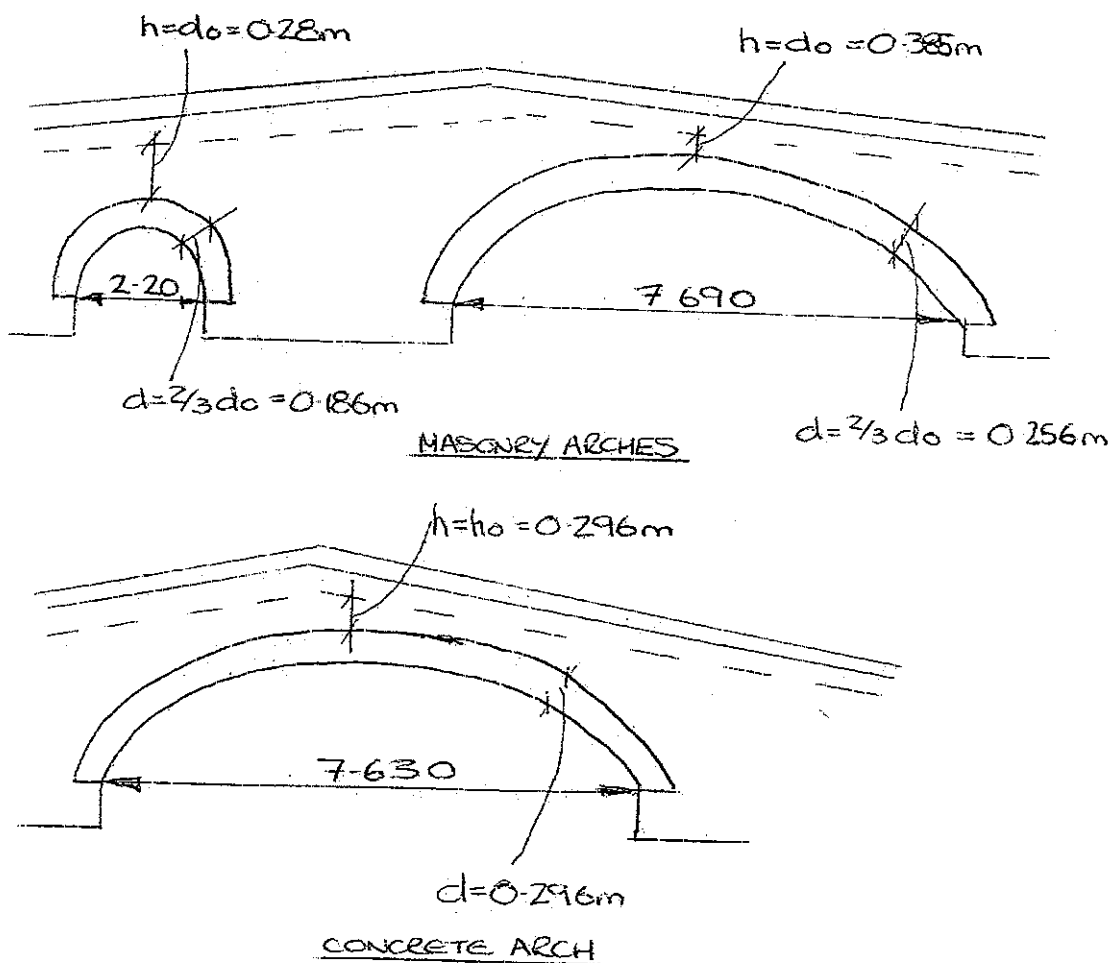
4301/B1

The minor masonry arch has a span of 2.2m arch ring thickness of 0.28m and depth of fill above the crown of 0.697m.

The major masonry arch has a span of 7.690m, arch ring thickness of 0.385m and depth of fill above the crown of 0.346m. All dimensions obtained during Special Inspection and shown on Drawing 4301/02.

4301/B2

The concrete arch has a span of 7.63m, an arch ring thickness of 0.385m and a depth of fill above the crown of 0.296m. All dimensions obtained during Special Inspection and shown on Drawing 4301/02.



LCC Structure No: Croasdale Bridge No: 4301/B1/B2
 Date: December 1997

- 5.3. Assumptions intended for calculation of structural element stiffness:
N/A
- 5.4. Proposed earth pressure co-efficients (K_a , K_o , or K_p) to be used for assessment of earth retaining elements:
N/A
- 5.5. Proposed assumptions for material strengths:
4301/B2: $f_{cu} = 21 \text{ N/mm}^2$ (from Laboratory Test Report by Test Consult)
 $f_y = 230 \text{ N/mm}^2$ (assumed).
6. GROUND CONDITIONS:
- 6.1. Is there evidence of foundation problems which have affected the structure in the past?
NO
 If yes, give details:
N/A
- 6.2. State details of known existing ground conditions:
Not Known
- 6.3. Has any additional ground investigation been carried for this assessment?
No
 If yes, give details: *N/A*
 If no, why is it not considered to be necessary?
The structure has been inspected for signs of settlement, tilting or rotation. There is evidence of minor movement to the cutwater, but no major signs of movement to the structure as a whole.
- 6.4. Describe foundations fully, giving maximum bearing pressures/ pile loads and strata in which foundations are located (if quantitative assessment considered necessary)?
Not Known
- 6.5. Is the ground, under or adjacent to the structure, liable to subsidence, erosion, ground movements or settlement due to embankment loading, mineral extraction, flowing water or any other cause?
Yes, possible erosion due to flowing water.
 If yes, give estimated time scale, extent (horizontal and vertical) of the anticipated movements and basis of the assessment of movements:
No erosion noted.

LCC Structure No: Croasdale Bridge No: 4301/B1/B2

Date: December 1997

7. **CHECKING:**

7.1 Proposed category of structure:

I

7.2 If category III give name of proposed checkers:

N/A

8. **DRAWINGS AND DOCUMENTS:**

8.1 List of drawings and documents accompanying this submission:

(a) General Arrangement Drawing No: 4301/02

(b) Schedule TAS - Appendix A

(c) Principal Inspection Report dated November 1997

(d) Document of 'Analysis of Pier Stability in Multi Span Arch' sheets P.Ex 1a - 6a

8.2 Other drawings and documents used in the Assessment:

(a) Lancashire County Council Bridge Client Instruction No. BCI9.1E

9. **THE ABOVE IS SUBMITTED FOR ACCEPTANCE**

Signed D J Bradbury

Name D J Bradbury
Team Leader, Design Office

Date 10 DECEMBER 1997

10. **THE ABOVE IS AGREED SUBJECT TO AMENDMENTS AND CONDITIONS SHOWN BELOW:**

Signed

Name Dr E R L Cole
Group Engineer (Bridges)
LANCASHIRE COUNTY COUNCIL

Date

10.1. Amendments and Conditions:

L.C.C. Structure No: Croasdale Bridge (4301/B1/B2)
December 1997

Appendix A

TECHNICAL APPROVAL SCHEDULE "TAS" FOR ASSESSMENTS

SCHEDULE OF DOCUMENTS RELATING TO THE ASSESSMENT OF HIGHWAY BRIDGES AND STRUCTURES (All documents are taken to include revisions current at the date of completing this TAS).

Note Some of the documents below are mandatory and are marked as such in the column on the right hand side of the page.

M - Mandatory for all structures

C - Additional documents mandatory for concrete structures

S - Additional documents mandatory for steel structures

Further documents which are also relevant shall be marked by a cross in the same column. Either BD34/90, BD46/92 or BD50/92 shall be marked depending on which Assessment Stage applies to the structure.

1. BRITISH STANDARDS			
BS 153	: Part 3A	Specification for Steel Girder Bridges (see BE 1/77).	
BS 5268	: Part 2	Structural Use of Timber	
BS 5400	:	Steel Concrete and Composite Bridges	
	Part 1	: 1988 - General Statement (see BD 15/92)	C, S
	Part 3	: 1982 - CP for Design of Steel Bridges (see BD 13/90)	S
	Part 9	: 1983 - Bridge Bearings (see BD 20/92)	
	Part 10	: 1980 - CP for Fatigue (see BD 9/81)	
BS 5628	: Part 1	: 1992 - Unreinforced Masonry	
	Part 2	: 1985 - Structural use of Reinforced and Prestressed Masonry	
	Part 3	: 1985 - Materials and Components, Design and Workmanship	
BS 5930	: 1981	Site Investigations	
BS 8004	: 1986	Code of Practice for Foundations	
BS 8002	: 1994	Code of Practice for Earth Retaining Structures (for Reinforced Brickwork Retaining Walls only)	
2. BRITISH STANDARD CODES OF PRACTICE			
CP 114	Part 2	Reinforced Concrete in Buildings (see Tech Memo BE 1/73)	
CP 116	Part 2	The Structural Use of Precast Concrete (see Tech Memo BE 1/73)	
CP 2		Earth Retaining Structures	
3. DOT PUBLICATIONS (HMSO)			
Simplified Tables of External Loads on buried Pipelines (1970)			

4. MISCELLANEOUS	
Circular Roads No. 61/72 - Routes for Heavy and High Abnormal Loads	M
5. TECHNICAL MEMORANDA (BRIDGES)	
BE 1/73 Reinforced Concrete for Highway Structures (Relevant Parts for the Design of Buried Precast Concrete Pipes and Sign/Signal Gantries Only)	
BE 1/77 Standard Highway Loadings (Relevant Parts for the Design of Buried Precast Concrete Pipes and Sign/Signal Gantries Only)	
6. DEPARTMENTAL STANDARDS	
6.1 BRIDGES AND STRUCTURES	
BD 2/89 Technical Approval of DTp Highway Structures on Motorways and other Trunk Roads	M
BD 7/81 Weathering Steel for Highway Structures	
BD 9/81 Implementation of BS 5400 : Pt 10 : 1980 - CP for Fatigue	
BD 10/82 Design of Highway Structures in Areas of Mining Subsidence	
BD 15/92 General Principles - Use of BS 5400 : Pt 1 : 1988	C, S
BD 20/92 Bridge Bearings - Use of BS 5400 : Part 9 : 1983	
BD 21/93 The Assessment of Highway Bridges and Structures	M
BD 29/87 Design Criteria for Footbridges	
BD 30/87 Backfilled Retaining Walls and Bridge Abutments	
BD 31/87 Buried Concrete Box Type Structures	
BD 32/88 Piled Foundations	
BD 34/90 Technical Requirements for the Assessment and Strengthening Programme for Highway Structures - Stage 1	X
BD 37/88 Loads for Highway Bridges	M
BD 41/95 Reinforced Clay Brickwork Retaining Walls of Pocket-Type and Grouted-Cavity Construction. Use of BS5628: Part 2:1985	
BD 42/94 Design of Embedded Retaining Walls and Bridge Abutments (Unpropped or propped at top)	
BD 44/95 The Assessment of Concrete Highway Bridges and Structures	C
BD 46/92 Technical Requirements for the Assessment and Strengthening Programme for Highway Structures - Stage 2	
BD 48/93 The Assessment and Strengthening of Highway Bridge Supports	
BD 49/93 Design Rules for Aerodynamic Effects on Bridges	M
BD 50/92 Technical Requirements for the Assessment and Strengthening Programme for Highway Structures - Stage 3	

*L.C.C. Structure No. Croasdale Bridge (4301/B1/B2)
December 1997*

Appendix A

BD 52/93 The Design of Highway Bridge Parapets	M
BD 56/96 The Assessment of Steel Highway Bridges and Structures	S
BD 61/96 The Assessment of Composite Highway Bridges and Structures	

EASIPOINT^{320110532 P}

HISTORIC MORTAR



Historic Colour Range

Dark Grey, Sandstone, Standard, Dark Brown,
Light Grey, Brick Red, Yorkstone

Product Details/Classification

EasiPoint Historic is a dry packed blend of lime complying with BS EN 459-1, GGBS complying with BS6699, selected silica sands and natural aggregates complying with BS EN 13139 together with additives to provide water resistance, thixotropic properties, workability and colour.

EasiPoint Historic is a traditional hydrated lime, sand, GGBS mortar.

BENEFITS

- ✓ **Fast Application**
- ✓ **Cost Effective**
- ✓ **Cement Free**
- ✓ **Complete Joint Fill**
- ✓ **Stain-free & Colour Consistent**

Specification Outline

Pointing shall be carried out using EasiPoint Historic Mortar as manufactured by EasiPoint Marketing Ltd. The product must be stored, handled and used strictly in accordance with the manufacturer's instructions.

Quality Assurance

EasiPoint Mortars are manufactured under a quality system conforming to BS EN ISO 9001:2000.

Typical Properties @ 20°C

Compressive Strength	8N/mm ²
Initial Set	3 hours
Pot Life	30 mins
Density	2,050Kg/m ³

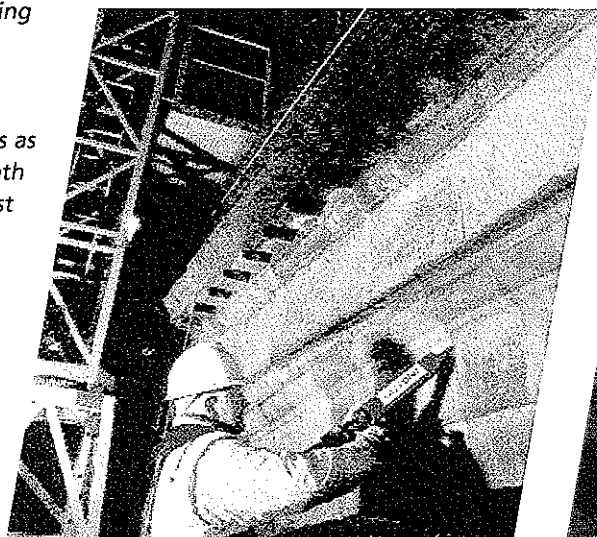
Description

Designed for gun-injection, EasiPoint Historic provides a cement-free mortar for pointing soft brick or stonework

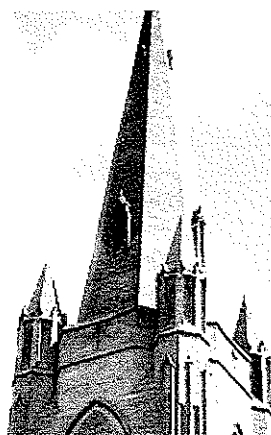
Consistent in both colour and finish, EasiPoint Historic mortars are pumped deep into the joint, providing a complete fill and a degree of flexibility. The mortar is porous allowing the passage of water through the mortar joint.

EasiPoint Historic can be injected into joints as narrow as 5mm and will penetrate to a depth in excess of 100mm, allowing for the deepest of joints.

A standard range of seven colours is readily available. Bespoke blends, where exact matching is required, can also be formulated.



HISTORIC MORTAR



Instructions for Use

Joint Preparation

In order to ensure adequate bonding of the new mortar to the masonry, it is important that the old mortar is removed, to a minimum depth of twice the joint width, and that any residual dust is removed from the joint.

If the masonry is porous, joints should be wetted down prior to repointing to prevent excessive suction.

Mixing

Place 4.00/4.5 litres of clean water in mixing tub and gradually add dry EasiPoint mortar whilst mixing (the quantity of water will vary with the colour used) Mix in a wide shallow pan using a low speed drill and EasiPoint Blender.

Mix until a consistency of stiff cream is achieved, adding a little extra water if required. Allow mortar to stand for approx 5 minutes. Remix with the addition of a small amount of water if necessary. Check correct consistency by filling the tube, the mortar should hang from the end of the nozzle when the tube is shaken.

Placing

Keeping the nozzle just clear of the wall inject mortar into the joint, slightly overfilling, working from the top of the wall downwards

The mortar should be tooled off after it has formed a semi-dry surface skin and lost it's initial sheen. The time this takes depends upon the absorbency of the masonry.

EasiPoint Historic may be placed at temperatures between 5°C and 35°C Do not carry out jointing work if rain is expected.

Precautions

Health and Safety

EasiPoint Historic is alkaline when mixed with water and should not come into contact with skin or eyes. Avoid inhalation of dust during mixing and wear safety glasses, dust mask and gloves. If skin contact occurs wash thoroughly with clean water. Should eye contact occur rinse immediately with plenty of clean water and seek medical advice. Full Health and Safety Data are given in a Product Safety Data Sheet.

Fire

EasiPoint Standard is non-flammable.

Yield

Each 25kg bag of EasiPoint Historic will yield approx. 13.5 litres of mixed material.

Storage and Shelf Life

This product must be stored in unopened bags, kept clear of the ground in cool, dry conditions, protected from excess draught and frost. When kept under these conditions between temperatures of 5-45°C the shelf life of the material will be 6 months from the date of manufacture.

Packaging and Ordering

EasiPoint Historic is supplied in 25kg valvesack bags.

Product Code

EA201 Dark Grey	EA205 Light Grey
EA202 Sandstone	EA208 Brick Red
EA203 Standard	EA209 Yorkstone
EA204 Dark Brown	

For further information and sales please contact:

EasiPoint Marketing Ltd
Restoration House
Drumhead Road
Chorley North Industrial Estate
Chorley, Lancs
PR6 7DE

Tel: 01257 224900
Fax: 01257 224901

EasiPoint Marketing Ltd products are guaranteed against defective materials and manufacture. Products are sold subject to the EasiPoint Marketing Ltd Terms and Conditions of Sale, copies of which are forwarded on invoice and are available on request. EasiPoint Marketing Ltd endeavours to ensure that the above data and any further advice is correct, however, it cannot accept any direct or indirect liability for the use of its products as such usage is beyond its control.

www.easipoint.co.uk