

**ALTERNATING TENSION AND COMPRESSION TEST OF HIGH  
STRESSES (S1) AND LARGE STRAINS (S2) IN THE MECHANICAL  
SPLICE FOR GROUT COUPLERS**

**HALFEN-MOMENT PTE LTD**

**Sample Marking : i) T16  
ii) T25  
iii) T40**

**Project No. : SL/2016-085  
Report No. : 111JIV86-15(2)  
Date : 25 August 2016**



Project Name: -  
Report title: Alternating tension and compression test of high stresses (S1) and large strains (2) in the mechanical splice for Grout Couplers  
Customer: Halfen-Moment Pte Ltd  
Contact person: Mr. Gary Connah  
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#### Client's Description of Sample

Sample Marking :  
i) T16  
ii) T25  
iii) T40

At the request of Halfen Moment Pte Ltd, DNVGL Laboratory Singapore had carried out Alternating tension and compression test of high stresses (S1) and large strains (S2) in the mechanical splice on T16mm, T25mm and T40mm rebars with grout coupling. The test was conducted at Materials & Structural Laboratory of DNVGL Singapore on 11<sup>th</sup> and 16<sup>th</sup> August 2016.

Load vs Strain curves were recorded during the test.

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☐ Secret

Keywords:

Re-Bar  
Coupler

Reference to part of this report which may lead to misinterpretation is not permissible.

Rev. No.	Date	Reason for Issue	Prepared by	Verified by	Approved by
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## 1.0 TEST SPECIMEN PREPARATION

The specimen was set up for testing on a calibrated 2,500kN Instron universal testing machine. The equipment/ instruments used is as follows:

- i) Wave-Matrix software program
- ii) Video Extensometer

## 2.0 TEST PROCEDURE

The following type of test was performed in accordance to client's instructions on the 2,500kN Instron universal testing machine.

Stage	Test	Tension	Compression	Cycles	Standard
1	Slip	$0.6f_y$	$0.02f_y$	3	ISO 15835-1 / 2 : 2009
2	S1	$0.9f_y$	$0.5f_y$	20	ISO 15835-1 / 2 : 2009
3	S2	$2\varepsilon_y$	$0.5f_y$	4	ISO 15835-1 / 2 : 2009
4	S2	$5\varepsilon_y$	$0.5f_y$	4	ISO 15835-1 / 2 : 2009
5	Load in Tension to failure				ISO 15835-1 / 2 : 2009

Note :

$f_y$  is the specified yield strength of the steel reinforcing bar

$\varepsilon_y$  is the strain of steel reinforcing bar at actual yield stress



## 3.0 SUMMARY OF TEST RESULTS

### **LOW CYCLE LOADING TEST RESULTS**

Sample Marking : i) T16  
ii) T25  
iii) T40  
Test standard : ISO 15835-1/2 : 2009  
Date of test : 11 / 16 August 2016  
Witnessed by : Mr. Gary Connah (Halfen-Moment)

#### **(I) SLIP TEST RESULTS**

Testing machine : 2500-kN UTM Elastic rate of loading : 3.0 mm/min  
Test Temperature : 23 deg C Total No. of Cycles : 3  
Test performed by : Jason / Shawn

Sample Marking	Diameter (mm)	Nominal Area (mm <sup>2</sup> )	Gauge Length (mm)	Strain (%)	Slip (mm)	Requirement
T16	16	201.06	288	0.0274	0.079	≤ 0.10mm
T25	25	490.88	440	0.0210	0.093	
T40	40	1256.64	700	0.0039	0.027	

#### **(II) COUPLERS OF CATEGORY S1 TEST RESULTS**

Testing machine : 2500-kN UTM Elastic rate of loading : 3.0 mm/min  
Test Temperature : 23 deg C Total No. of Cycles : 20  
Test performed by : Shawn

Sample Marking	Diameter (mm)	Nominal Area (mm <sup>2</sup> )	Gauge Length (mm)	$u_{20}$ (mm)	Requirement
T16	16	201.06	288	0.1969	≤ 0.30mm
T25	25	490.88	440	0.2155	
T40	40	1256.64	700	0.1511	

\*BBMS = Broke Between Mechanical Splice

#### **(III) COUPLERS OF CATEGORY S2 TEST RESULTS**

Testing machine : 2500-kN UTM Elastic rate of loading : 3.0 mm/min  
Test Temperature : 23 deg C Total No. of Cycles : 8  
Test performed by : Shawn

Type	Diameter (mm)	Nominal Area (mm <sup>2</sup> )	Gauge Length (mm)	$u_4$ (mm)	$u_8$ (mm)	^Tensile Strength (MPa)	Requirement	Fracture Location
T16	16	201.06	288	0.0415	0.0975	584	$u_4 : \leq 0.30\text{mm}$ $u_8 : \leq 0.60\text{mm}$	BAR BREAK
T25	25	490.88	440	0.0795	0.1855	544		BAR BREAK
T40	40	1256.64	700	0.1135	0.2175	618		BAR BREAK

BBMS = Broke Between Mechanical Splice



## **APPENDIX A**

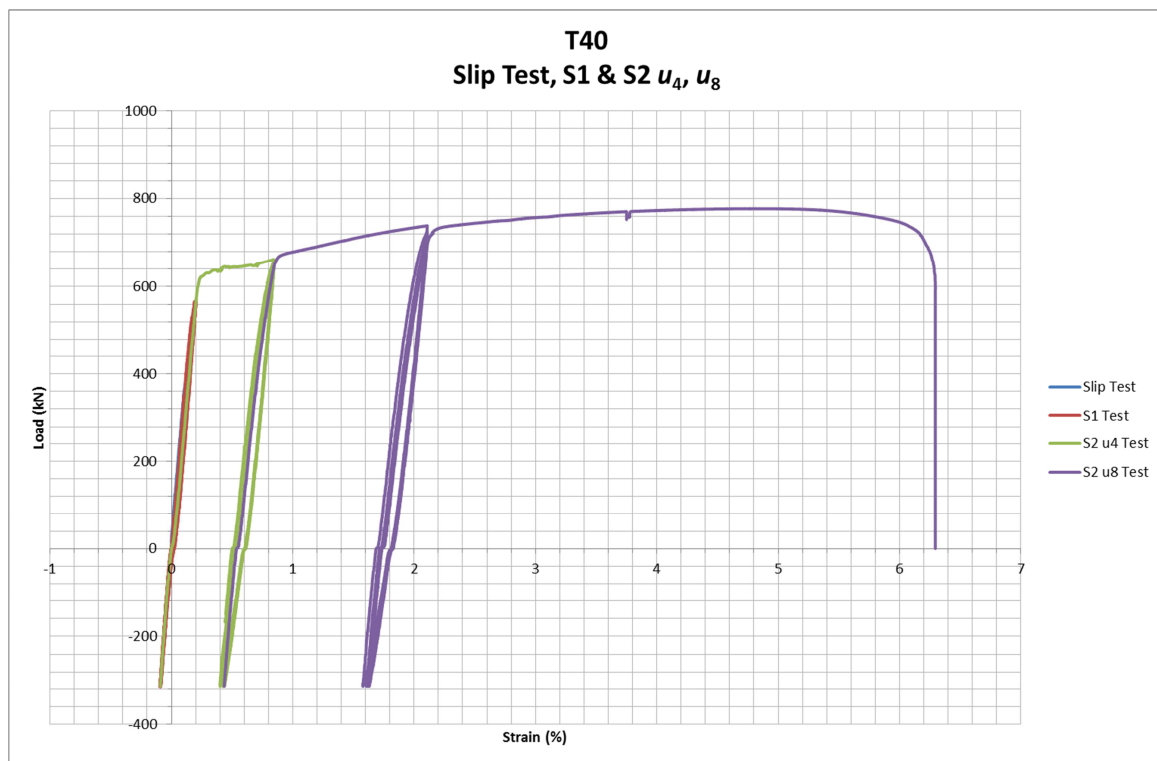
### **GRAPH OF TEST RESULT**



G1. T16 Alternating tension and compression test of large stresses (S1) and large strains (S2) in the mechanical splice - Load vs Strain Graph



G2. T25 Alternating tension and compression test of large stresses (S1) and large strains (S2) in the mechanical splice - Load vs Strain Graph

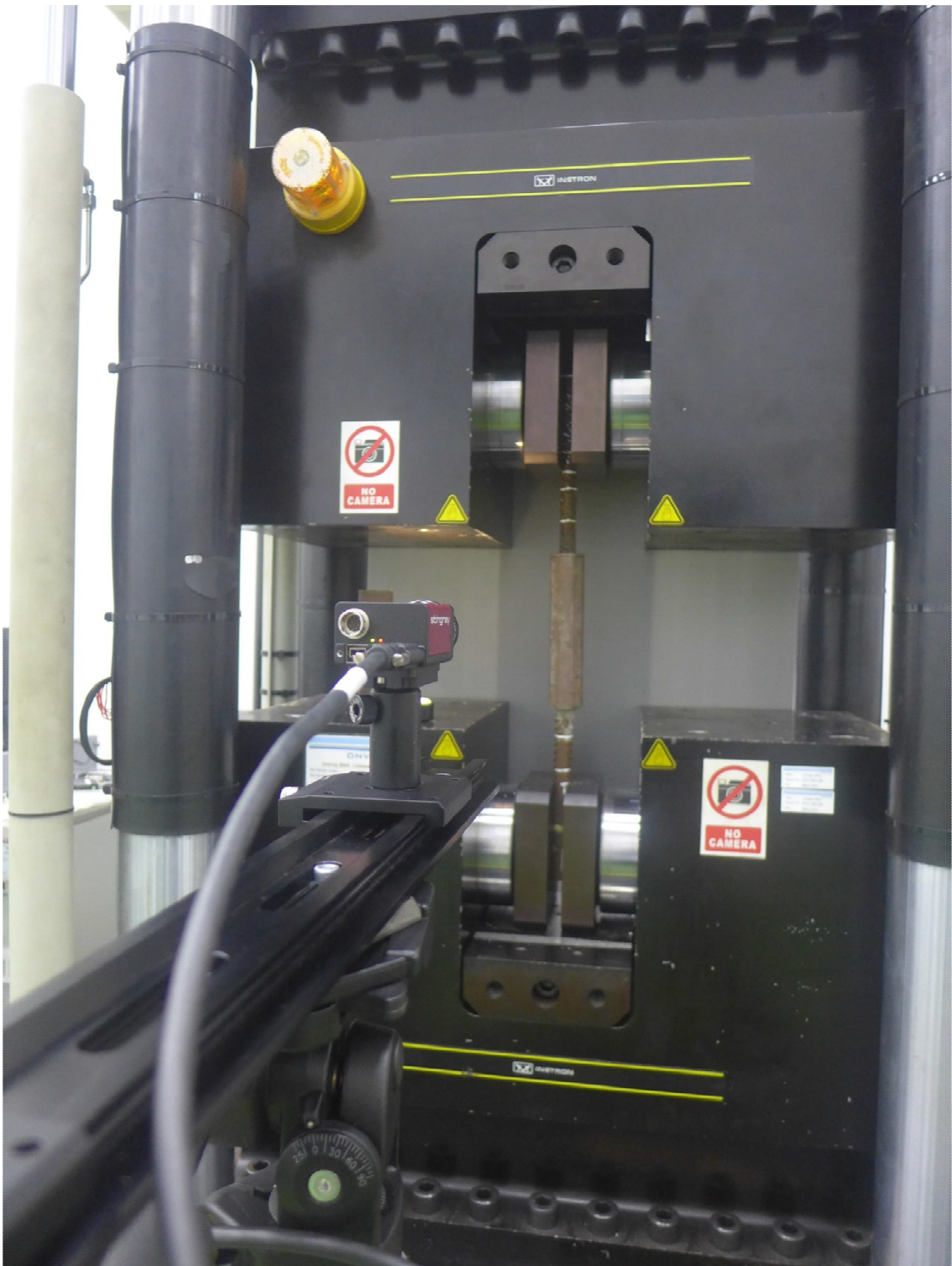


G3. T40 Alternating tension and compression test of large stresses (S1) and large strains (S2) in the mechanical splice - Load vs Strain Graph



## **APPENDIX B**

### **PHOTOGRAPHS**



P1. Test Setup





P2. T16, T25 & T40 Alternating tension and compression test of large stresses (S1) and large strains (S2) in the mechanical splice  
(After Test)



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