A90 Forth Road Bridge

Special Inspection Report

North Main Tower Expansion Joint
Removal & Reinstatement of Side-Span Plate
SW No.3
October 2015

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SPECIAL INSPECTION REPORT

A90 9 Forth Road Bridge

North Main Tower Expansion Joint
Removal & Reinstatement of Side-Span Plate SW No.3

October 2015

Document Control Sheet

Rev.	Status	Date	By	Check	Approve
0	Final	24/11/2015			

Contents

Executive Summary

This report presents the findings of the October 2015 Forth Road Bridge North tower Demag expansion joint special inspection, which was undertaken at the north west main tower expansion joint, side-span plate No.3. All inspections were close visual inspection (CVI) carried out in accordance with the *Register of Programme Special Inspections for the Forth Road Bridge* and the *Forth Road Bridge Engineering Manual*.

The inspection works were completed during a North bound carriageway closure during nightshift hours on Saturday 24th October 2015. The inspection works were completed without delays and no significant defects found during removal or reinstatement of the slide train.

The inspection found the overall joint unit in a fair condition, though areas of significant corrosion was evident on the support cell steelwork and fixings thought to be created by constant water ingress of water through the expansion joint plates from the carriageway. During the inspection, the plate springs were replaced and tensioned to the required setting. No other refurbishment works were undertaken during this inspection.

1. Introduction

A planned operational programme of works to remove and reinstate a Demag expansion joint plate located at the north west main tower was carried out on 24th/25th October 2015. The purpose of the inspection was to record the rate of deterioration and report on the current status of side-span plate SW No. 3 and to carry out any associated repairs that may be required before the plate was reinstated beck into its location. This report summarises the findings of the inspection and details the repairs undertaken.

The main Demag expansion joints are embedded in the roadway adjacent to the bridge main towers. The joints were developed, fabricated and installed by the German firm Demag A.G. and are a rolling leaf design. In total there are eight joints, four in each carriageway. Each joint comprises of six units of varying width, the four inner units are 1228 mm wide and the edge units adjacent to the central reserve are 1245 mm wide. The edge units adjacent to the verge are 1340 mm wide.

Each unit comprises of a tongue plate and movement train. The latter comprises a shuttle (bridge) plate and a number of link (train) plates. The trains are supported on curved beam slide tracks. The tongue plates and slide tracks of both the large and small joints are bolted to steelwork grillages that are connected to the main towers. Each tongue plate is attached to the support beam be a pair of spring loaded holding down bolts.

Close Visual Inspection (CVI) of all surfaces of plate SW No. 3 was undertaken during this inspection, supplemented by task lighting and head torches due to nightshift working.

2. Inspection History

The joints have generally performed well, although they have been in service for over 50 years. A major overhaul was carried out in 1975. During this work evidence of wear in the hinges and the interface between the trains and slide tracks was found.

A sample inspection in 2008, which involved the removal of the tongue plate and train of one of the units, revealed the following defects:

- Excessive play in the connection between the plates of the train due to wear within the hinges particularly elongation of the holes
- General wear of the shuttle and link bearings (cams and blocks)
- Wear of the slide track with localised surface indentations
- Excessive wear of the steel pads that interface with the bearing blocks at the end of the shuttle plates

In 2008, Atkins developed a scheme for the replacement of the expansion joints, however due to a funding shortfall the scheme was not taken forward. Late in 2008 details were announced for the new Forth Replacement Crossing (FRC) which was programmed to be completed in 2016. Due to the commencement of the FRC scheme, a review of schemes was undertaken on the Forth Road Bridge to defer any which would cause major traffic disruption. As a result the replacement of the joints was deferred until after the opening of FRC.

Given the joints had reached the end of their service life and required to be replaced because of concerns over their reliability and the consequences of their failure in service, a Failure Mode and Evaluation Analysis was undertaken by Atkins and FETA to identify areas of concern. The analysis concluded that the life of the joints could be extended subject to certain measures being put in place.

One of these measures is to increase the inspections on the expansion joints and as such recommendations were made to remove a single train unit on an annual basis to note any signs of significant deterioration and carry out any remedial works required.

Further to this recommendation, the following inspections have been undertaken to date:

- October 2004 North East Main Tower, plate SE 3
- January 2009 North West Main Tower, plate MW 3
- October 2011 South East Main Tower, plates ME 3 and SE 3
- October 2014 North West Main Tower, plate MW 3

3. Inspection Procedure

The 2015 expansion joint inspection was conducted and completed using the procedures as specified in Amey method statement MS.048 Rev 2. A copy of the method statement is included within Appendix A.

The purpose of the inspection is to determine the level of deterioration and specifically inspect key areas, such as:

- The pins and bushes which hold the leaves of the sliding plates together
- The wearing pads on the sliding plates
- The bolts and plates which connect the sliding and tongue plates to the structure
- The level of wear at the road surface to both the sliding and tongue plates

Previous plates removed from the NE Sidespan and NW Main span highlighted possible areas of concern during the removal / replacement of the sliding plates. Pins, bushes, bolt springs etc. may be replaced on plates that are removed during the inspection.

After removal of the plate train, the location is cleaned down using a stiff brush and pressure washing equipment ready for inspection.

Close Visual Inspection and dimensional checks were carried out by Amey Bridge Inspectors on the radius girders and plate train, focussing on the key areas noted above.

4. Inspection Findings

4.1 Pre-Removal Inspection

Prior to the commencement of the work to remove Side-span plate No. 3, top plate dimensional checks were carried out and recorded. A copy of the dimensional check sheet is included within **Appendix B** to this report.

Tongue plate

Prior to removal of the tongue plate an inspection was carried out to record the current status of the plate & associated fixings.

> Springs: Tongue plates springs both east & west were intact and secure. General breakdown of protective paint coating on the springs was evident. The continual compression & de-compression of plate movement from vehicle axial load transferral induces break-down. This combined with the location and exposure to the elements creates an environment which exposes the springs and general corrosion is inevitable - this was evident on both springs at the time of inspection. Spring dimensions were recorded prior to removal - spring sizes on both East & West springs were recorded at 72mm. By recording this information this ensure's that new springs can be compressed to this size on reinstatement of the tongue plate. Both blocks located on the east & west side of the plate remain intact & secure.

General condition of springs during pre-inspection

The tongue plate in general, remains in satisfactory condition. Wear down on the tongue plate leading edge was evident where is meets the with the rocker plate sliding plates. This was extremely prominent from the centre point of the plate where the edge slightly rippled due to the wear in the plate edge at this point.

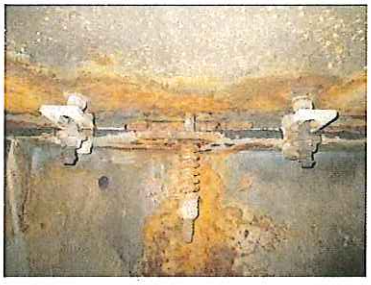
The cell condition was to be as expected, although areas of heavy corrosion were evident on the cell steelwork & associated fixings. The majority of the discolouration / staining on the cell steelwork is created by constant ingress of water distributed from the carriageway and through the expansion joint plates. In general the cell steelwork remains in a satisfactory condition.

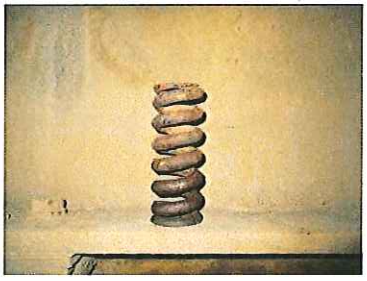
Heavy corrosion to cell steelwork

Rocker & Sliding Plates

Prior to removal of the rocker & sliding plates an inspection was carried out to record the current condition of the plate & associated fixings.

Rocker Spring: Rocker plate spring located centrally in the plate were intact and secure. General breakdown of the protective paint coating on the spring was evident. The continual compression & de-compression of plate movement from vehicle axial load transferral induces break-down. This combined with its location and exposure to the elements creates an environment which exposes the spring and general corrosion is inevitable. This was evident on the rocker spring at the time of inspection. Spring dimension's were recorded prior to removal, spring size recorded at 140mm. By recording this information this can ensure that new spring will be compressed to this size on reinstatement of the rocker plate.





Condition of Rocker Plate and Springs

Rocker plate end bearing blocks: Both blocks located on the east & west side of the plate remain intact & secure.

Rocker plate sliding plates: Both sliding plate remain attached, intact & secure.

Rocker & Siding Plate failsafe system: All train plates, bolts & associated fixings attached to sliding plates remain intact, secure & in a satisfactory condition.

4.2 Removal of Plates

Following completion of all pre removal inspections, the removal of the tongue plate / Rocker plate / sliding plate proceeded.

Tongue plate: Tongue plate lifting bracket attached using existing spring holes & secured using specified bolts. Plate lifted & laid down by crane. No problems were encountered during lift.

Tongue plate end bearing blocks: Both blocks located on the east & west side of the bearing ledge remain intact & secure.

Fixing of lifting eye beam for removal of slide train

Rocker & sliding plate: Fixed lifting eye attached to plate using existing rocker plate spring hole & secured using specified bolt. Plate lifting clamp was attached to the sliding plate section No 2 and secured. Crane lift took place. On lift, resistance was found in the south east corner between sliding plate leaf No 2 & the west face of the sliding plate on N\W No 4. The reason for the resistance was due to unequal gaps between the two leaves of the sliding plates. This was rectified by the use of a lever bar to which force was applied to ease the pressure on both faces. This method proved to be successful and the lift continued and was completed without any further issues. The plate was lifted and laid on its surface side to allow inspection of all sliding plate links, pins and bushes. All welds on the links to sling plate sections were visually inspected, all were found to be in a satisfactory condition. It was decided that no further method of inspection would be necessary.

Removal of slide train

Pins: The sliding plate section pins (as in previous inspections on several plates) were found to be worn and out of shape. All remain in-situ, intact and secure.

General Condition of Slide Train Pins and Bushes

Bushes: All bushes were visually inspected and dimensions recorded. Bush thickness were measured in four locations on both internal & external faces. Wear-down was evident on all bushes. Refer to inspection record sheets within Appendix B for more information.

Example of Wear to Radius Arm from Bushes

Rocker plate end bearing blocks: Both blocks located on the east & west side of the plate remain in a satisfactory condition. All welds on the rocker plate end bearing support blocks were visually inspected, both were found to be in a satisfactory condition. It was decided that no further method of inspection would be necessary. A slight mismatch of levels between the rocker plate end and the deck panel end was recorded. Refer to inspection record sheets within Appendix B for more information.

Rocker Plate End Bearing Blocks (East and West)

Radius arm girder: A visual inspection of the radius arm girder was carried out to record the depth of wear down through the constant movement of the sliding plate sections. Refer to inspection record

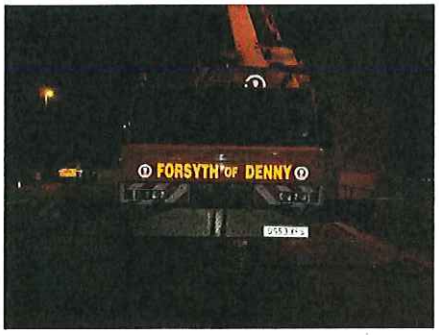
sheets within Appendix B for more information. The structural integrity of both E & W radius arms remain in a satisfactory condition.

Radius Arm Girders

Following the completion of the required inspections, all areas were cleaned down to remove all dirt and debris build up to eliminate any possibility of encountering problems during the reinstatement of the rocker/sliding and tongue plates.

4.3 Reinstatement of Plates

Following the replacement of the joint, and to ensure correct settlement, seating and alignment of the plates the crane was driven over the joint.



Crane for Removal & Reinstatement of Slide Train

A visual inspection was carried out from the cell and this proved to be successful. All plates were seated correctly.

Rocker plate: New spring fitted. Tensioned to required pre–removal length of 140mm. Fail-safe bolts fitted. Failsafe train plates fitted & tightened. All satisfactory

New spring fitted to rocker plate

Tongue plate: New springs were fitted on both East & West. Tensioned to required pre–removal length of 72mm. Fail-safe bolts fitted. All satisfactory.

New springs fitted to tongue plate

5. Conclusions & Recommendations

It should be recorded that only the replacement of the plate springs was carried out. No other refurbishment work with the exception of cleaning operations took place to remove excessive build-up of detritus from the plate end bearing seats and radius arm girder surfaces, this was to reduce any possibility of encountering any problems when reinstating either the tongue plate or the rocker / sliding plate.

All works and Inspection procedures were witnessed, carried out and completed to the satisfaction of Amey Major Bridge Manager – Forth Road Bridge, Mr Angus Bruce & supervisors G. Elliott, L. Coyle & J. McGill. Following completion of works, the site was inspected, all materials used to complete works were removed and the site cleaned.

Appendix A: Inspection Method Statement

METHOD STATEMENT:-
MS048 Rev2 Removal & Inspection of Selected Plate Trains at the Main Tower Demag Expansion Joints

WORKS INFORMATION

Prepared by:

SCOPE OF WORK: At each of the main towers on the Forth Road Bridge expansion joints are located to allow movement of the main span and side spans, independently from the tower. These expansion joints are known as the Demag joints. They operate by a series of sliding plates (which are permanently connected to the side and main spans) bearing on top of radius girders (which are permanently attached to the main towers). Tongue plates extend from the tower steelwork and bear on top of the sliding plates whilst allowing the sliding plates to move below them.
Expansion and contraction of the deck steelwork therefore exposes more or less of the sliding plates to traffic. For a general arrangement of the Demag joints please refer to the original as built drawing No BE6044a/5. The purpose of this exercise is to determine the level of deterioration and inspection of the joints in key areas such as;

- The pins and bushes which hold the leaves of the sliding plates together.
- The wearing pads on the sliding plates.
- The bolts and springs which connect the sliding and tongue plates to the structure.
- The level of wear at the road surface to both sliding and tongue plates.

A decision on the level of maintenance and inspection has been formulated by the maintenance manager and passed on to all maintenance bridge inspectors and maintenance supervisors, previous plates removed from the NE sidespan and NW mainspan did highlight any possible pitfalls in the removal / replacement procedure. Pins, bushes, bolts springs etc may be replaced on the plates that are removed.
For location of the intended plates to be removed please refer to AMEY Drg No BC 06 63-01-16
Failsafe measures have been installed during spring 2011 see MS 060 also Atkins Drgs 5057541/314/101 and 5057541/314/100

EQUIPMENT:

30t Crane (plan based on type PPM350 ATT) & Lift Supervisor, 6.5 tonne SWL Shackle/1.5 tonne SWL Lifting Eye, 6.5 tonne SWL Shackle/3 tonne SWL Lifting Bar, 6 tonne plate camp,
3 tonne pulllift x 2, Acroprops, Miscellaneous Rigging Equipment, Welding Equipment, Electrical Hand Tools, Hand tools, Mobile Power Washer.

METHOD OF WORKING:

All personnel involved with this work described in this method statement will read both the method statement and the accompanying risk assessments; these are in addition to existing work packs and inclusive safety documentation. On completion of reading both briefings, they will sign both record sheets to confirm their understanding of the method statement and work pack in its entirety.

Safety

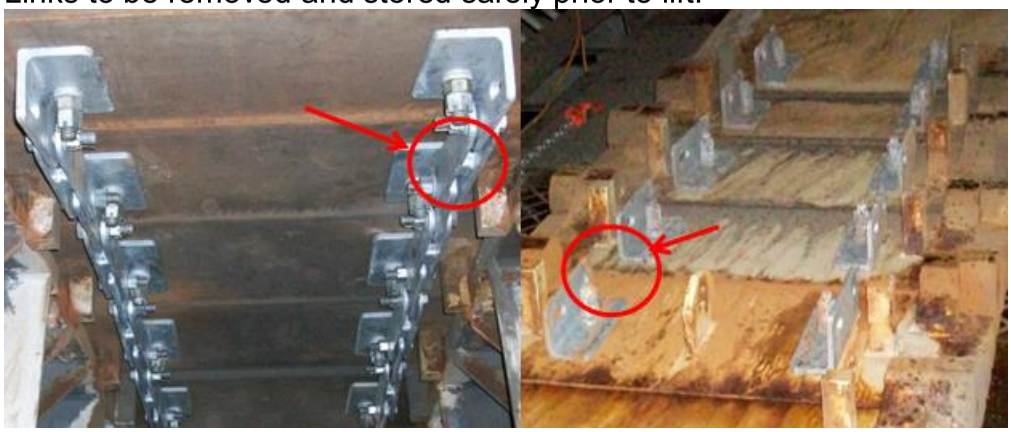
This work will be carried out by trained and competent personnel only, who are familiar with the equipment to be used in this operation. Carriageway access will only be permitted after the Operations Department have notified Maintenance personnel that the TM is complete and the carriageway is available.
Communication between operatives will be by radio where visual and verbal communication is not feasible. Only the cranes Lift Supervisor will direct the crane lifts.
No lifting operations will be carried out in adverse weather conditions; nominally wind speeds from 30mph will trigger safety review, dependant on site specific location and direction.
Radio comms will be carried out on designated channel.

Documentation

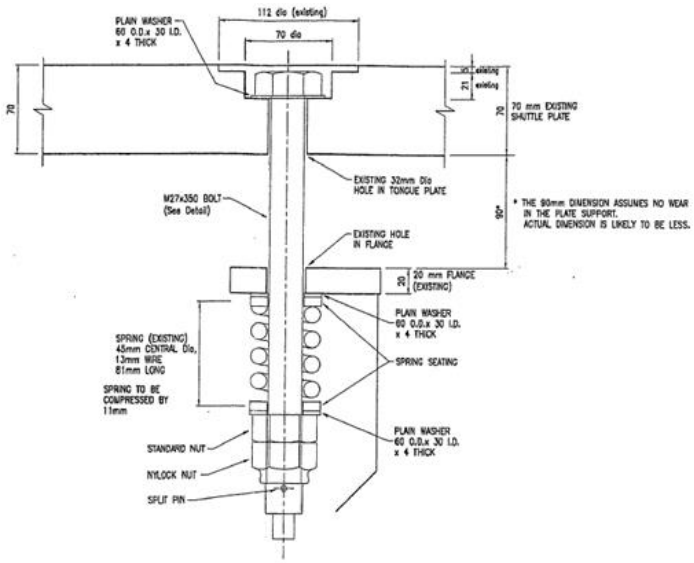
Work Pack: 411
Drgs: BC 06 63-01-16 RevTBC, BC 06 63-01-17 Rev 3, BC 06 63-01-18 Rev 2, BC06-63-01-22rev2, BC 06 63-01-19 Rev 1, BC 06 63-01-20 Rev 2, BC 06 63-01-22 Rev 2, BC 06 63-01-50 Rev 2. (For further reference Atkins – 5057541/314/101Rev D, 5057541/314/100 Rev D, 5057541/314/103 Rev C)
Risk Assessments: MA186, MA018, MA069, MA103
Other: SP007, MS060

Task A: Catch mat install –
Lay Monarflex covering over open floor grating.

Task B: Remove safety chain links –
Links to be removed and stored safely prior to lift.



Task C: Remove “Tongue Plate Spring” bolts –
By removing split pins and backing off lock nut and standard nut (see below detail) referring to Drg.5057541/314/103 Rev C . **Ensure all nuts, pins, springs etc. are contained securely in a bag or bin**.



DETAIL OF TONGUE PLATE HOLDING DOWN BOLT ASSEMBLY
(2 No PER PLATE)
(Scale 1:2)

Task D: Install lifting bar –
to remove tongue plate, attach as shown.

Task E: Position crane –
As shown on Drg. BC 06-01-16 Rev3 and under supervision of the lift supervisor carry out the lift to remove tongue plate. Lay down on timbers.

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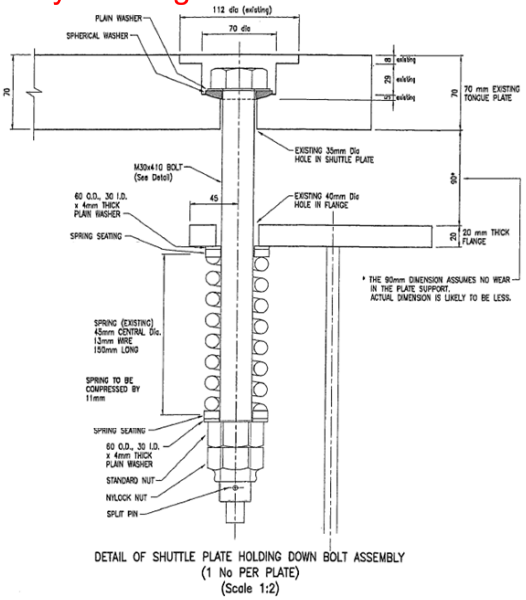
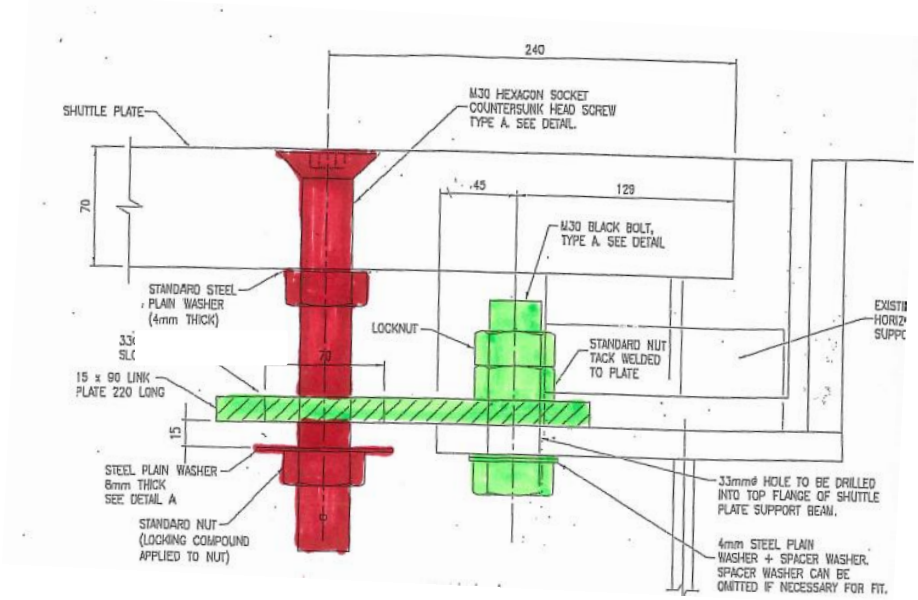
Task F: Remove “Rocker Plate Spring” bolt –
Using the same method for the tongue plate spring bolts, referring to Drg.5057541/314/103 Rev C (see below detail). **Ensure all nuts, pins, springs etc. are contained securely in a bag or bin**.



Task G: Remove “Anchor bolts” from rocker plate.
The link plate can be left in position, attached to the below deck beam.
Reference Drg. 5057541/314/100 Rev D



Remove parts indicated in red.

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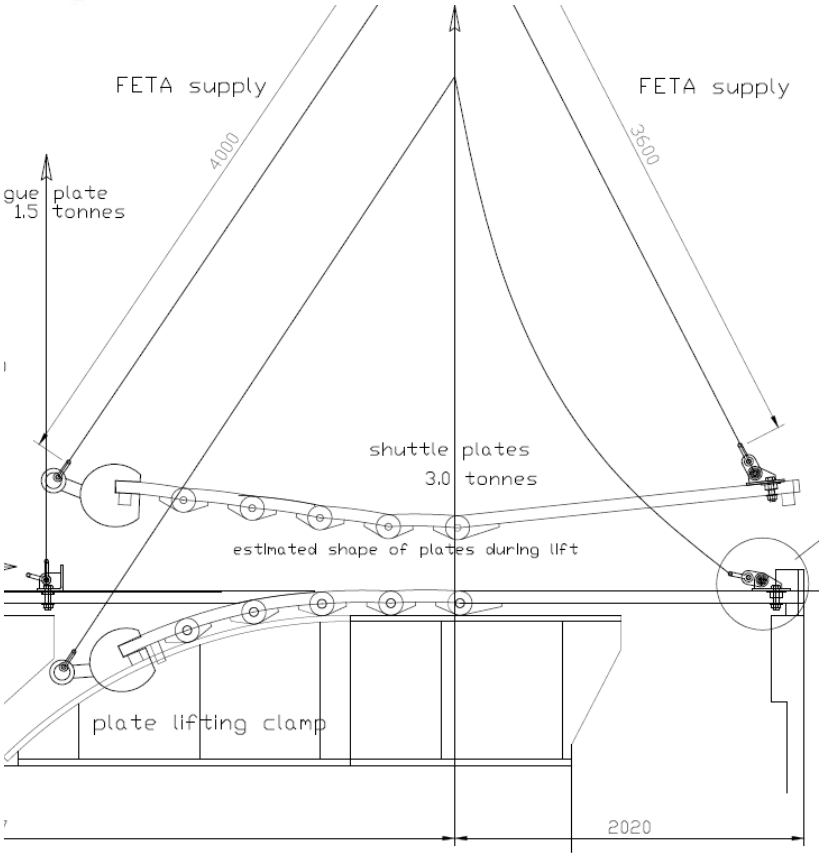
Task H: Demag Train removal -
Lifting tackle to be attached as per drawing, and only by competent trained rigger. (Drg. BC 06 63 01 17 Rev3)



The lift will be controlled by the cranes Lift Supervisor and assisted by AMEY Riggers. When lifted clear of the expansion joint the train shall be laid on timbers.

Task I: Edge protection/access-

Install royalty barriers around the open expansion joint to prevent any accidents and secure an access ladder for inspection use.

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Task J: Expansion Joint Movement prevention –
Small acro props will be inserted between the other two expansion trains to prevent closure through vibration etc.

Task K: Cleaning-
Using a stiff brush and power wash the radius girders ready for inspection.

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Task L: Overturning plate train –
The lift will be controlled by the cranes Lift Supervisor and assisted by Amey Riggers. The train will be lifted by the rocker plate end using the plate grab and manipulated onto the reverse side using the crane. Follow the below link for an example operation:
Q:\E Engineering\E3 - Maintenance\E3.1 Bridge Maintenance\Joints\Main Demag Expansion Joints\Photos\2011-10-09 demag 2011\Rocker. Sliding Plates Reversal S.E. No3. 2011 004.MOV

Task M: Inspection –
Dimensional check will be carried out by Amey Bridge Inspectos and any other parties authorised by Amey.

Task N: Re-Instatement –
A reverse procedure of events shall take place to reinstate the expansion joint to a road worthy state as before. Follow the below link for an example of train insertion:
..\..\E3 - Maintenance\E3.1 Bridge Maintenance\Joints\Main Demag Expansion Joints\Photos\2011-10-09 demag 2011\Rocker Plate & Sliding Plate Insertion S.E.No.3 2011 005.MOV

Task O: Work Completion Inspection –
The Supervisor in charge of the works will carry out an inspection to ensure all works have been re-instated to a satisfactory condition before the carriageway is handed back to the operations department. This will also include a survey of the carriageway area where maintenance has had a work detail.

Directory

G:\dd\t&p\rnmmd\branch8\FRB FOI\2. Inspection Records - Main Cable, Cable Anchorages\Amey - Forth Bridges Unit Operating Contract - From 01.06.15 - FOI\Main Tower Expansion Joints\NW Maint Tower SW.3 2015.10.24\MS048 Rev2.docx

CLIENT
Transport Scotland

PRINCIPAL DESIGNER
Amey Highways Ltd
Forth Bridges Unit
Forth Road Bridge
South Queensferry
West Lothian
EH30 9SF

PRINCIPAL CONTRACTOR
Amey Highways Ltd
Forth Bridges Unit
Forth Road Bridge
South Queensferry
West Lothian
EH30 9SF

…….. Date……...
Major Bridge Manager – Forth Road Bridge

Signed on Behalf of Amey Highways

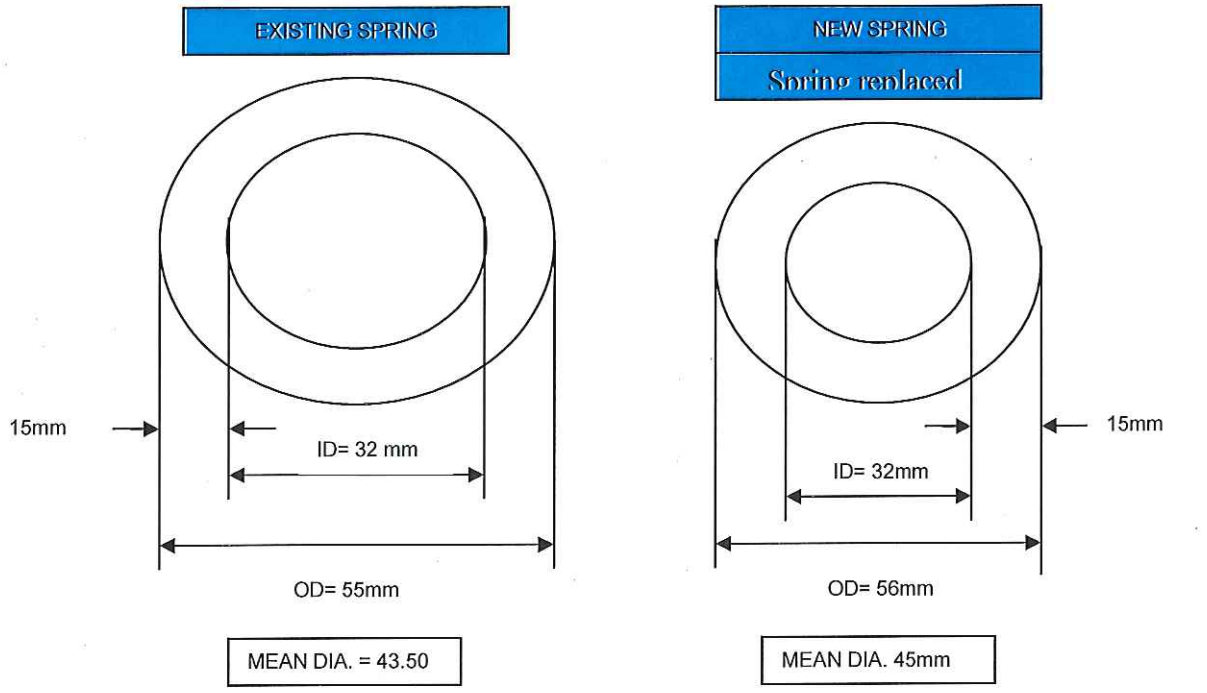
MS048Rev2
Removal & Inspection of Selected Plate Trains at Main Tower Demag Expansion Joints

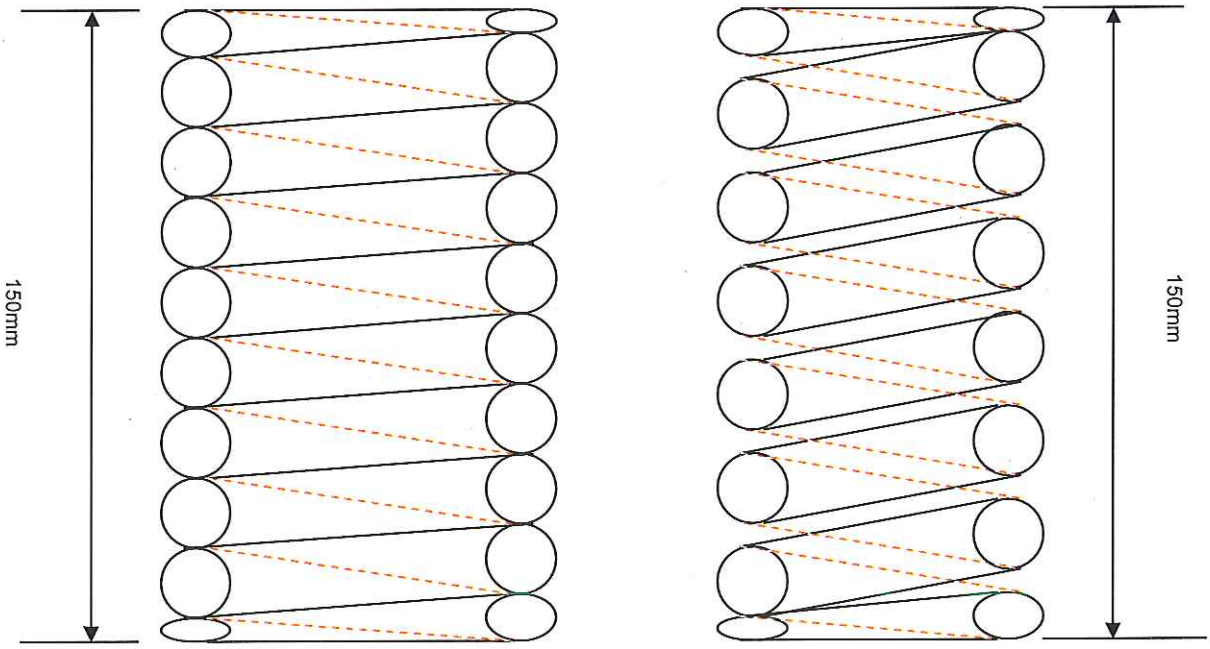
NAME	TRADE	DATE	SIGNED

Appendix B: Inspection Record Sheets

INSPECTION DEPARTMENT.
DEMAG PLATE SPRING DIMENSIONS. ROCKER PLATE. SW 3.
DATE. 2015.10.24.

ROCKER PLATE





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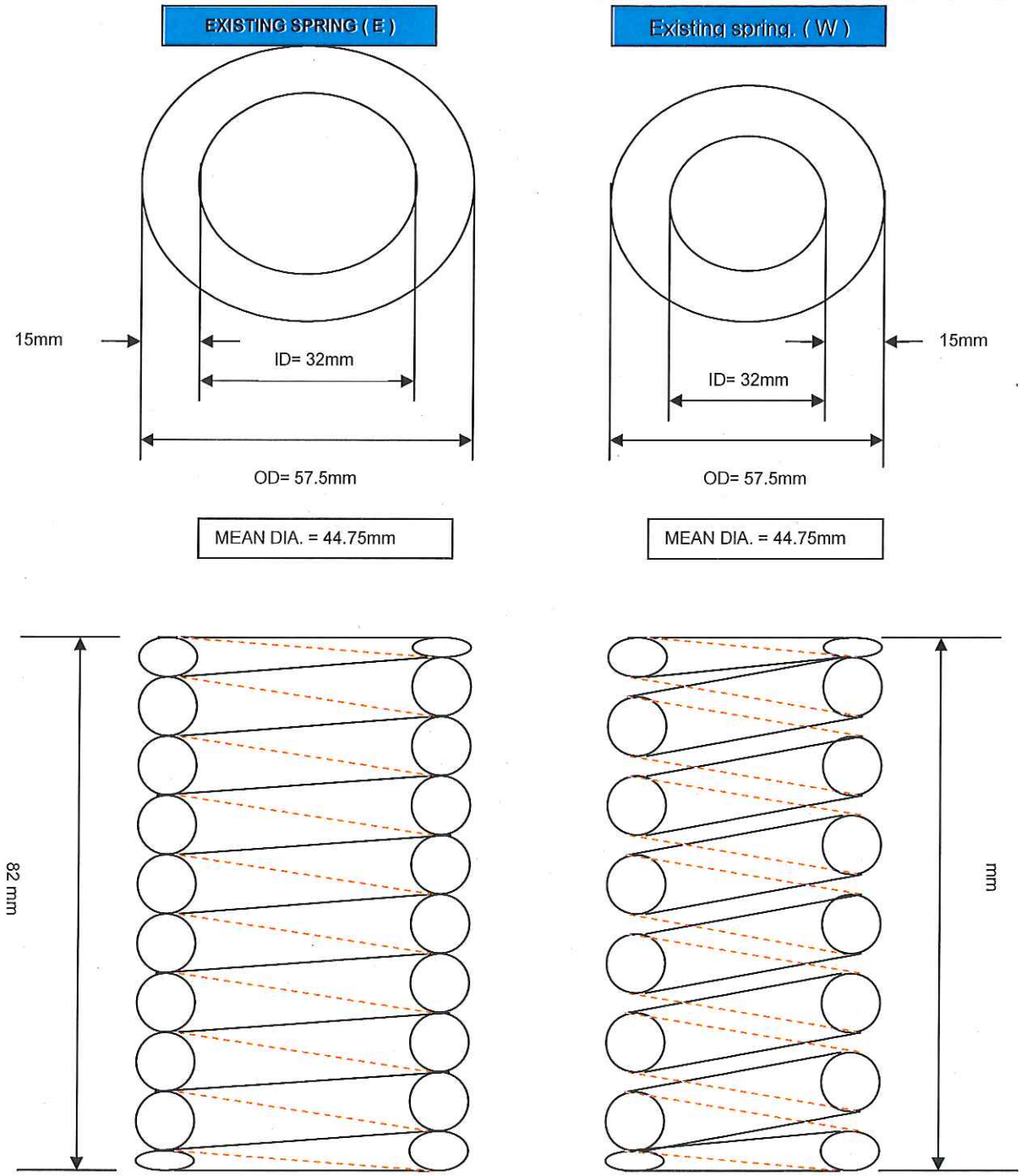
INSPECTION DEPARTMENT.
DEMAG PLATE SPRING DIMENSIONS. ROCKER PLATE. SW 3.
DATE. 2015.10.24.

TONGUE PLATE.



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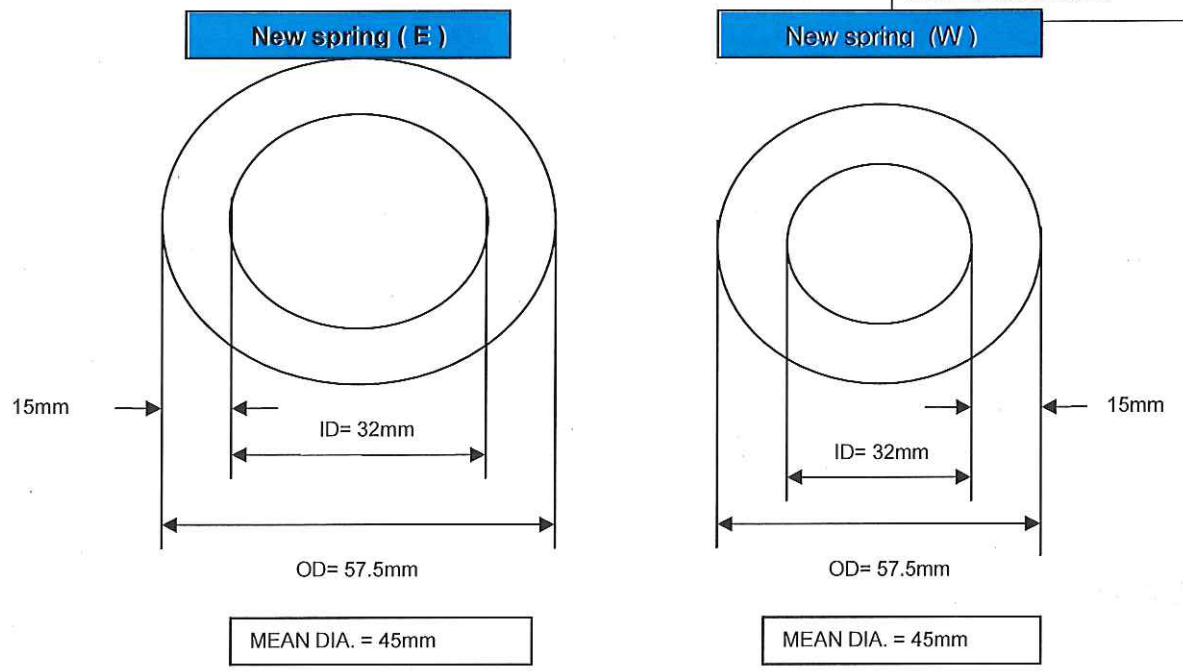
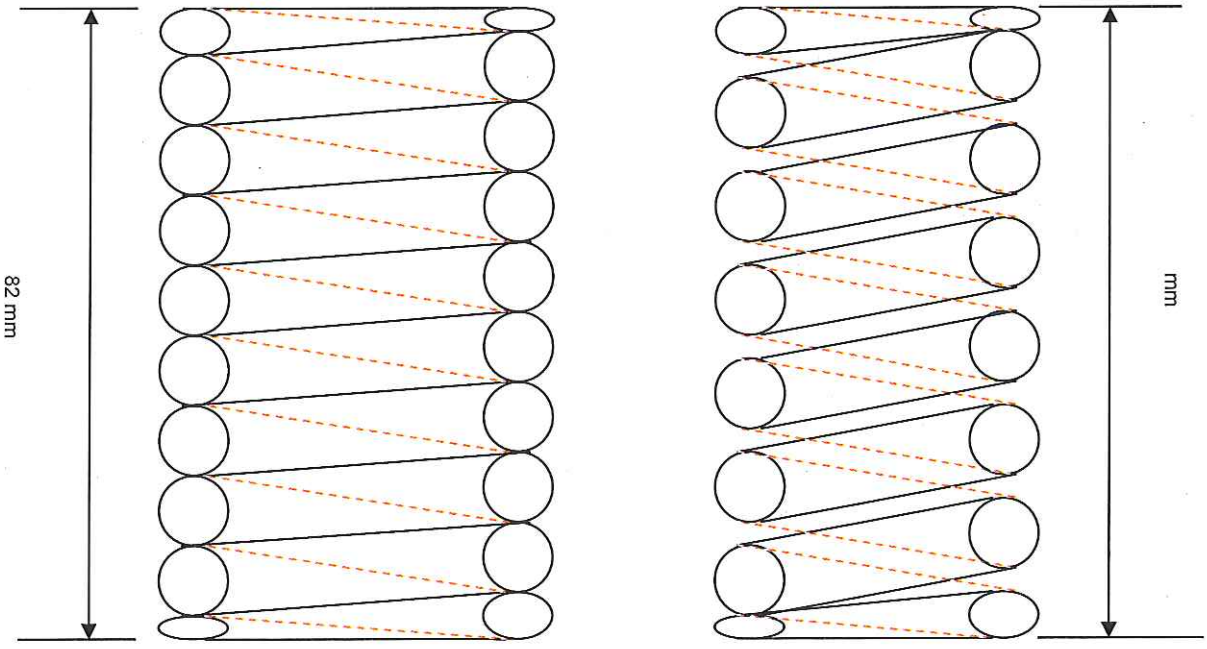
INSPECTION DEPARTMENT.
DEMAG PLATE SPRING DIMENSIONS. ROCKER PLATE. SW 3.
DATE. 2015.10.24.





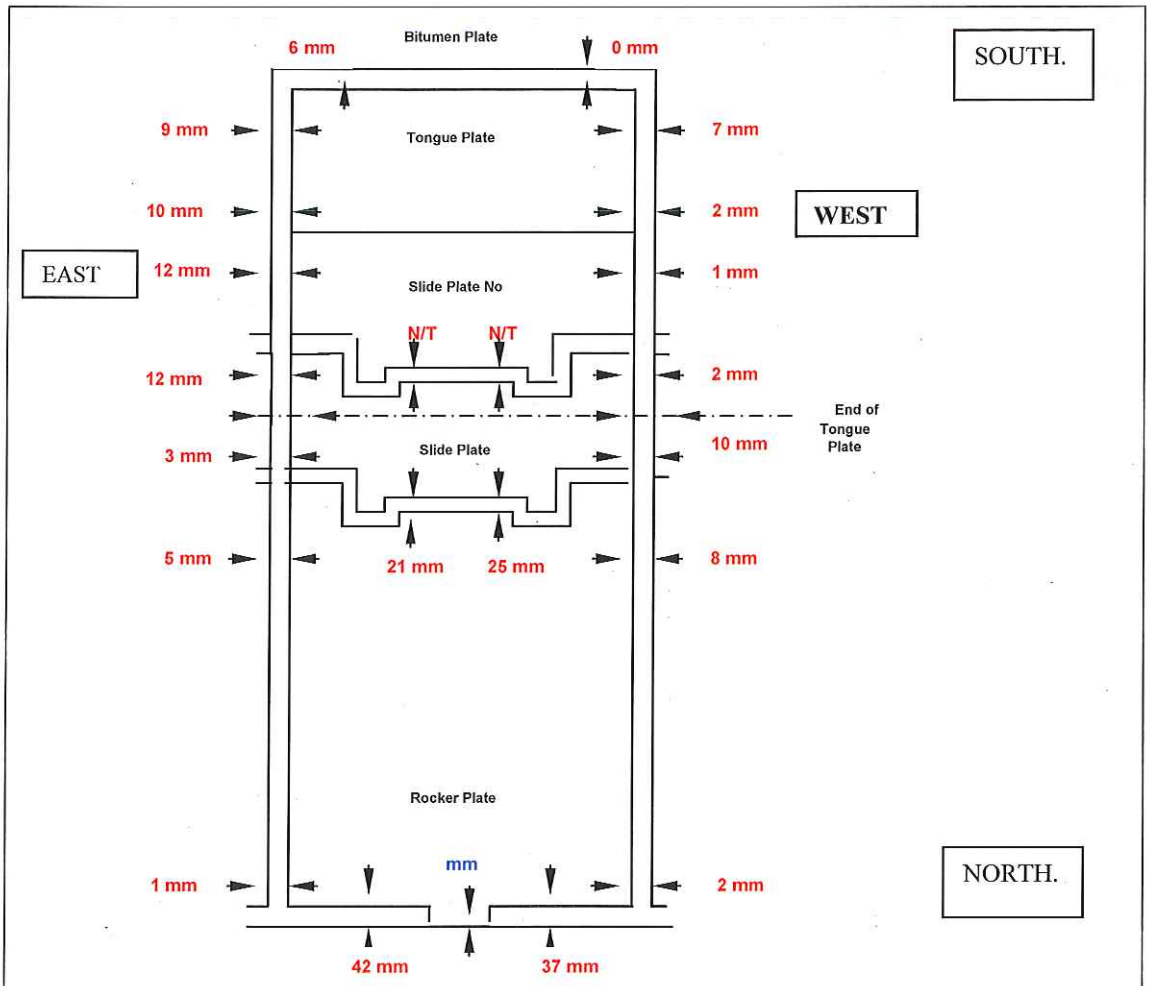
G:\dd\t&p\rnmmd\branch8\FRBFOI~1\25A97~1.INS\AMEY-F~1.15-\MAINTO~2\NWMAIN~1.24\Demag Spring Dimension SW 3. Info 2015.10.24..doc

INSPECTION DEPARTMENT
North main tower expansion joint . SW 3.
DATE: 2015.10.24.

Inspection Record Sheet:-	
Subject :- Demag plate set removal	Location: **North main tower expansion joint . SW 3.**

Inspection Record Sheet:- BC. 06/ SSSW & Amey . Plates Rocker & Tongue SW. 3.		
Subject :- Demag plate set removal	Location. North West main tower .SSW 3.	
Pre & Post removal Dimensional Checks		
Pre-removal Checks		
Task	Yes	No
* Record top side clearance gaps as identified on survey sht 2 of 4	✓	
* Mismatch between adjacent plates, rocker SW2 – N. 6mm .S 4mm	✓	
rocker SW 4 -N. 8mm . S. 6mm	✓	
Slide plate No.1 SW 2 - 3mm Centre	✓	
Slide plate No.1 SW 4 - 3mm Centre	✓	
Tongue plate SW 2 - 10mm . S. 8mm	✓	
Tongue plate SW 4 – 9mm . S. 7mm	✓	
* Spring lengths:- rocker plate:-150mm. Post removal. 140mm Pre removal.	✓	
* Spring lengths:- tongue plate:- E &W Post removal 82mm. 72mm Pre removal.	✓	
Mismatch between adjacent plates Main span end trimmer & rocker plate:- East. 42 mm West. 37 mm	✓	
Post Removal Checks		
Task	Yes	No
Slide plate cam radius:- Measured at time of inspection. – Recorded as 1.410m Refer to drawing.	✓	
* Bush wall thickness: Please refer to attached sheets for External & Internal sizes.	✓	
*Radius girder wear plate thickness:- As per drawing.	✓	
* Tongue plate radius length:- As per drawing.	✓	
* Tongue plate end thickness:- Worn to nothing	✓	
Remedial & Completion Checks		
Task	Yes	No
* Top side clearance gaps (complete sht 3 of 4)	✓	
* Pins and bushes replaced:- No pins or bushes replaced .		✓
*Springs and pins replaced:- No springs or pins replaced .	✓	
*Spring lengths:- rocker plate:-150mm. Post removal. 140mm Pre removal.	✓	
*Spring lengths:- tongue plate:- :- E &W Post removal 82mm. 72mm Pre removal.		
* Complete comment sheet 4 of 4 (if required)		
Inspected by:	Date: 2015.10.24.	
Pre-removal Dimensional Checks		

INSPECTION DEPARTMENT
North main tower expansion joint . SW 3.
DATE: 2015.10.24.

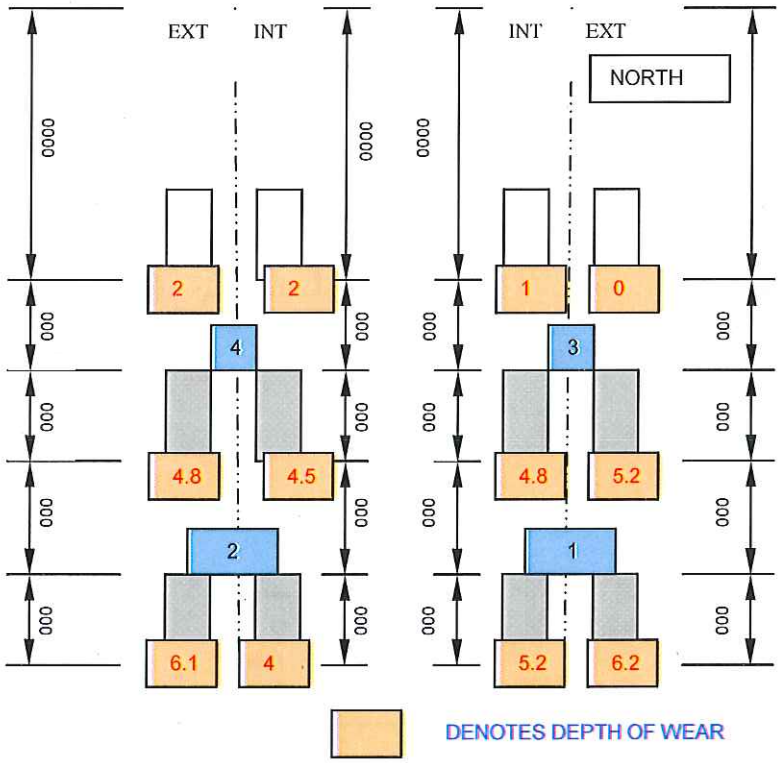


Inspection Record Sheet:-	
Subject :- Demag plate set removal.	
Pre-removal Dimensional Checks	
Inspected by:	
Date:	2015.10. 24

INSPECTION DEPARTMENT
North main tower expansion joint . SW 3.
DATE: 2015.10.24.

Inspection Record Sheet:- BC. 06/ & Amey SSSW. 2015.10.24. Rocker Plate SW 3.	
Subject:- Demag Plate Set Removal	Location:- South west main tower. SW.3.

Pin No.		Internal Dia.	External Dia.
1		39mm	39mm
Bush Thkns	Top	5 mm	5 mm
	Bottom	3 mm	3 mm
	North	3.5 mm	0 mm
	South	3.5 mm	3.5 mm
Pin No.		Internal Dia.	External Dia.
2		39mm	39mm
Bush Thkns	Top	0 mm	6 mm
	Bottom	3 mm	2.5 mm
	North	3 mm	0 mm
	South	1.5 mm	4.5 mm
Pin No.		Internal Dia.	External Dia.
3		39mm	39mm
Bush Thkns	Top	2 mm	2.5 mm
	Bottom	4 mm	2 mm
	North	5 mm	0 mm
	South	3 mm	1.5 mm
Pin No.		Internal Dia.	External Dia.
4		39mm	39mm
Bush Thkns	Top	0 mm	5 mm
	Bottom	0 mm	0 mm
	North	0 mm	0 mm
	South	0 mm	3 mm



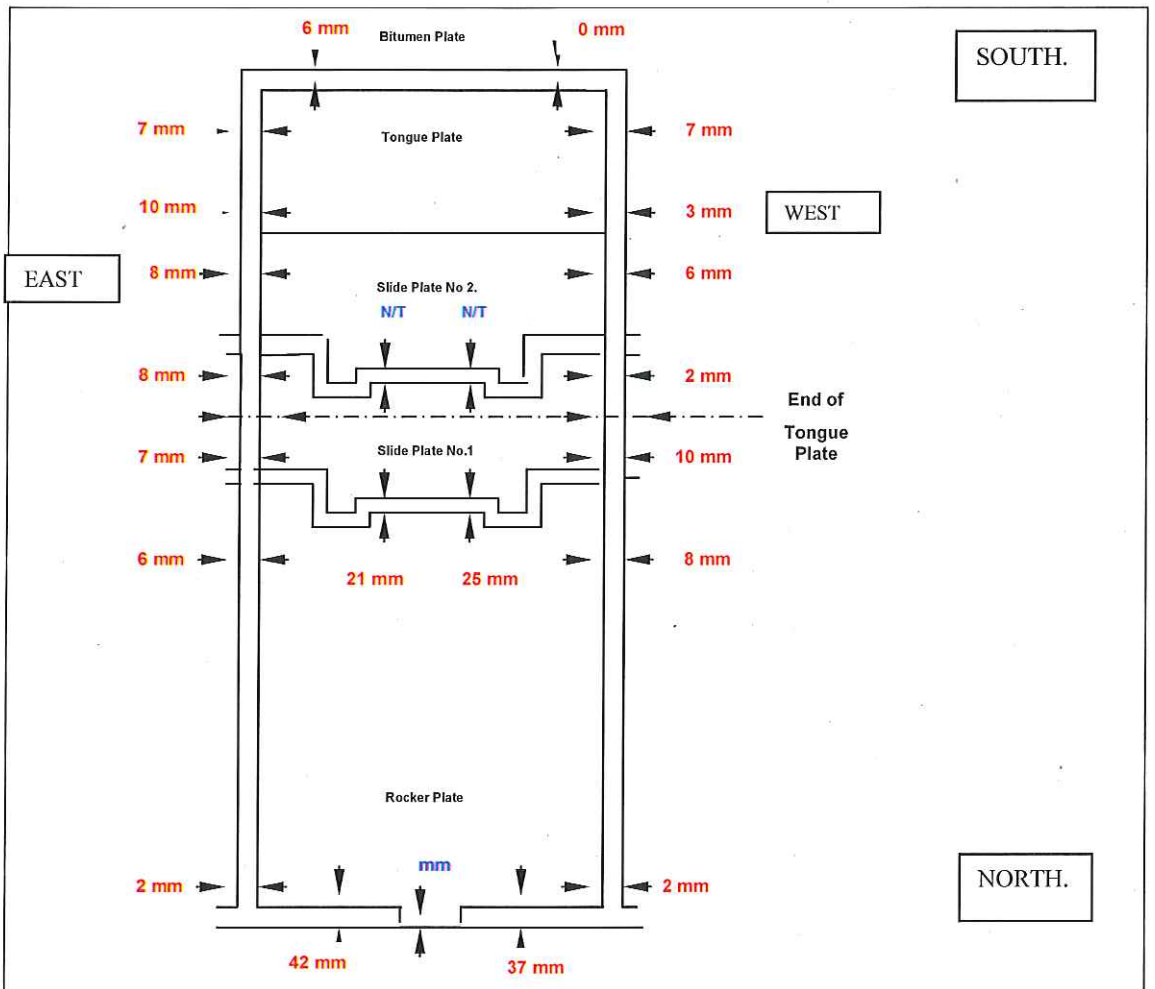
Bush bore dimensions. :- (largest across oval, horizontal axis.) - No dimensions taken

Inner. : (1) (2) (3) (4)
Outer. : (1) (2) (3) (4) n/a.

Comments.: Internal & External bush thickness recorded by A. Bruce. & J.Mcgill.

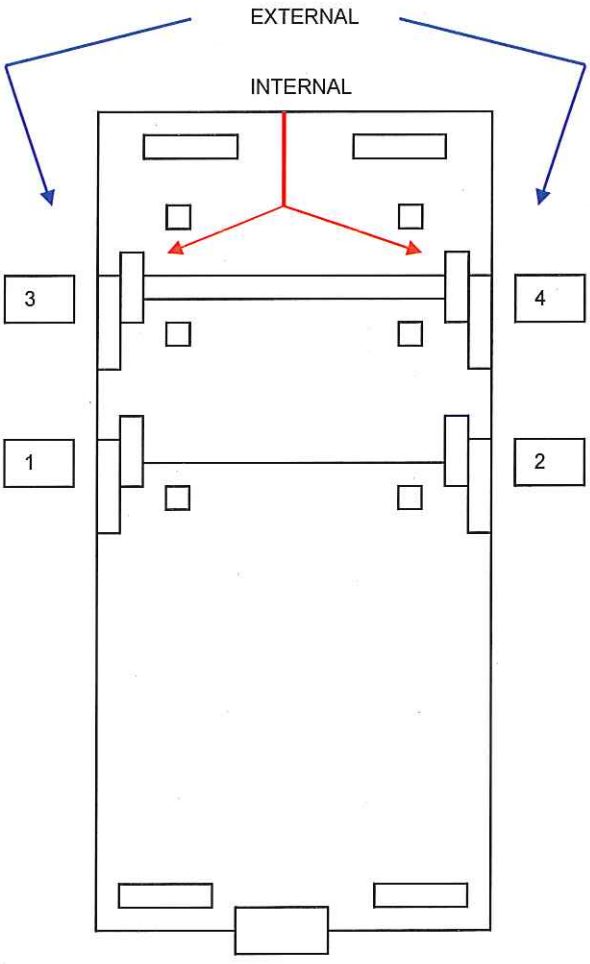
Inspected by. : - Date. 2015.10.24..

INSPECTION DEPARTMENT
North main tower expansion joint . SW 3.
DATE: 2015.10.24.



Inspection Record Sheet:-			
Subject :- Demag plate set removal			
Post -removal Dimensional Checks			
Inspected by:			
Date:	2015.10.24.		

INSPECTION DEPARTMENT
DEMAG DIMENSIONAL BLANK . PINS & BUSHES. SW 3.
DATE. 2015.10.24.



PIN No.	EXTERNAL	INTERNAL
1	39mm	39mm
Bush thickness		
Top	5 mm	5 mm
Bottom	3 mm	3 mm
North	0 mm	3.5 mm
South	3.5 mm	3.5 mm
2	39mm	39mm
Bush thickness		
Top	6 mm	0 mm
Bottom	2.5 mm	3 mm
North	0 mm	3 mm
South	4.5 mm	1.5 mm
3	39mm	39mm
Bush thickness		
Top	2.5 mm	2 mm
Bottom	2 mm	4 mm
North	0 mm	5 mm
South	1.5 mm	3 mm
4	39mm	39mm
Bush thickness		
Top	5 mm	0 mm
Bottom	0 mm	0 mm
North	0 mm	0 mm
South	3 mm	0 mm

INSPECTION DEPARTMENT
DEMAG DIMENSIONAL BLANK . PINS & BUSHES. SW 3.
DATE. 2015.10.24.

INSPECTION DEPARTMENT
DEMAG DIMENSIONAL BLANK . PINS & BUSHES. SW 3.
DATE. 2015.10.24.

amey