

Report Number: 14110937

Nanjing Guhua MetalWork Co Ltd  
Xiongzhou Industrial Park  
Luhe District  
Nanjing, ChinaOrder Number : GH1120  
Date of Issue: 22/12/2014  
Test Date : 12/12/2014  
to 18/12/2014

This report details the results of tests carried out on Drop-forged Double Couplers used for connecting steel tubes of 48.3mm outside diameter and of at least 3.2mm nominal wall thickness at a minimum in the construction of working scaffolds and falsework required for the construction, maintenance, repair and demolition of buildings and structures.

### Description and Marks on couplings

Drop-forged Double Couplers

Marks : CLASS B-L EN74-1 GH 0914

### Basis of Tests

The couplings have been tested in accordance with the relevant sections and requirements of EN 74-1 :2005.

### Information supplied by the customer

Manufactured by: Nanjing Guhua MetalWork Co Ltd  
Shape: As per drawings shown at the end of this report  
Dimensions: As per drawings shown at the end of this report  
Mass: As per drawings shown at the end of this report  
Material Characteristics: As per drawings shown at the end of this report

## RESULTS

### Design

The design of the coupling complied with the requirements of the relevant items in clause 6.2 of the standard.

### Dimensions and Material Characteristics

The measured dimensions, mass and material characteristics, of the couplings, were all within the tolerances as specified by the manufacturer. (Drawings are shown at the end of this report)

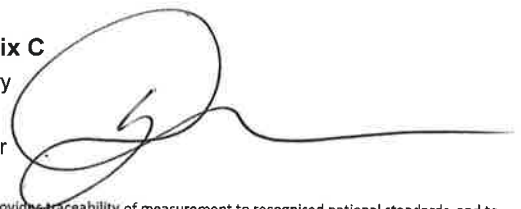
### Marking

The markings satisfy the requirements laid out in EN74-1.

**Results of all tests performed are detailed on the following pages.**

All requirements stated are minimum values.

**This report consists of the report, appendix A, appendix, B and Appendix C**

Authorised Signatory  
L Mangham  
Operations Manager

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**Slipping Force Tests**, tested in accordance with Clause 7.2.1

Tested using 3.2mm steel tube ( $RT_{S1}$ )		
Test Number	$\Delta_1 \leq 7\text{mm}$ (kN)	$1 \leq \Delta_2 \leq 2\text{mm}$ (kN)
1	25.48	30
2	27.58	30
3	24.84	30
4	26.89	30
5	25.38	30
6	27.63	30
7	26.89	30
8	22.54	30
9	24.72	30
10	20.01	30

$F_{S5\%}$	<b>20.31</b>	<b>30.00</b>
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Tested using 4.0mm aluminium tube ( $RT_A$ )		
Test Number	$\Delta_1 \leq 7\text{mm}$	$1 \leq \Delta_2 \leq 2\text{mm}$
11	22.5	30
12	24.71	30
13	26.73	30
14	26.93	30
15	19.43	30

$F_{S5\%}$	<b>17.08</b>	<b>30.00</b>
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Photograph of Setup for Slipping Force



The photograph above shows the setup for slipping force but is not necessarily the coupler under test.

The  $F_{S5\%}$  figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:

Class B:	$\Delta_1 \leq 7\text{mm} = 10\text{kN}$ Minimum
	$1 \leq \Delta_2 \leq 2\text{mm} = 15\text{kN}$ Minimum
Class A:	$\Delta_1 \leq 7\text{mm} = 7\text{kN}$ Minimum
	$1 \leq \Delta_2 \leq 2\text{mm} = 10\text{kN}$ Minimum

From the results, the prototype is Accepted to Class B for slipping force

Load-displacement curves are shown in Appendix A as charts 1 to 15



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**Failure Force**, tested in accordance with clause 7.2.2

Tested using solid steel bar (RB)	
Test Number	Maximum Load $P_{f,ult}$ (kN)
16	60
17	60
18	60
19	60
20	60
$F_{f,5\%}$	<b>48.00</b>

The  $F_{f,5\%}$  figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:-

$P_{f,ult}$  = 30.0kN minimum for Right Angle couplers & 20kN for Swivel couplers

Load-displacement curves are shown in Appendix B as charts 16 to 20

From the results, the prototype is Accepted to Class B for failure force

Photograph of setup for Failure Force



The photograph above shows the setup for failure force but is not necessarily the coupler under test.

**Pull Apart Force**, tested in accordance with clause 7.3

Tested using solid steel bar (RB)	
Test Number	Maximum Load $F_{p,c}$ (kN)
21	60
22	60
23	60
24	60
25	60
$F_{p,5\%}$	<b>48.00</b>

Requirements from EN 74-1 table 8:-

$P_{f,ult}$  = 20.0kN minimum

Load-displacement curves are shown in Appendix B as charts 21 to 25

From the results, the prototype is Accepted to Class B for pull apart force

Photograph of setup for Pull Apart Force



The photograph above shows the setup for pull apart force but is not necessarily the coupler under test.

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**Indentation Check, tested in accordance with clause 7.5**

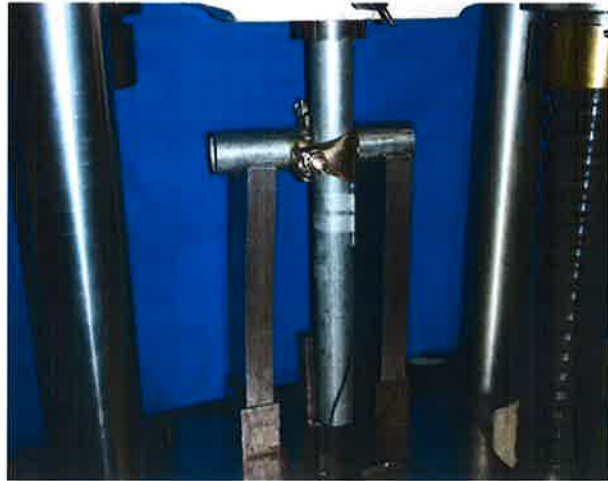
Tested using 2.7mm wall steel tube (RT <sub>S2</sub> )	
Test Number	Maximum Indentation $\Delta_{10}$ (mm)
26	0.84
27	1.01
28	0.94
29	0.98
30	0.84

The figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:-  
 $P_{ind} = \leq 1.5\text{mm}$

From the results, the prototype is Accepted to Class B for indentation check

Photograph of setup for Indentation Check



The photograph above shows the setup for indentation check but is not necessarily the coupler under test.

**Cruciform Bending Stiffness Tests, tested in accordance with Clause 7.4.1**

Tested using 3.2mm steel tube (RT <sub>S1</sub> )			
Test Number	$C_{\phi 1, MB, C}$	$C_{\phi 2, MB, C}$	$M_{ult, c}$
	(kNm/rad)	(kNm/rad)	kNm
31	27.53	11.21	2.67
32	29.21	10.37	2.67
33	29.84	13.20	2.67
34	30.88	15.10	2.67
35	25.04	9.27	2.67
36	22.48	8.59	2.67
37	28.61	9.93	2.67
38	29.78	12.86	2.67
39	25.40	9.17	2.67
40	26.83	11.24	2.67

$M_{B, 5\%}$	<b>22.30</b>	<b>7.47</b>	<b>2.67</b>
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Tested using 4.0mm aluminium tube (RT <sub>A</sub> )			
Test Number	$C_{\phi 1, MB, C}$	$C_{\phi 2, MB, C}$	$M_{ult, c}$
	(kNm/rad)	(kNm/rad)	kNm
41	18.82	9.40	2.67
42	18.75	9.74	2.67
43	20.40	10.35	2.67
44	19.94	11.47	2.67
45	18.79	9.15	2.67

$M_{B, 5\%}$	<b>17.53</b>	<b>8.00</b>	<b>2.67</b>
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The  $M_{B5\%}$  figures must be equal to or greater than the requirements stated

Requirements from EN 74-1 table 8:

Steel Tube	
$C_{\phi 1, MB, C}$	= 15.0 kNm/rad
$C_{\phi 2, MB, C}$	= 6.0 kNm/rad
$M_{ult, c}$	= 1.6 kNm
Aluminium Tube	
$C_{\phi 1, MB, C}$	= 13.0 kNm/rad
$C_{\phi 2, MB, C}$	= 5.0 kNm/rad
$M_{ult, c}$	= 1.6 kNm

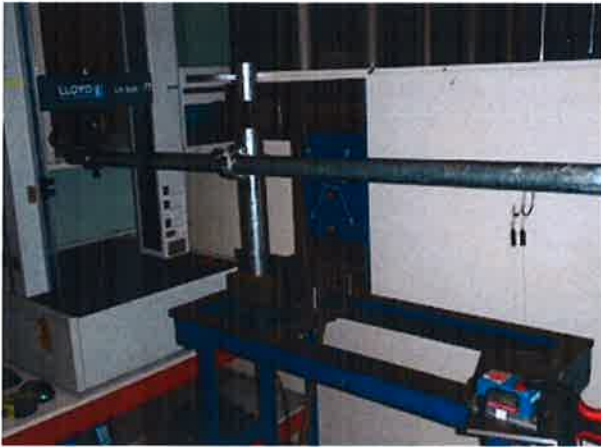
Load-displacement curves are shown in Appendix C as charts 31 to 45

From the results, the prototype is Accepted to Class B for cruciform bending stiffness and ultimate moment



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Photograph of setup for Cruciform Bending Stiffness



The photograph above shows the setup for cruciform bending stiffness but is not necessarily the coupler under test.

**Rotation Stiffness and Moment Tests**, tested in accordance with Clause 7.4.2

Tested using 3.2mm Steel tube (RT <sub>A</sub> )		
Test Number	$C_{\phi,MT,c}$	$M_{T,c}$
	kNm/rad	kNm
46	27.50	0.755
47	26.17	0.867
48	24.68	0.867
49	26.00	0.801
50	31.97	0.593

$M_{T5\%}$	<b>21.29</b>	<b>0.52</b>
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Tested using 4.0mm aluminium tube (RT <sub>A</sub> )		
Test Number	$C_{\phi,MT,c}$	$M_{T,c}$
	kNm/rad	kNm
51	17.02	0.867
52	17.30	0.761
53	16.33	0.733
54	18.68	0.772
55	17.46	0.768

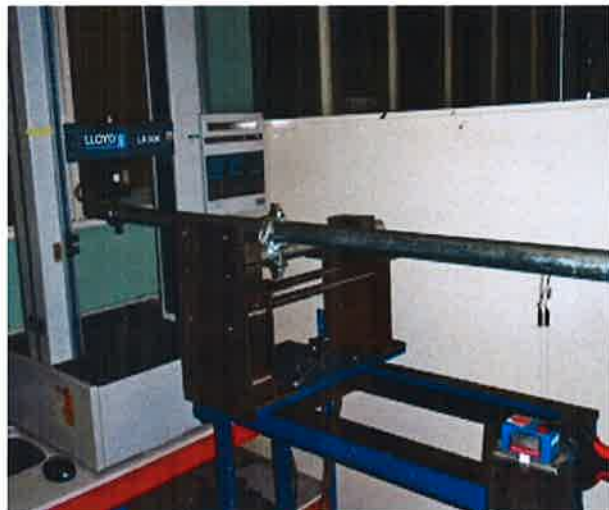
$M_{T5\%}$	<b>15.38</b>	<b>0.67</b>
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The  $F_{S5\%}$  figures must be equal to or greater than the requirements stated below.

Requirements from EN 74-1 table 8:

Steel and Aluminium Tube		
$C_{\phi,MT,c}$	=	7.5 kNm/rad
$M_{T,c}$	=	0.13 kNm

Photograph of setup for Rotation Stiffness and Moment



The photograph above shows the setup for rotation stiffness and moment but is not necessarily the coupler under test.

Load-displacement curves are shown in Appendix C as charts 46 to 55

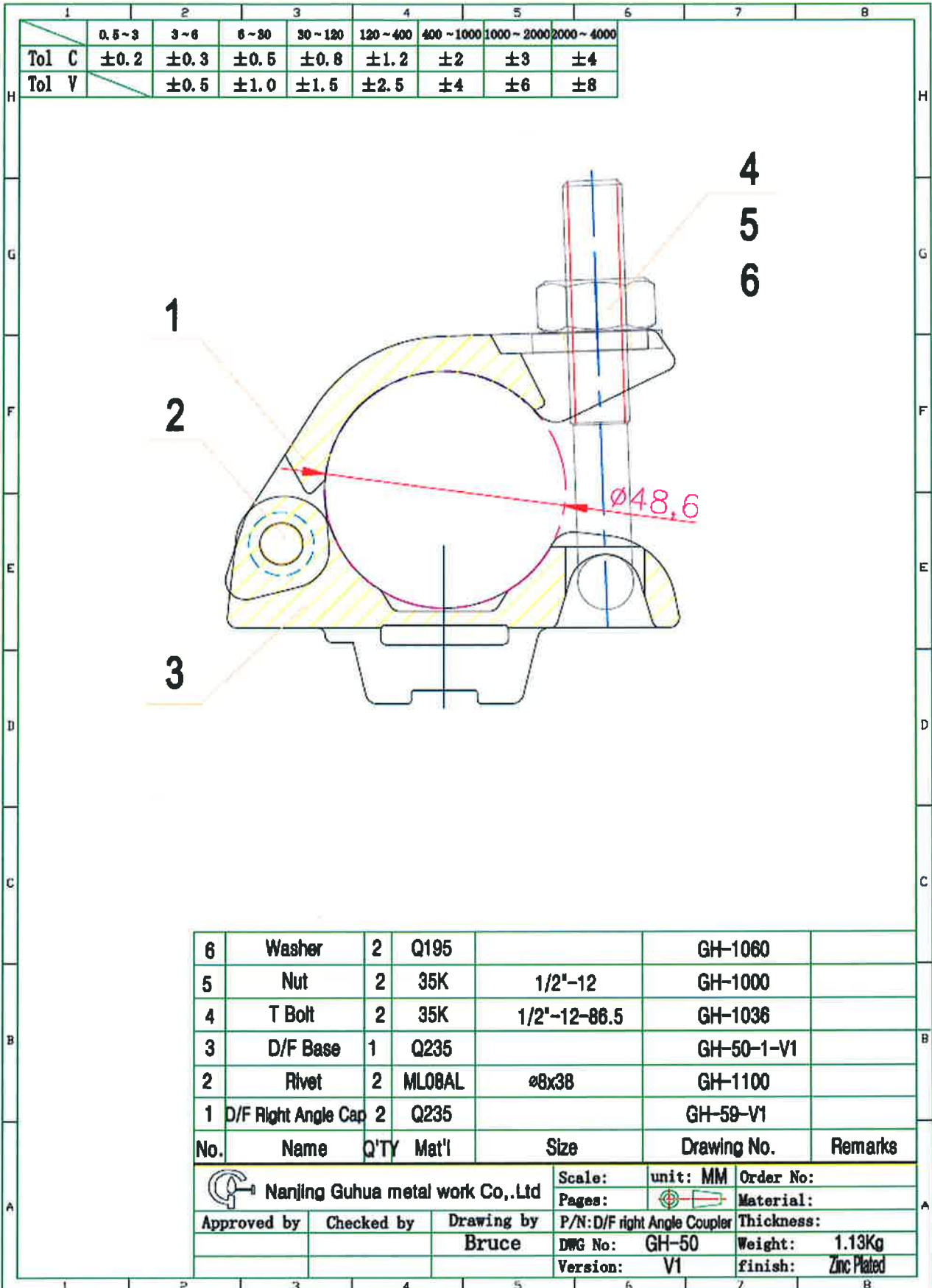
From the results, the prototype is Accepted to Class B for rotation stiffness and moment





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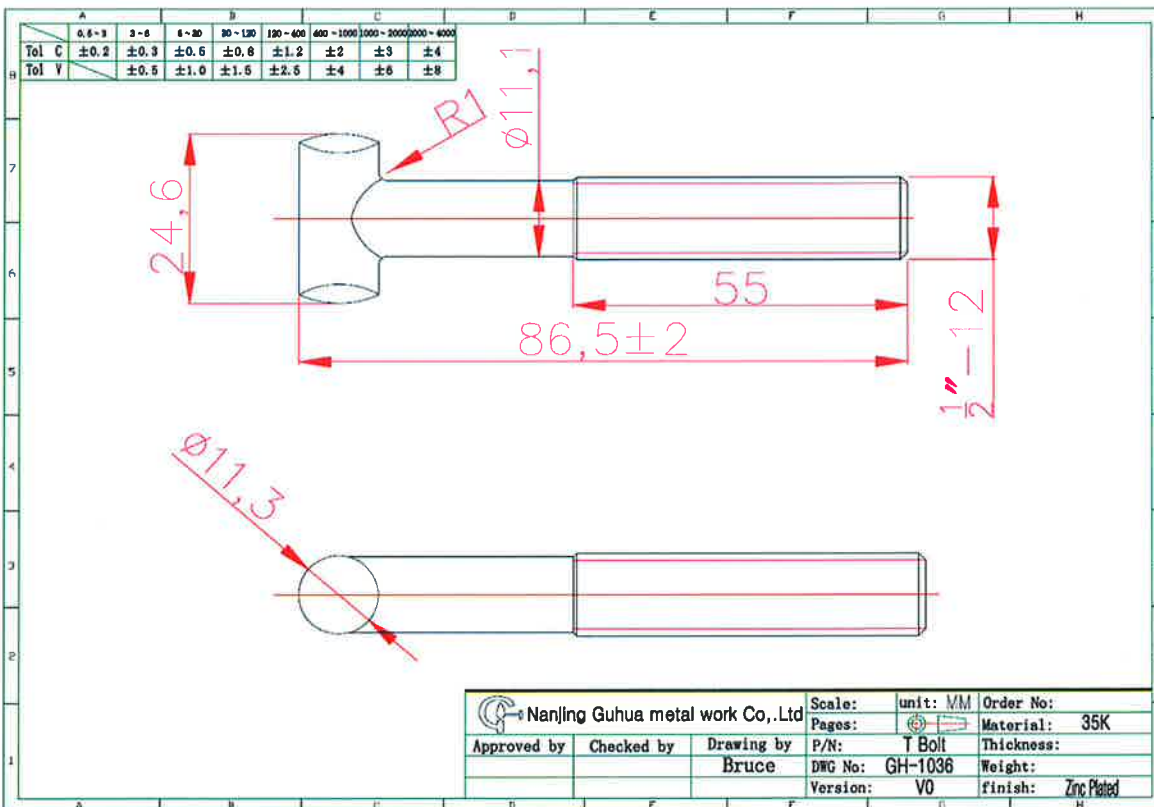
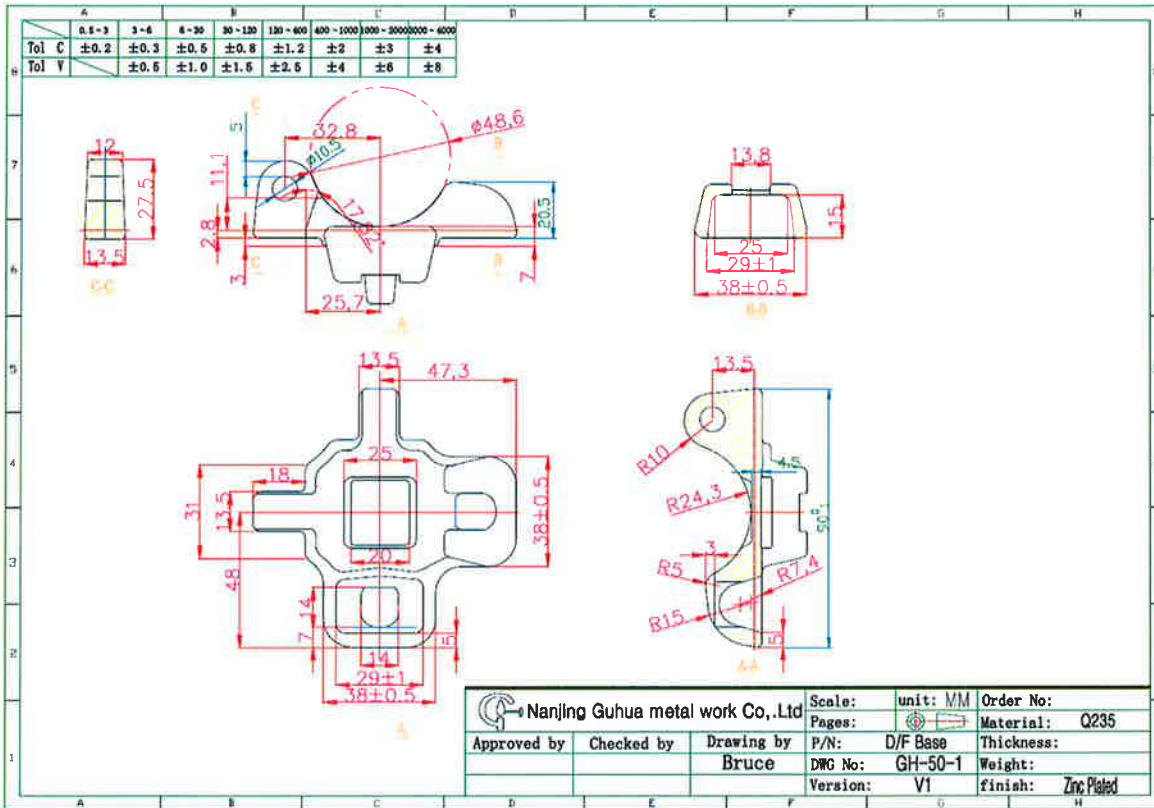
Drawings



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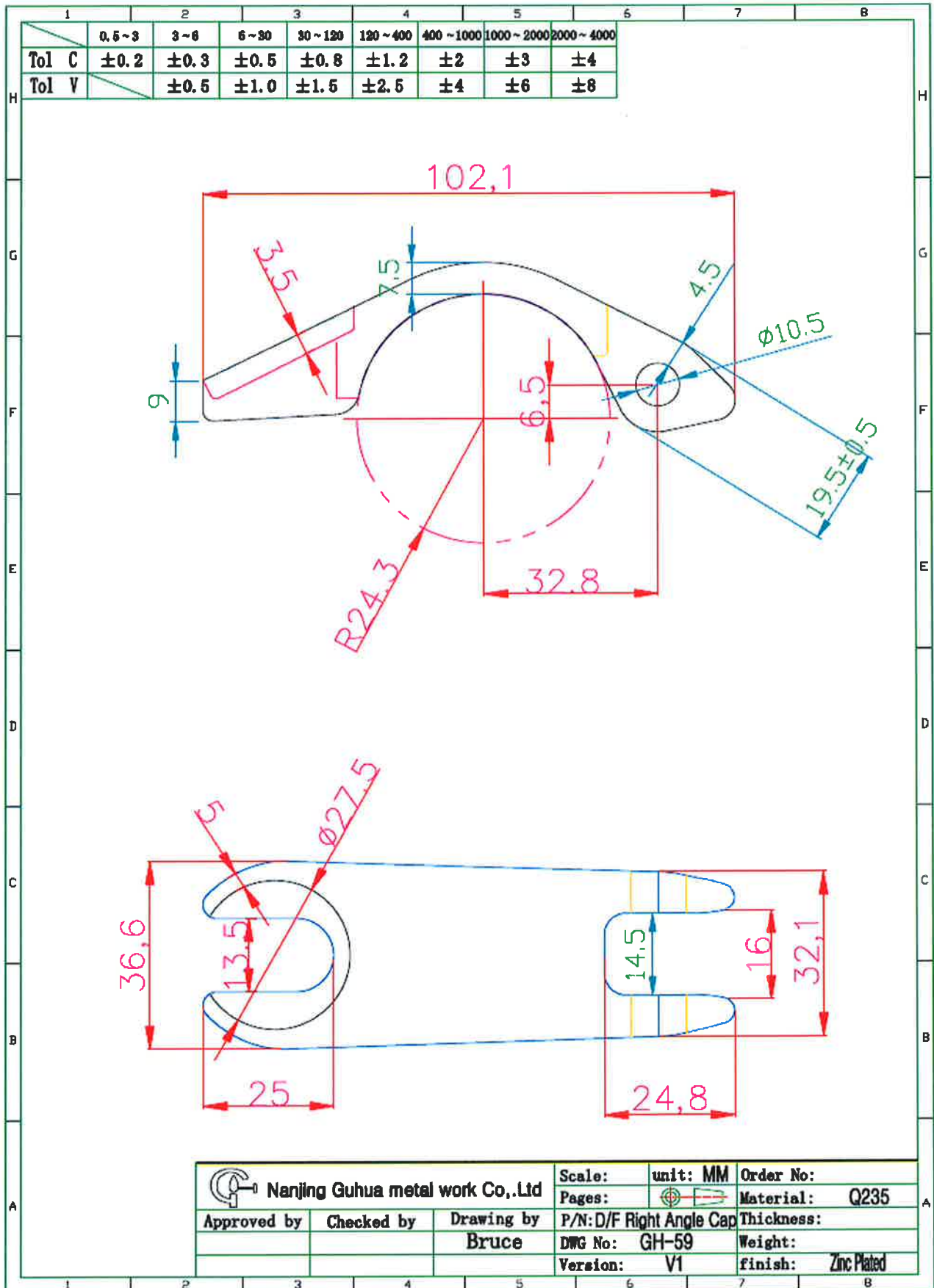
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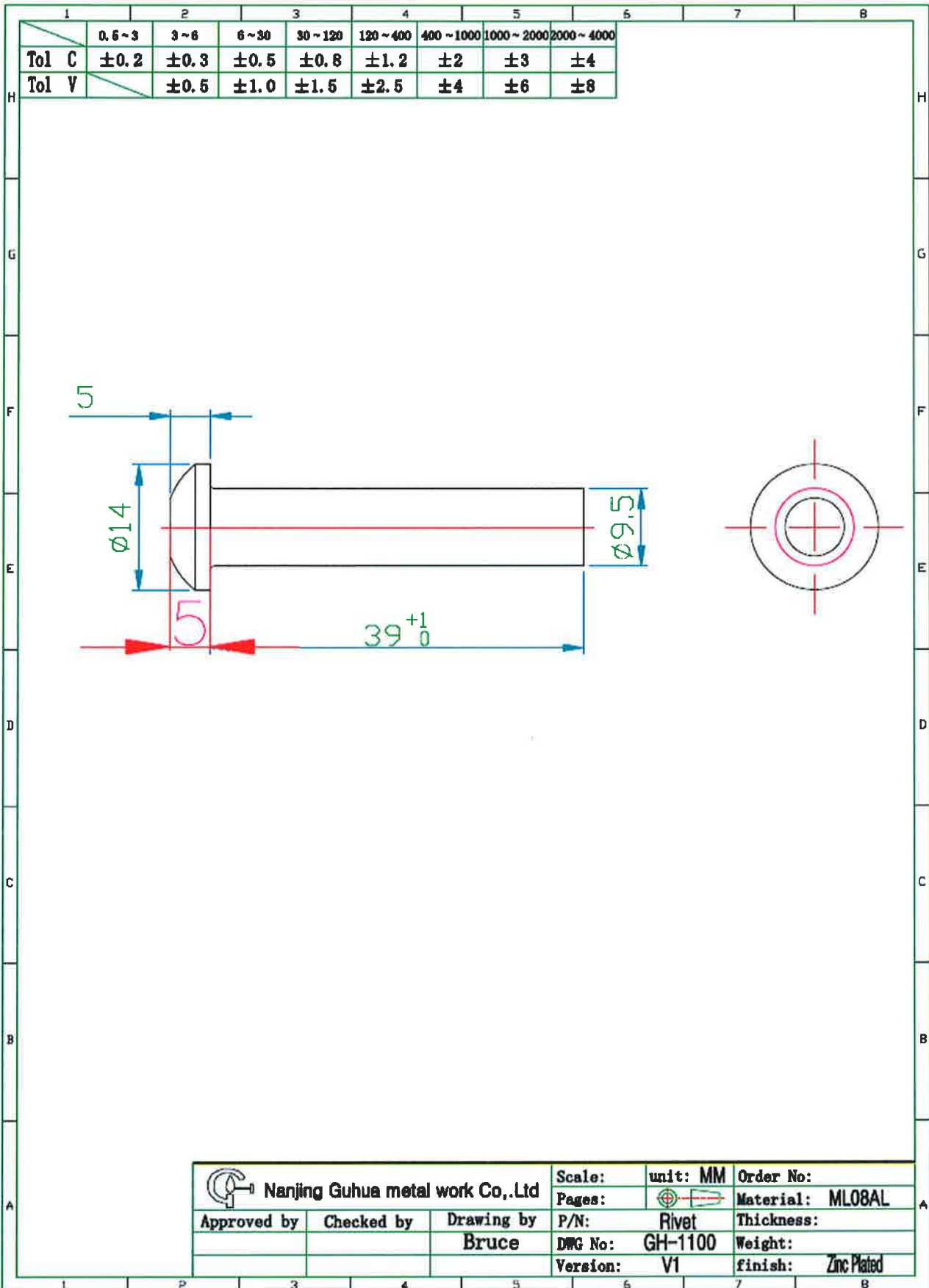


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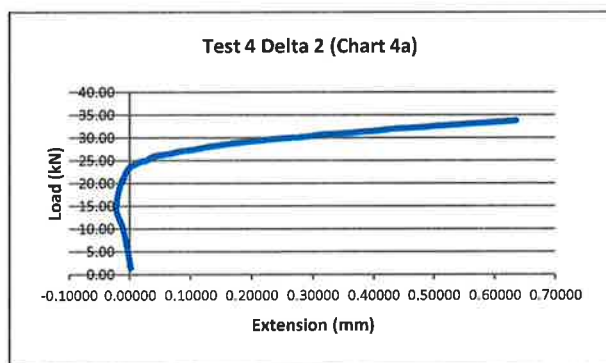
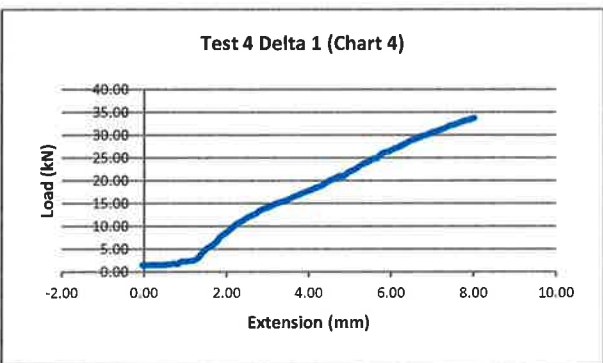
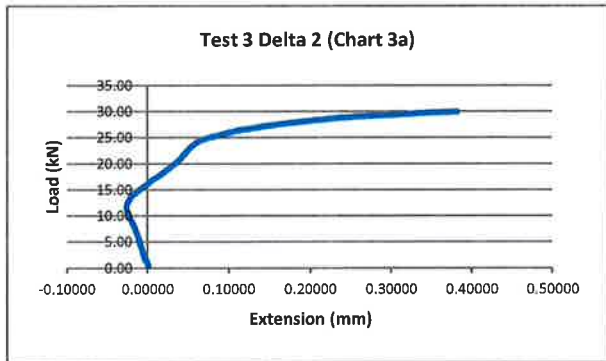
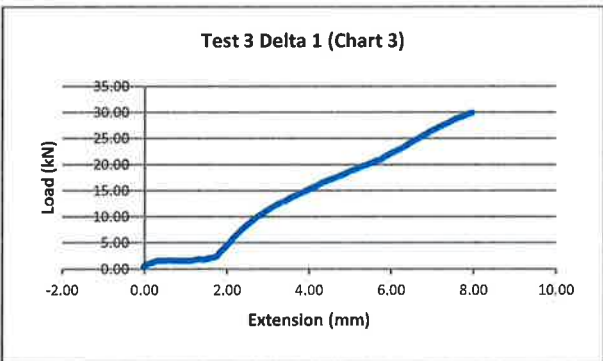
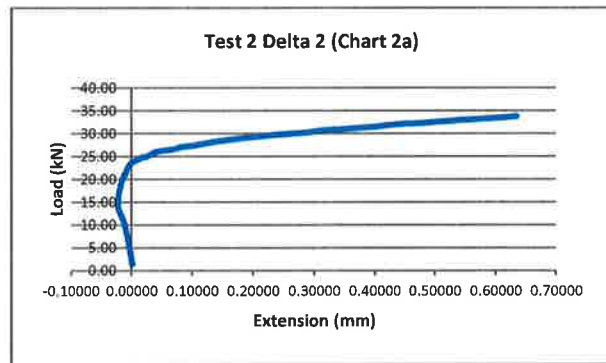
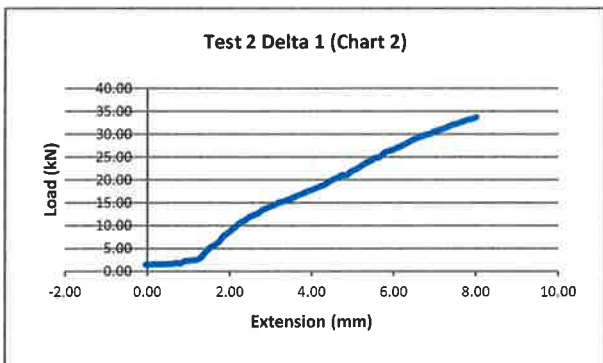
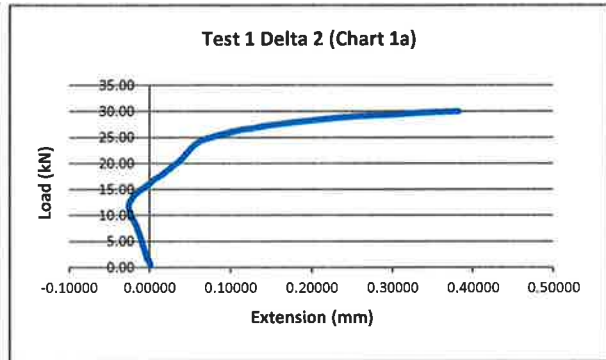
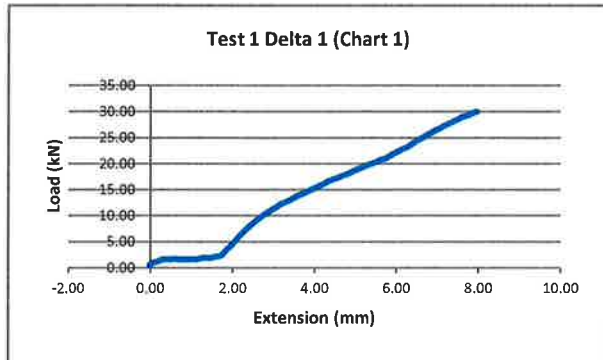
Photograph of coupler under test



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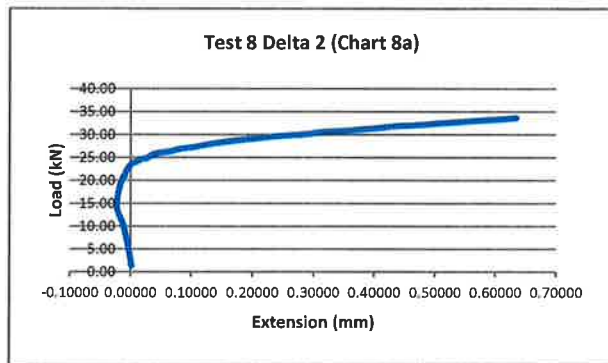
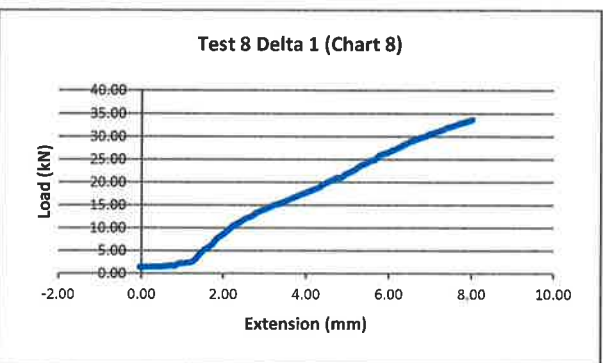
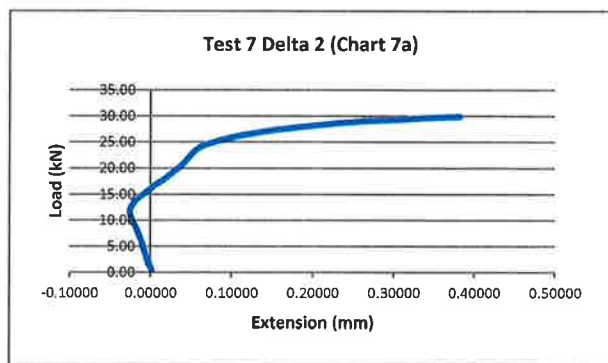
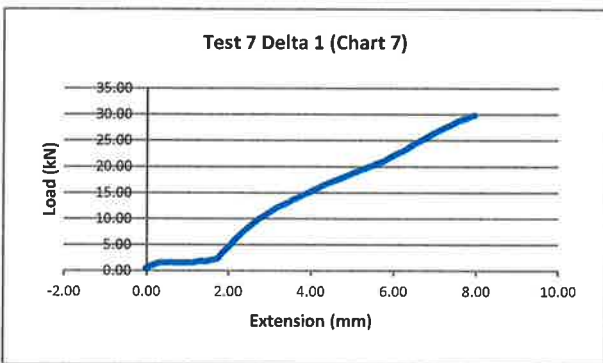
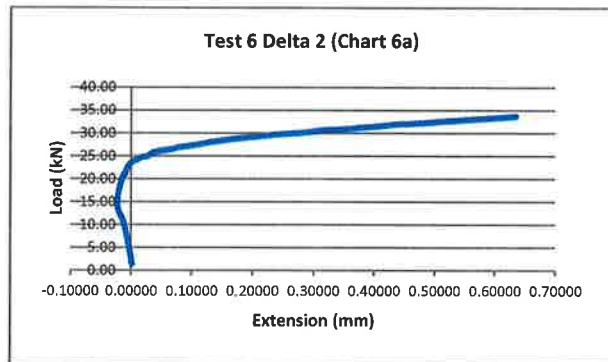
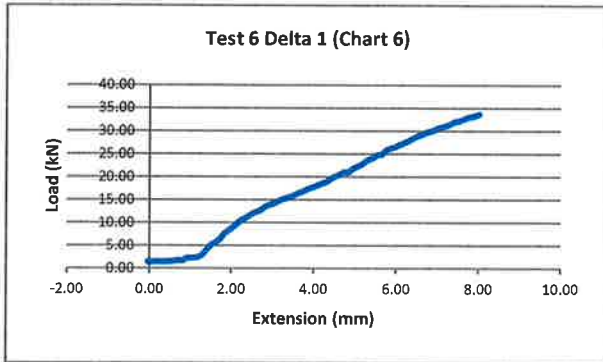
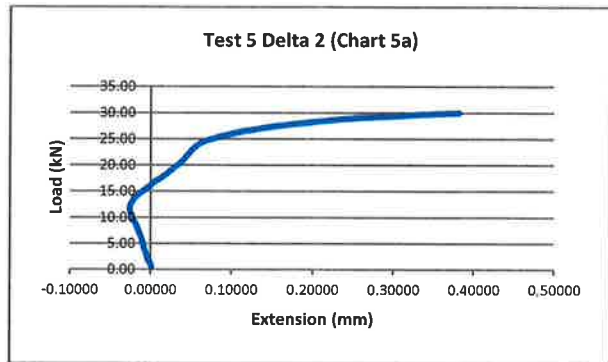
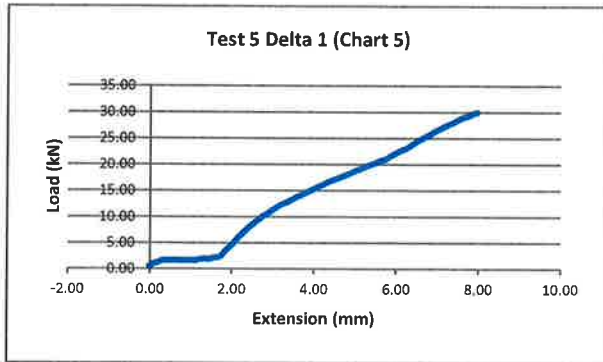
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## Appendix A



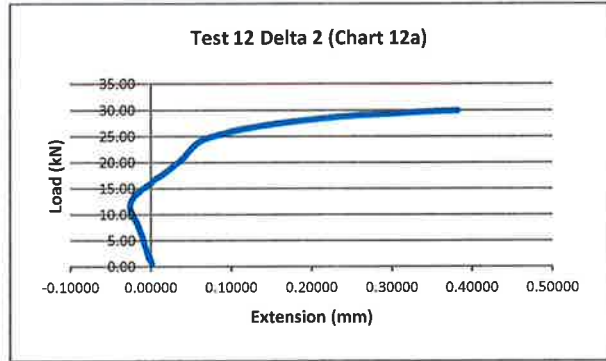
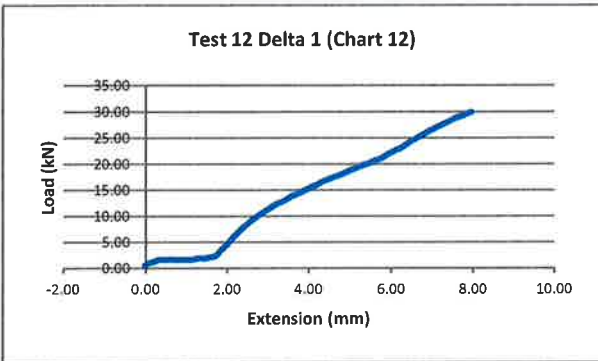
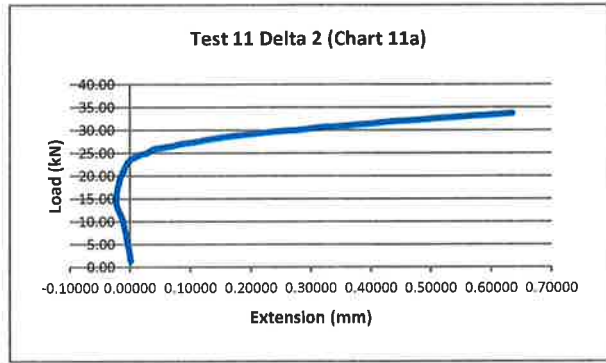
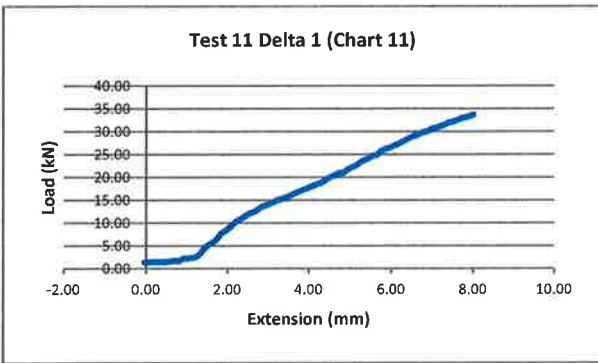
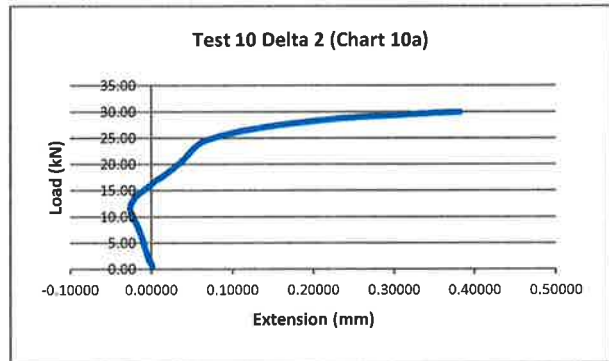
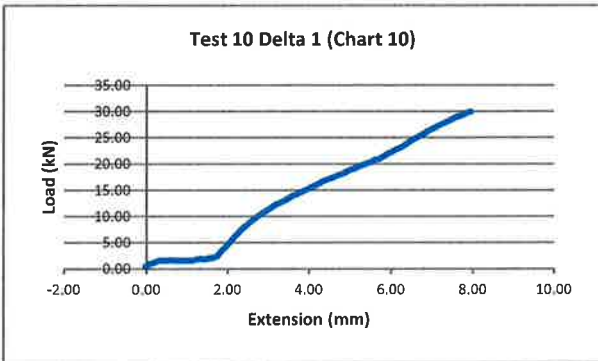
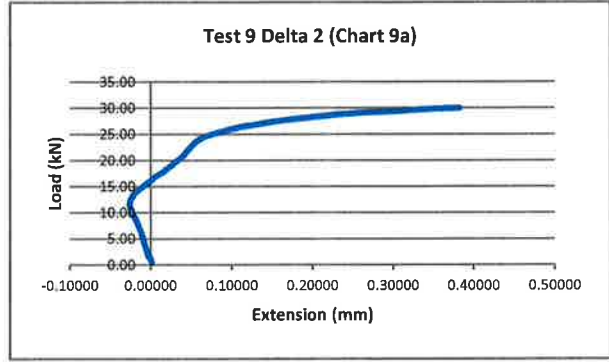
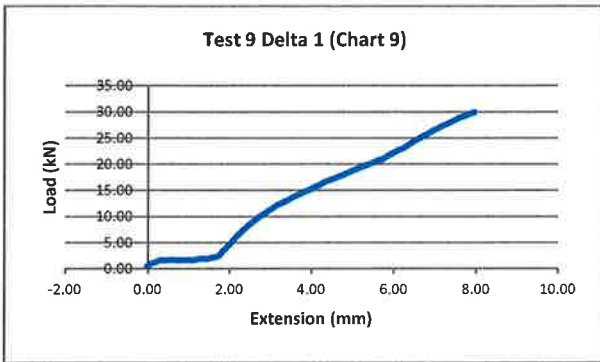
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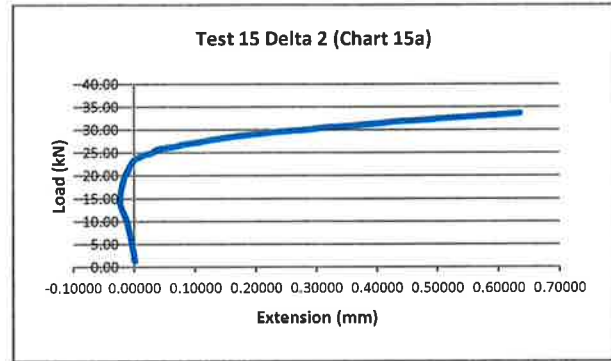
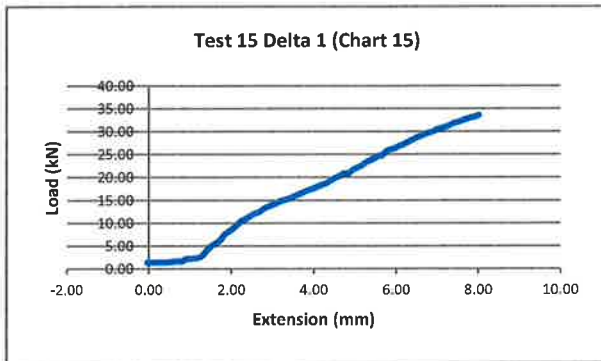
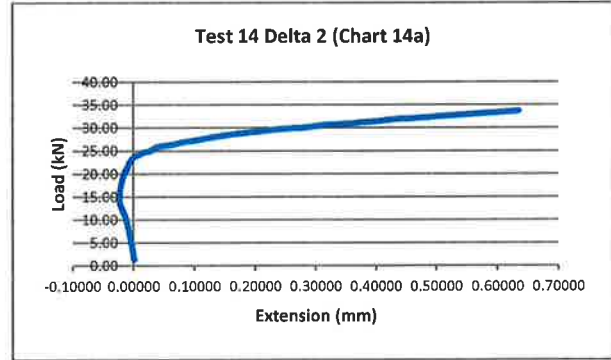
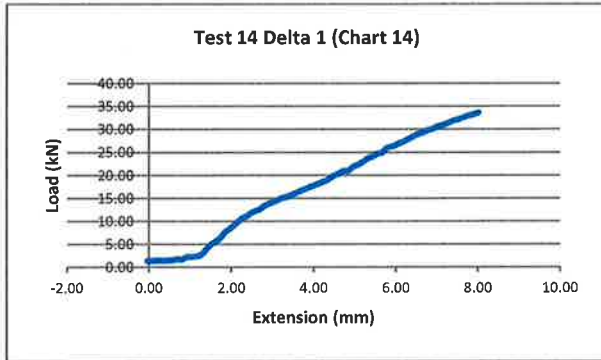
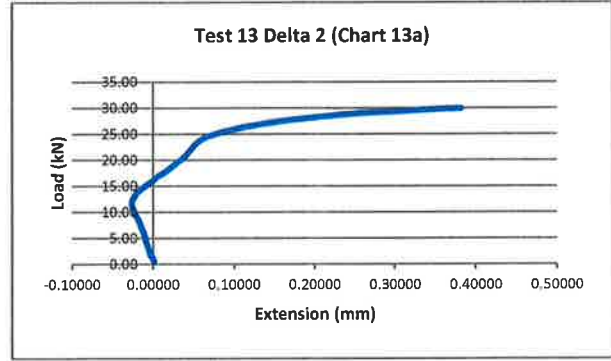
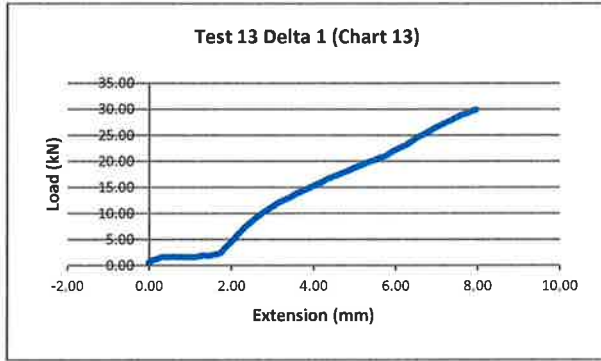
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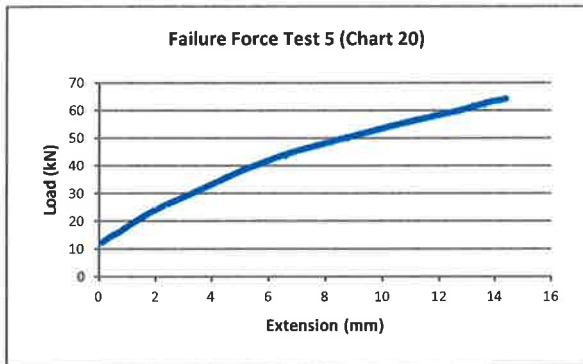
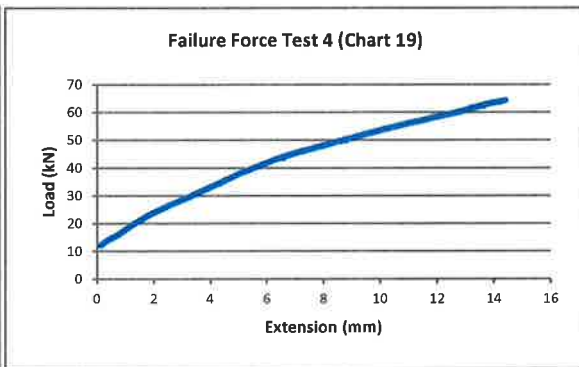
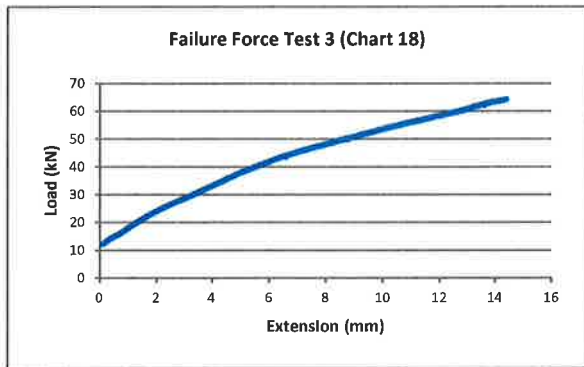
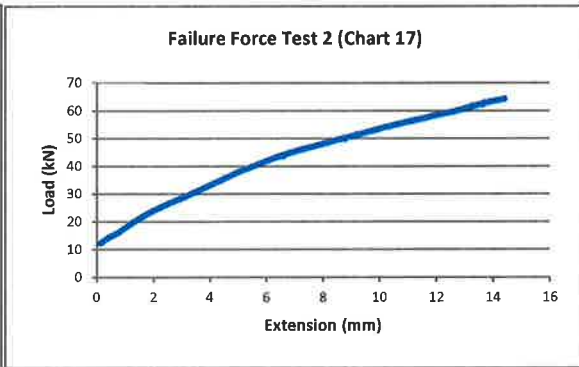
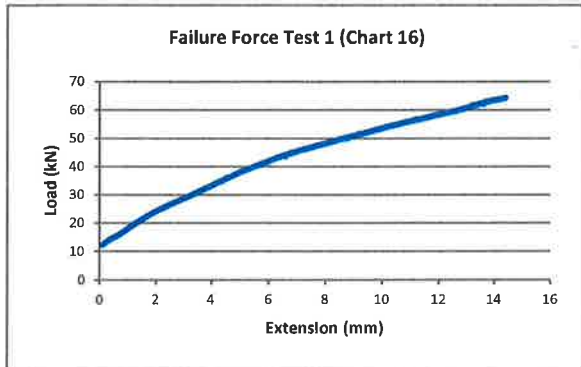


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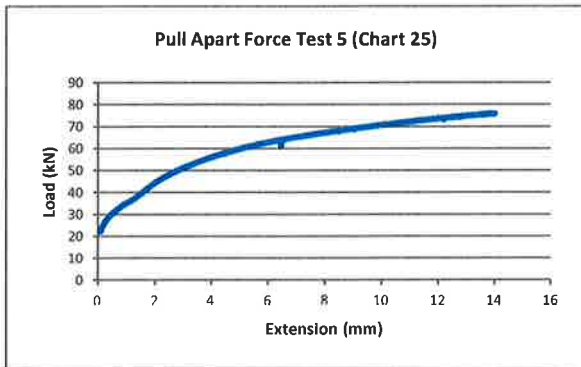
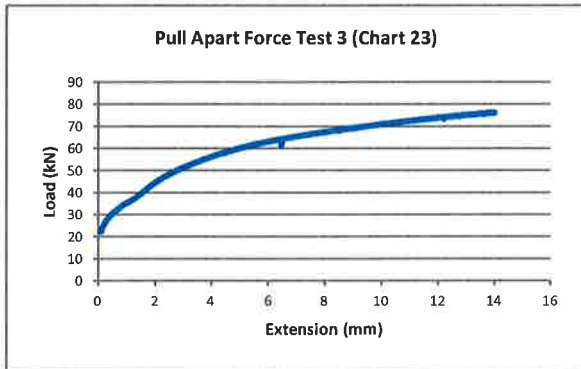
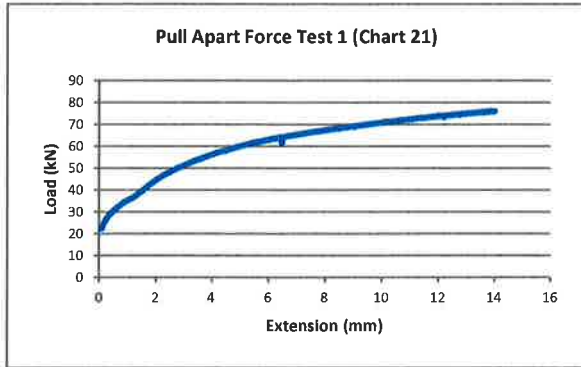


## Appendix B



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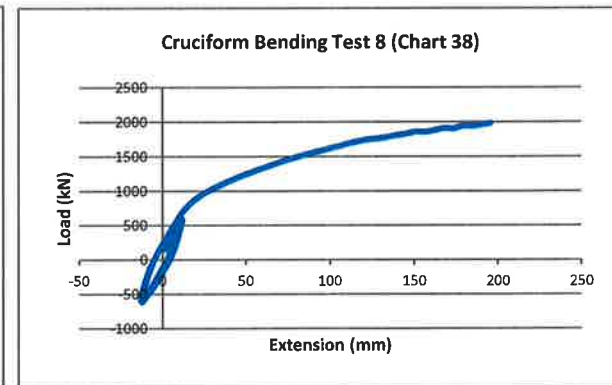
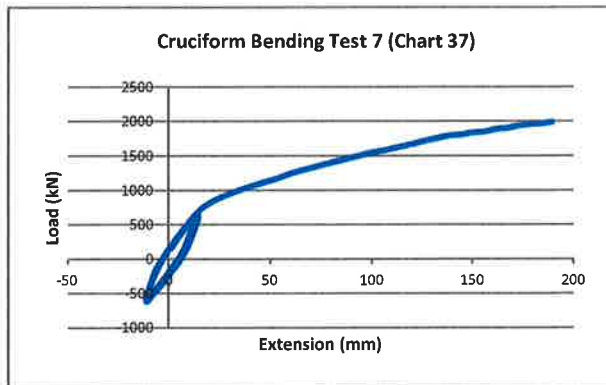
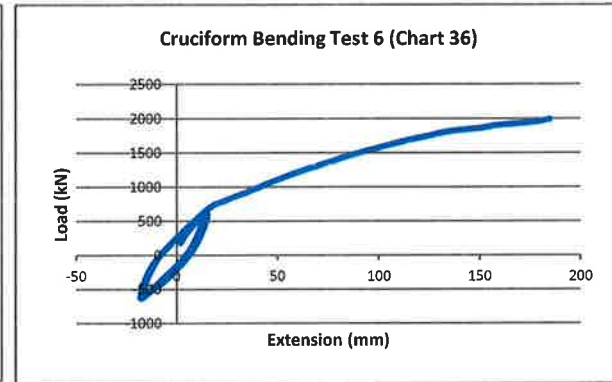
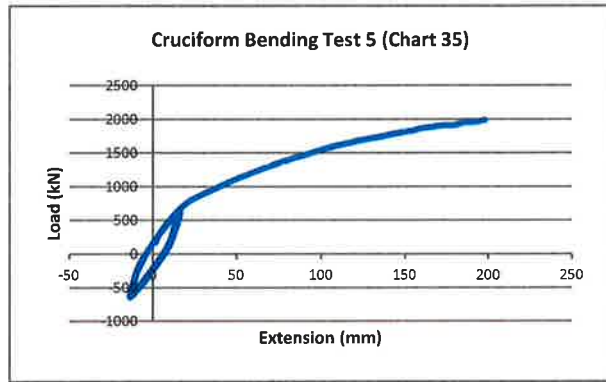
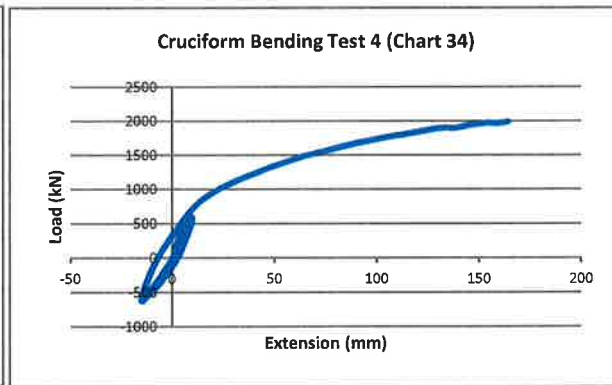
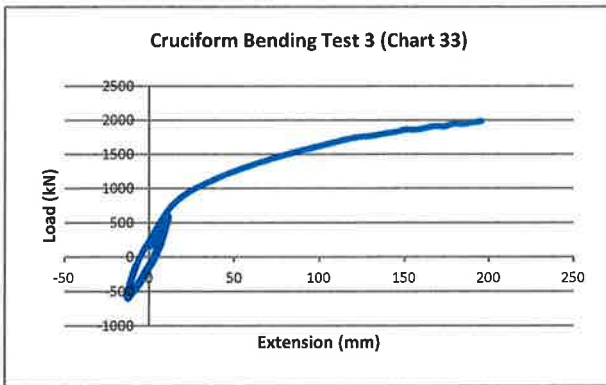
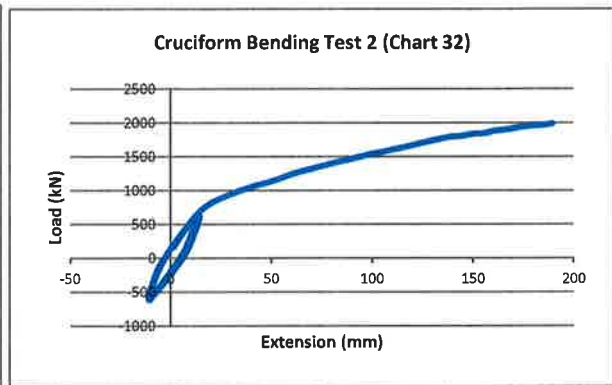
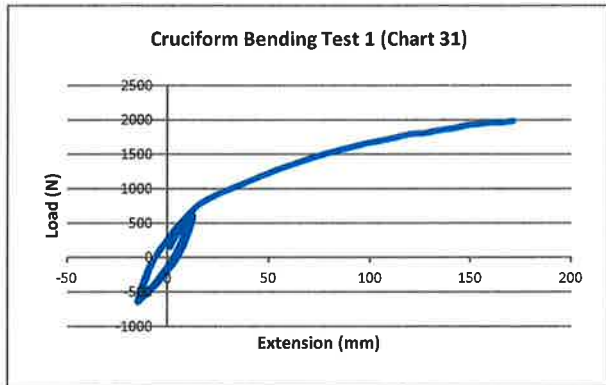
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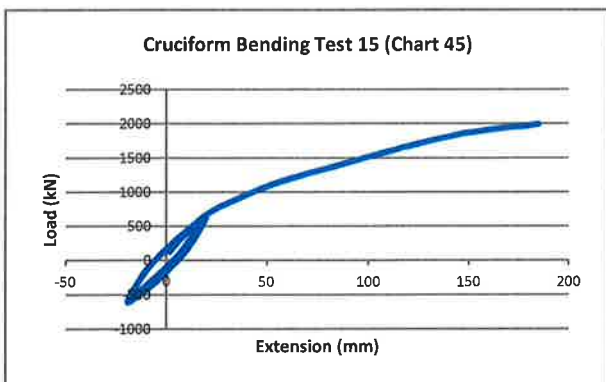
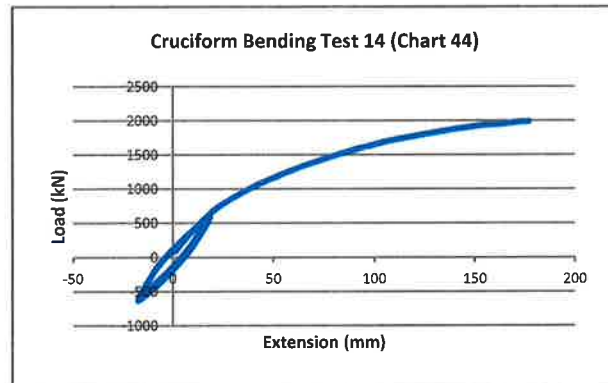
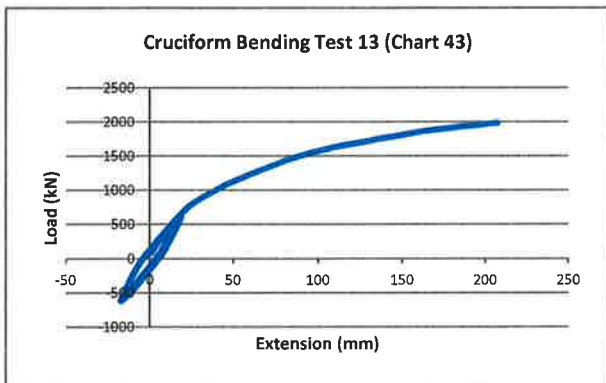
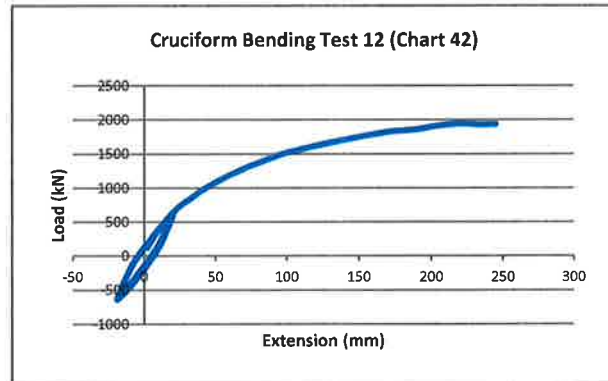
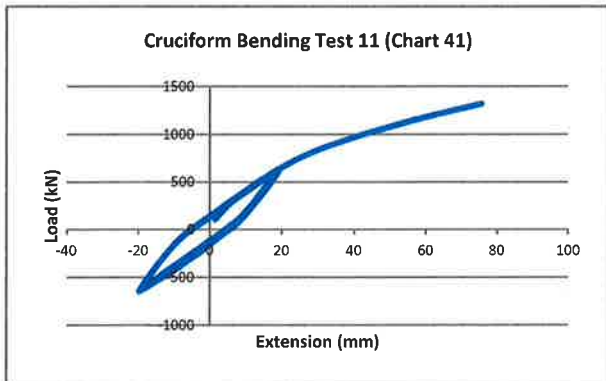
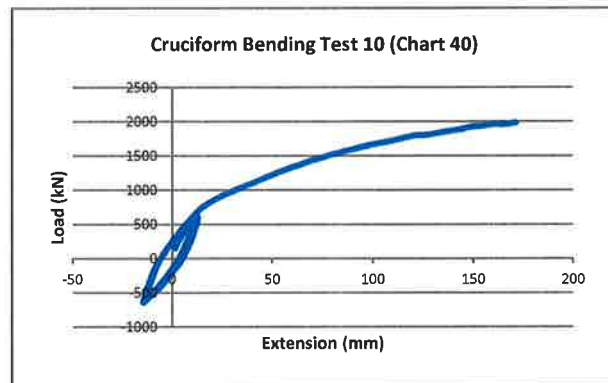
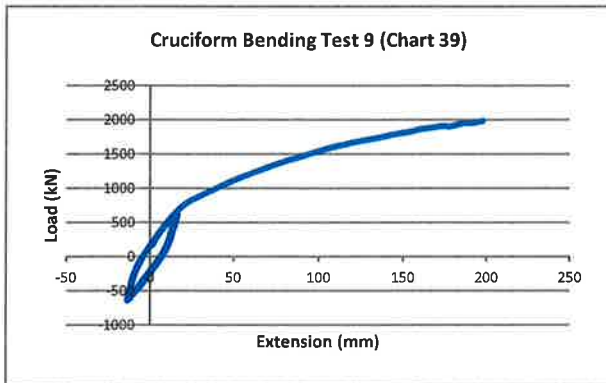


## Appendix C



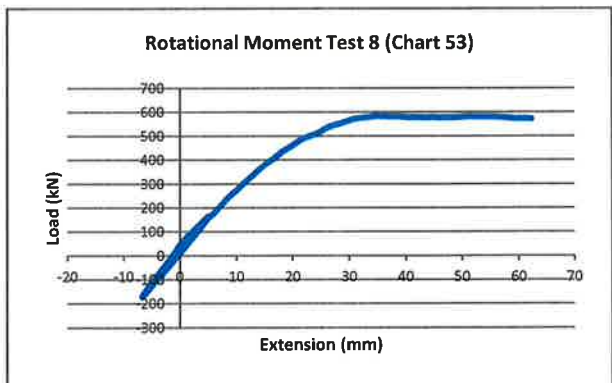
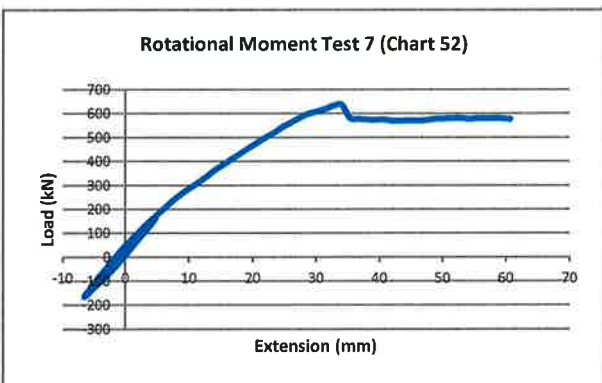
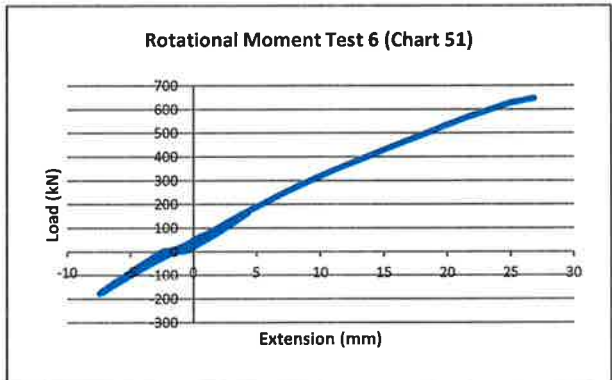
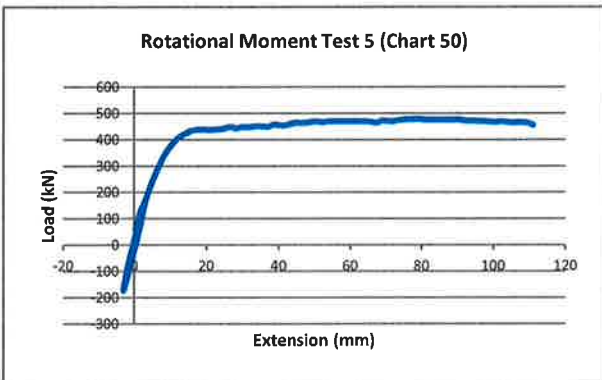
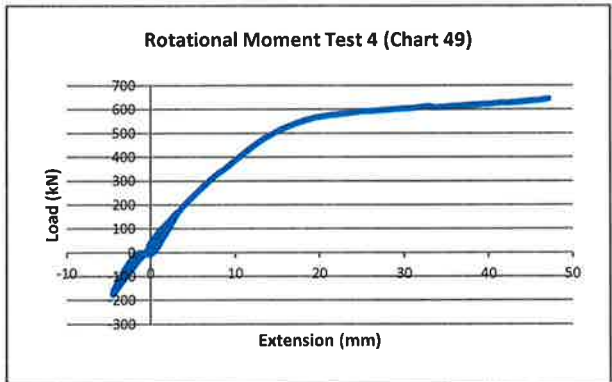
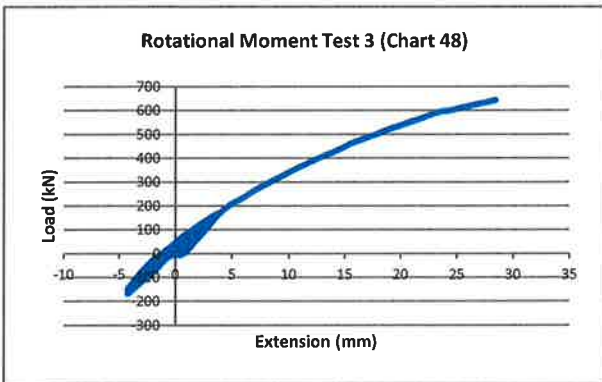
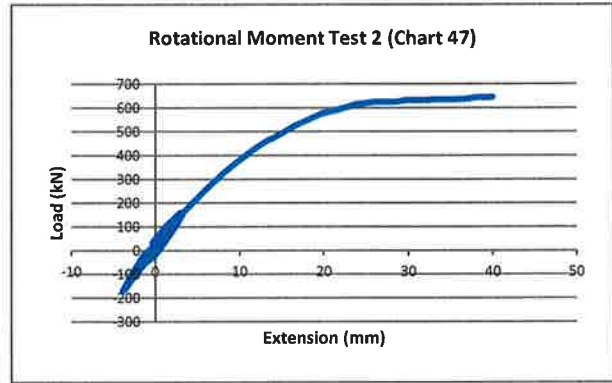
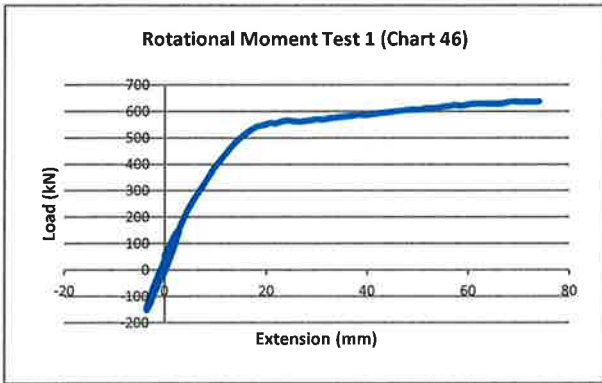
*km*

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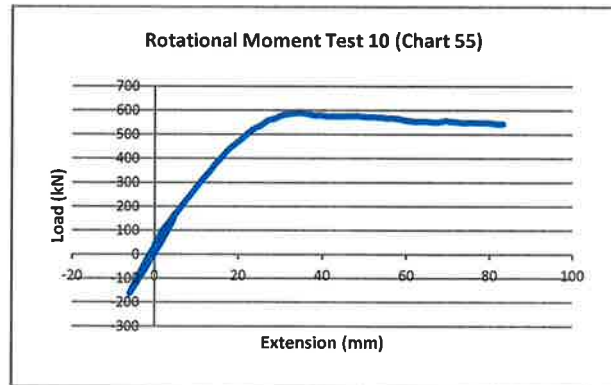
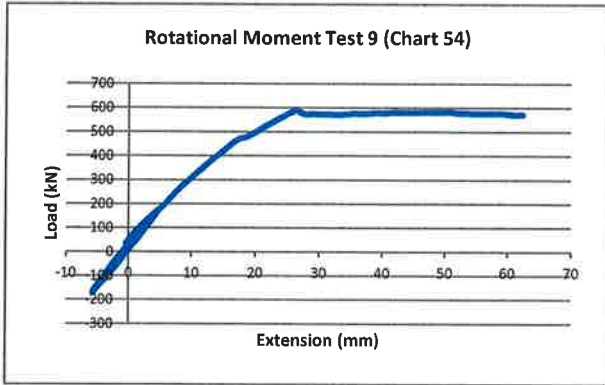
*Lm*

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*Lu*

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*Law*