

## FUGRO TECHNICAL SERVICES LIMITED

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# MaterialLab

Client Ref. : --  
Report No. : 124675ST130008

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## REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

### Sample Description

#### Information Supplied by Client

Client : Sunway Metal Manufactory Limited  
Project : Shear Strength Test of Anchor Bolt  
Sample Description : E8 Anchor Bolt  
Client's Sample I.D. : --

#### For Expanding Anchor

Supplier Name : Sunway Metal Manufactory Limited  
Reference Number : E8  
Location of the Fixings in the Base Specimen : (Please refer to the diagrams)  
Embedded Length : 60 mm Minimum requirement of BS 5080 : 180 mm  
Hole Diameter : 8 mm for distance of fixing from the edge  
Bolt Diameter : 8 mm Minimum requirement of BS 5080 : 300 mm  
Hole Depth : 60 mm anchor spacing of fixing  
Concrete Grade : 22 N/mm<sup>2</sup>

#### For Concrete

Mix Proportions : Not provided  
Location of Reinforcement : Inside the concrete, double layers of squares  
Type of reinforcement : Embedded with deformed bars  
Cast Unit Shape : Square  
Dimensions of Cast Unit : 500 x 500 x 192 mm  
Concrete Age : 30 days  
Compressive Strength (Average) : 224 kgf/cm<sup>2</sup>

#### Laboratory Information

Location of Test : Product Testing Laboratory of MaterialLab  
Lab. Sample I.D. : ST130008/1,2,4,5 & 7  
Date Received : 03 January 2013  
Date Specimens Fixed : 22 March 2013  
Date Tested : 22 April 2013  
Span of Reaction Support : 320 mm  
Test Method : BS 5080 : Part 2 : 1986 and  
In accordance with our in-house method STMS-3131 which refers to ETAG-001-Annex-A  
Loading Method : Increment Loading  
Procedure of Forming Cracks : The cracks on the concrete plate were introduced by splitting it under compressive load at both notched parts and monitored by crack transducer for keeping the width of the cracks between 0.3-0.4 mm.

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**REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE****Test Method (STMS-3131)****METHOD STATEMENT FOR SHEAR STRENGTH OF AN ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE**

(In-house method which refers to ETAG-001-Annex-A)

1. An anchor bolt to be tested shall be provided by the client.
2. The square concrete plate with a side length of 500 mm and with a depth of 192 mm shall be prepared. Furthermore, eight deformed bars with a diameter of 13 mm shall be arranged in the concrete plate. Moreover a side of the plate shall be notched and aluminium plates are installed at the lower part of the plate.
3. The concrete plate with compressive strength of at least 224 kgf/cm<sup>2</sup> shall be used. Six hours after casting of concrete, the plate shall be covered with wet sand for 2 weeks and then cured in the laboratory before testing. The age of the concrete at the test shall be around 30 days.
4. An anchor bolt shall be installed at the center of the concrete plate.
5. The cracks on the plate shall be introduced by splitting it under compressive load at both notched parts and monitored by crack transducer, which shall be positioned afar from 25 mm of the bolt center along the cracks for keeping the width of the cracks between 0.3-0.4 mm.
6. The cracks shall be ensured to pass through the anchor bolt by visual inspection. The picture is shown at picture 1.
7. The sketch of the specified concrete structure is shown at sketch 1.
8. The head of the bolt connected with the embedded stud shall be pulled horizontally by a hydraulic jack with using a coupler in according to BS 5080 : Part 2 : 1986.
9. All recorded test force and displacement shall be reported.



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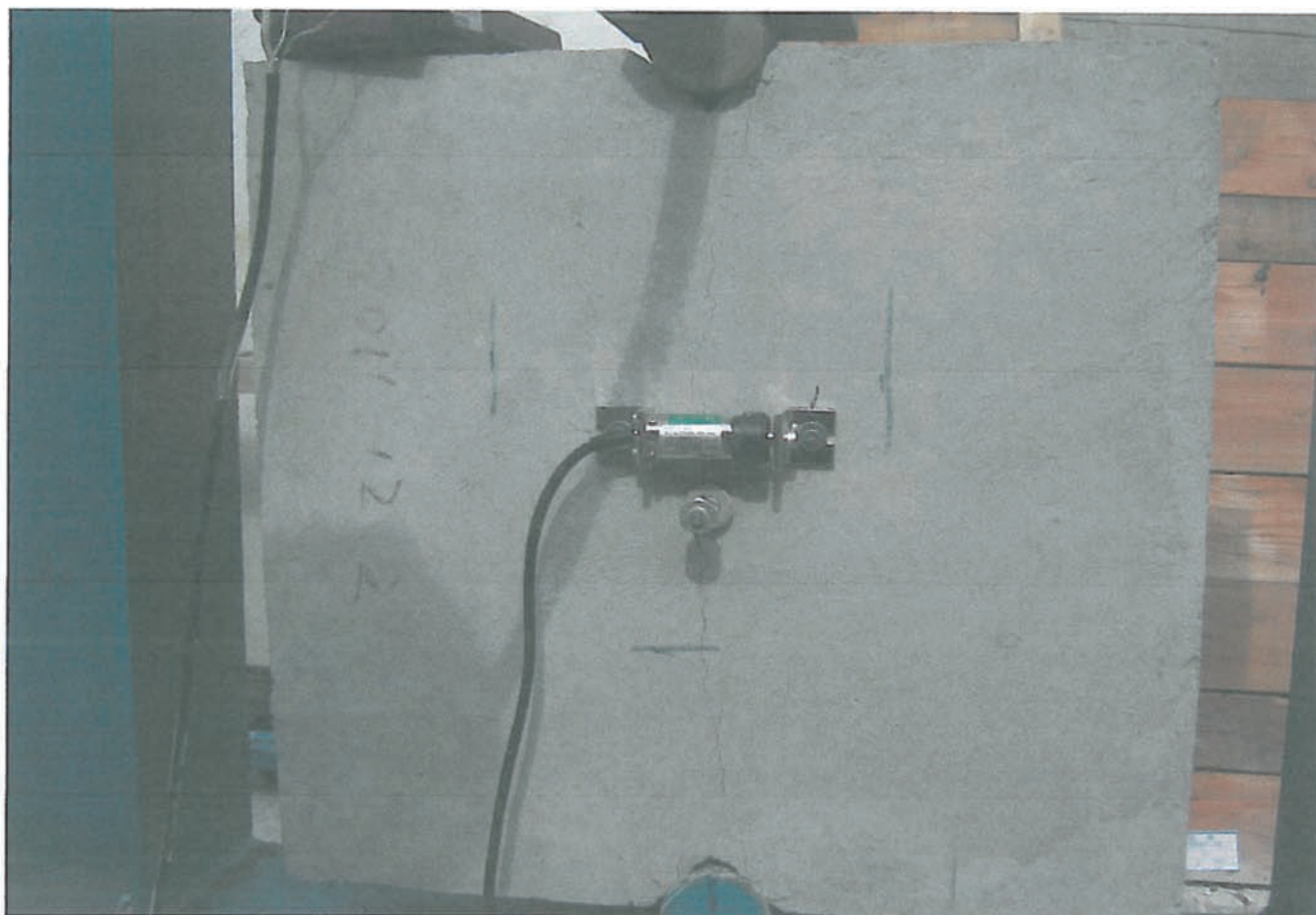
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## REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

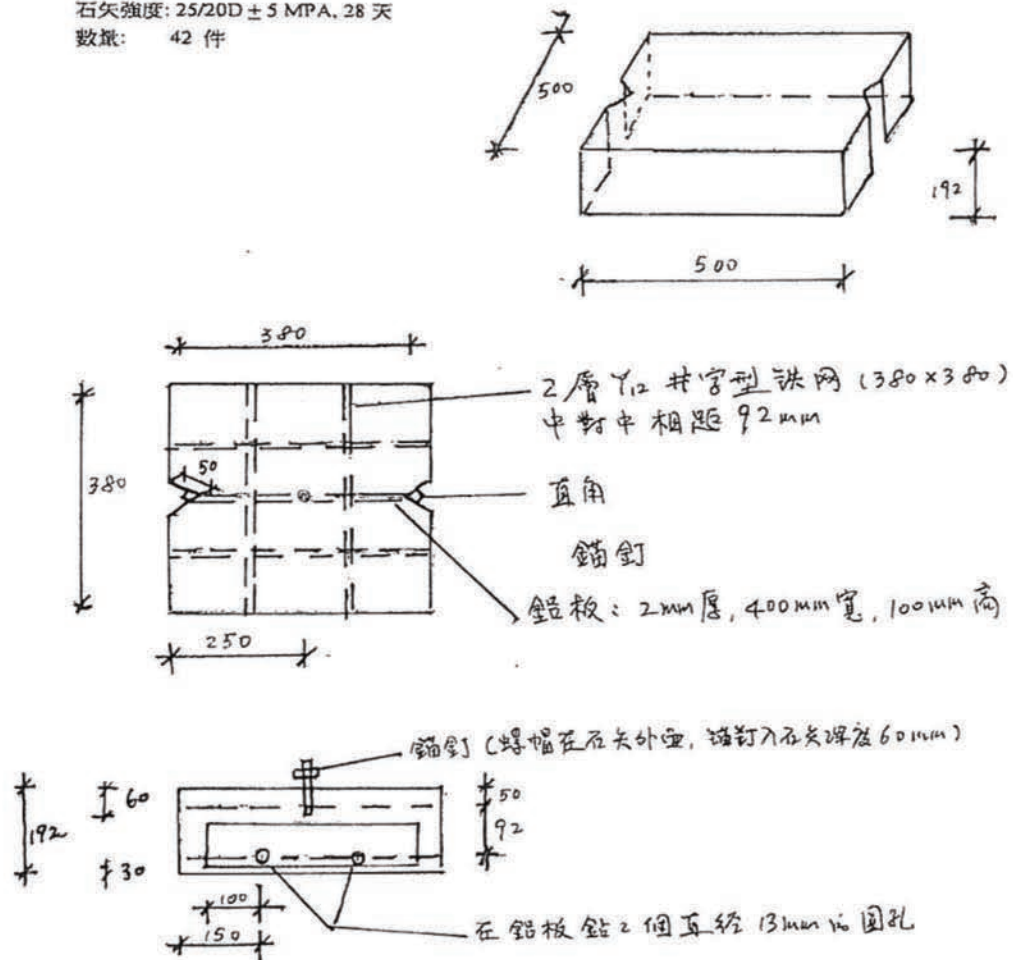
### Test Method



Picture 1 : The picture indicates the cracks with crack transducer positions

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**REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE****Test Method**石矢強度: 25/20D  $\pm$  5 MPA, 28 天  
數量: 42 件

Sketch 1 : The specified concrete structure



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## **REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE**

### **Summary of Test Results (Install the Anchor Bolts Before the Concrete Cracked)**

Lab. Sample I.D.	Force Interval (kN) / Displacement (mm)											Ultimate Force (max.) (kN)
	2 kN	4 kN	6 kN	8 kN	10 kN	12 kN	14 kN	16 kN	18 kN	20 kN	22 kN	
ST130008/1	0.060	0.354	0.777	1.285	1.997	2.956	4.397	--	--	--	--	14.78
ST130008/2	0.057	0.291	0.624	0.985	1.554	2.573	--	--	--	--	--	13.16
ST130008/4	0.405	0.986	1.915	3.336	4.899	6.356	7.823	--	--	--	--	15.22
ST130008/5	0.048	0.785	1.403	1.860	2.212	2.650	--	--	--	--	--	13.83
ST130008/7	0.937	1.524	2.112	2.856	4.143	5.869	--	--	--	--	--	13.92
<b>Mean</b>	--	--	--	--	--	--	--	--	--	--	--	<b>14.18</b>
<b>Standard Deviation</b>	--	--	--	--	--	--	--	--	--	--	--	<b>0.82</b>

Remark : The test results relate only to the samples tested.

Checked by : 2901 Date : 28/5/2013 Certified by : Chan Chun Wai Ivan Date : 28.5.2013  
Chan Chun Wai Ivan  
Manager (Product Testing Laboratory)

**\*\* End of Report \*\***



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## REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

### Sample Description

#### Information Supplied by Client

Client : Sunway Metal Manufactory Limited  
Project : Shear Strength Test of Anchor Bolt  
Sample Description : E8 Anchor Bolt  
Client's Sample I.D. : --

#### For Expanding Anchor

Supplier Name : Sunway Metal Manufactory Limited  
Reference Number : E8  
Location of the Fixings in the Base Specimen : (Please refer to the diagrams)  
Embedded Length : 50 mm Minimum requirement of BS 5080 : 180 mm  
Hole Diameter : 8 mm for distance of fixing from the edge  
Bolt Diameter : 8 mm Minimum requirement of BS 5080 : 300 mm  
Hole Depth : 60 mm anchor spacing of fixing  
Concrete Grade : 33 N/mm<sup>2</sup>

#### For Concrete

Mix Proportions : Not provided  
Location of Reinforcement : Inside the concrete, double layers of squares  
Type of reinforcement : Embedded with deformed bars  
Cast Unit Shape : Square  
Dimensions of Cast Unit : 500 x 500 x 180 mm  
Concrete Age : 30 days  
Compressive Strength (Average) : 336 kgf/cm<sup>2</sup>

#### Laboratory Information

Location of Test : Product Testing Laboratory of MaterialLab  
Lab. Sample I.D. : ST120023/1-12  
Date Received : 11 January 2012  
Date Specimens Fixed : 16 February 2012  
Date Tested : 27 March 2012  
Span of Reaction Support : 320 mm  
Test Method : BS 5080 : Part 2 : 1986 and  
In accordance with our in-house method STMS-3131 which refers to ETAG-001-Annex-A  
Loading Method : Increment Loading  
Procedure of Forming Cracks : The cracks on the concrete plate were introduced by splitting it under compressive load at both notched parts and monitored by crack transducer for keeping the width of the cracks between 0.3-0.4 mm.



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## **REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE**

### **Test Method (STMS-3131)**

### **METHOD STATEMENT FOR SHEAR STRENGTH OF AN ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE**

(In-house method which refers to ETAG-001-Annex-A)

1. An anchor bolt to be tested shall be provided by the client.
2. The square concrete plate with a side length of 500 mm and with a depth of 180 mm shall be prepared. Furthermore, eight deformed bars with a diameter of 13 mm shall be arranged in the concrete plate. Moreover a side of the plate shall be notched and aluminium plates are installed at the lower part of the plate.
3. The concrete plate with compressive strength of at least 270 kgf/cm<sup>2</sup> shall be used. Six hours after casting of concrete, the plate shall be covered with wet sand for 2 weeks and then cured in the laboratory before testing. The age of the concrete at the test shall be around 30 days.
4. An anchor bolt shall be installed at the center of the concrete plate.
5. The cracks on the plate shall be introduced by splitting it under compressive load at both notched parts and monitored by crack transducer, which shall be positioned afar from 25 mm of the bolt center along the cracks for keeping the width of the cracks between 0.3-0.4 mm.
6. The cracks shall be ensured to pass through the anchor bolt by visual inspection. The picture is shown at picture 1.
7. The sketch of the specified concrete structure is shown at sketch 1.
8. The head of the bolt connected with the embedded stud shall be pulled horizontally by a hydraulic jack with using a coupler in according to BS 5080 : Part 2 : 1986.
9. All recorded test force and displacement shall be reported.



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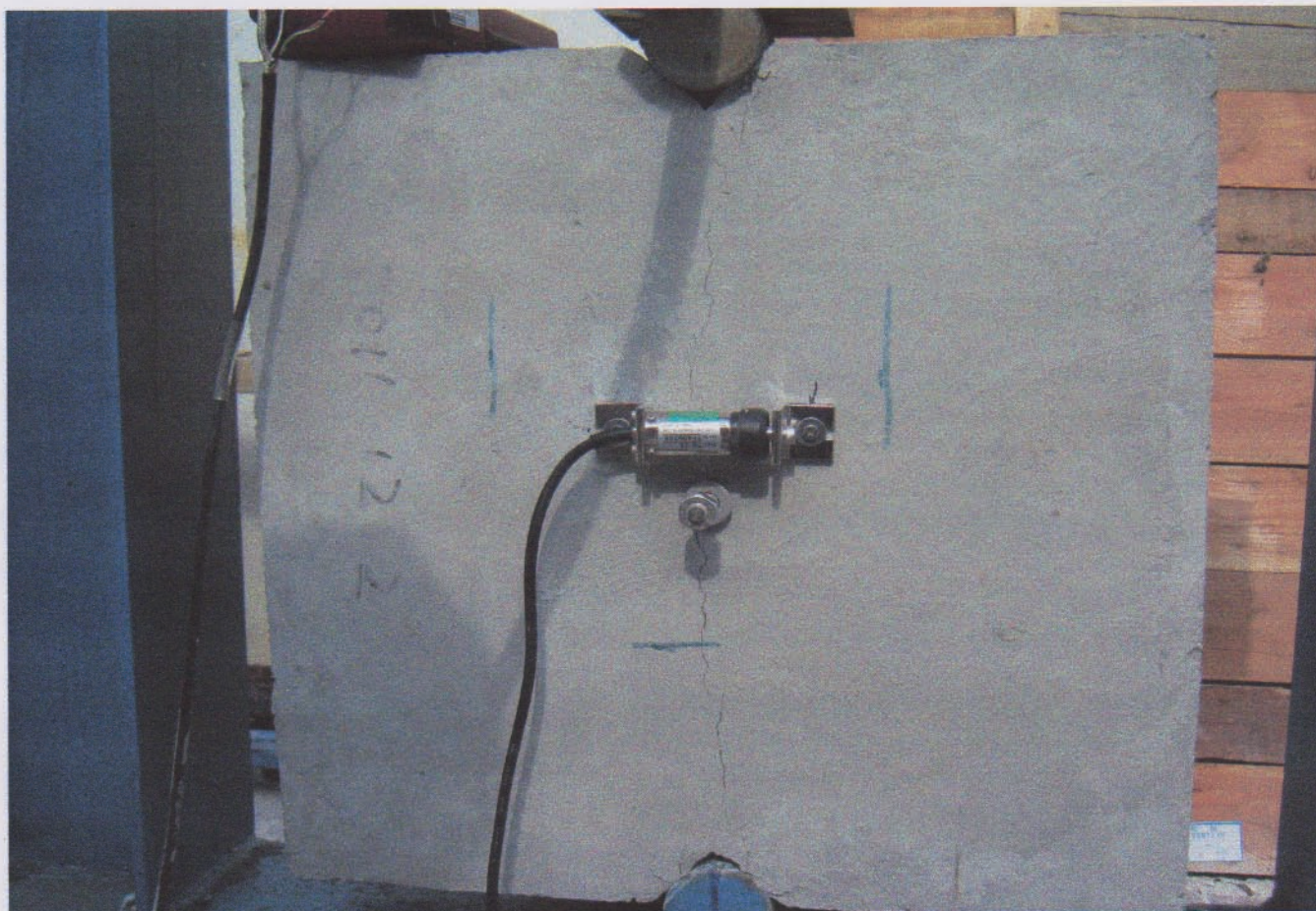
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## REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

### Test Method



Picture 1 : The picture indicates the cracks with crack transducer positions

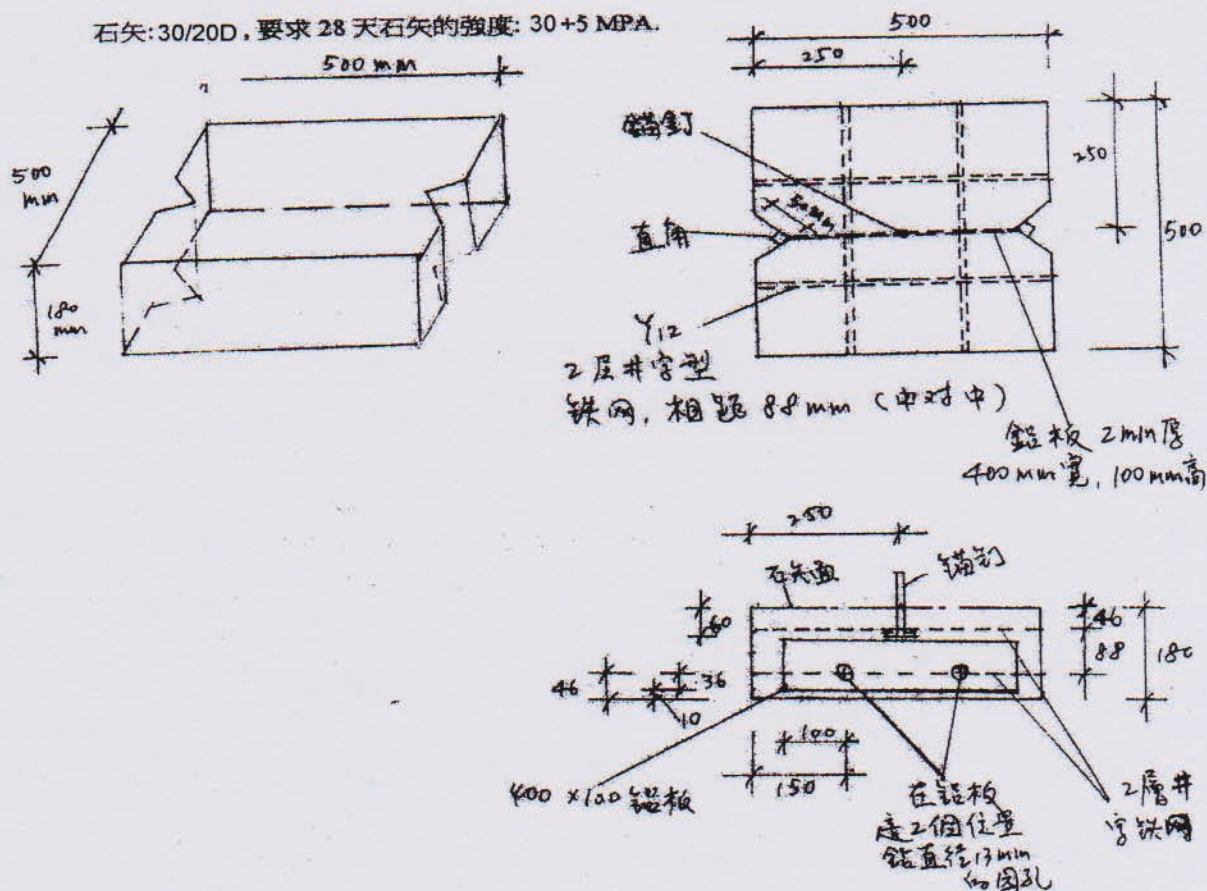


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## REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

### Test Method



Sketch 1 : The specified concrete structure



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## **REPORT ON SHEAR STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE**

### **Summary of Test Results (Install the Anchor Bolts Before the Concrete Cracked)**

Lab. Sample I.D.	Force Interval (kN) / Displacement (mm)							Ultimate Force (max.) (kN)
	3 kN	6 kN	9 kN	12 kN	15 kN	18 kN	21 kN	
ST120023/1	0.41	0.99	2.36	6.03	9.16	--	--	17.32
ST120023/2	0.05	0.70	1.95	6.10	10.00	--	--	15.34
ST120023/3	0.40	2.34	6.43	11.42	17.73	--	--	17.76
ST120023/4	1.28	1.93	2.96	7.40	10.36	13.13	--	16.35
ST120023/5	0.73	1.33	4.75	9.07	11.89	14.06	--	19.18
ST120023/6	0.91	2.74	5.64	22.22	27.00	--	--	15.79
ST120023/7	0.92	1.97	3.26	5.25	7.09	9.05	--	18.47
ST120023/9	0.88	1.69	3.50	6.64	9.43	11.83	--	18.97
ST120023/11	0.47	1.44	3.12	5.65	9.57	--	--	17.65
ST120023/12	1.92	4.02	12.43	15.48	17.50	19.11	--	20.65
<b>Mean</b>	--	--	--	--	--	--	--	<b>17.75</b>
<b>Standard Deviation</b>	--	--	--	--	--	--	--	<b>1.64</b>

- Remarks :
- 1.) The test results relate only to the samples tested.
  - 2.) The test configuration and samples after test are shown in the photographs on pages 6 to 11 of this report.
  - 3.) This report is to supersede our previous test report no. 114392ST120023.

Checked by : Egor Date : 16/10/2012 Certified by : Chan Chun Wai Ivan Date : 19.10.2012

Chan Chun Wai Ivan

Manager (Product Testing Laboratory)



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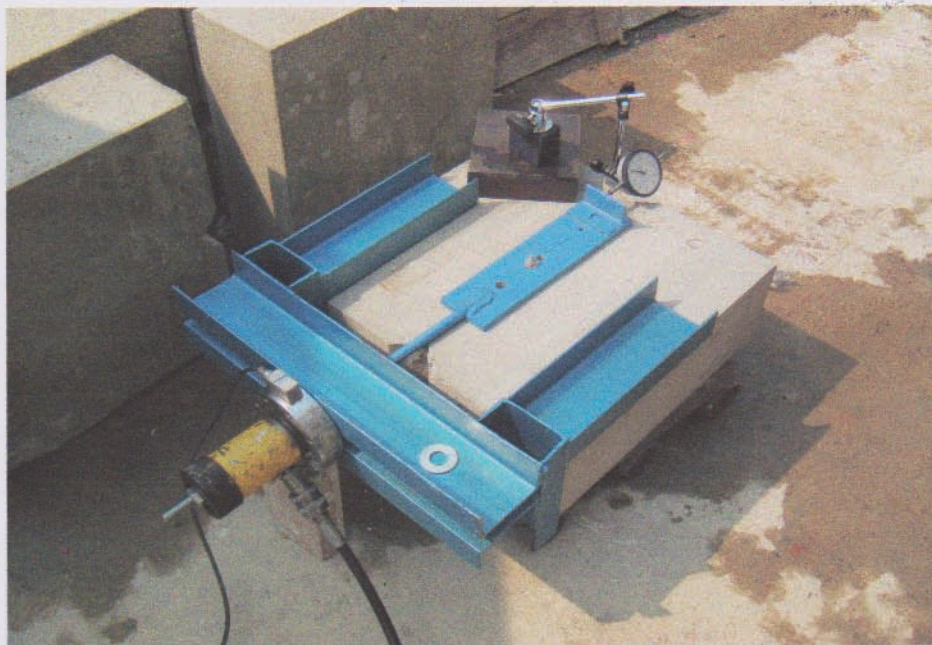
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Test Configuration



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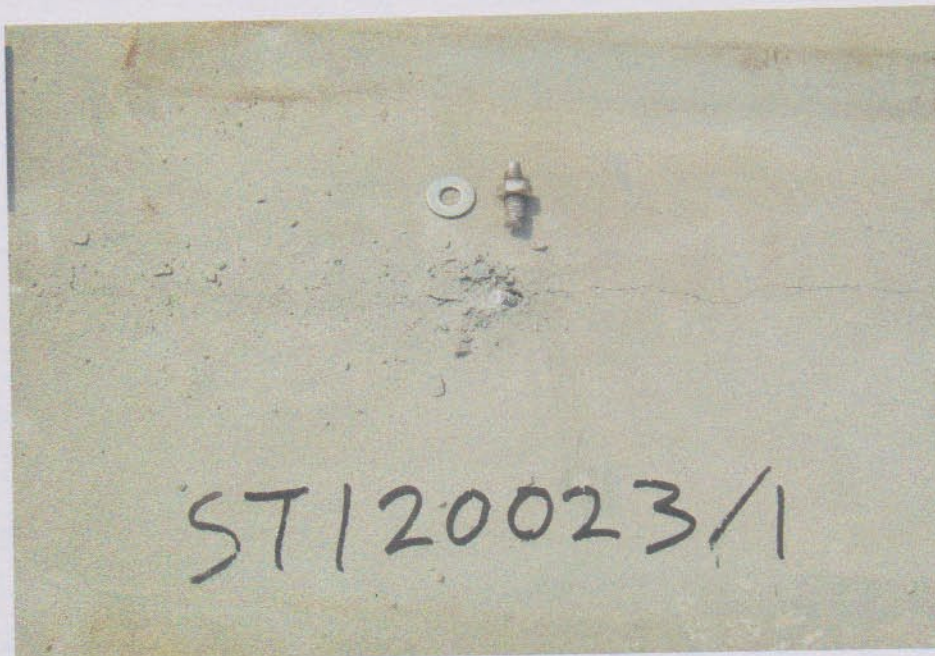
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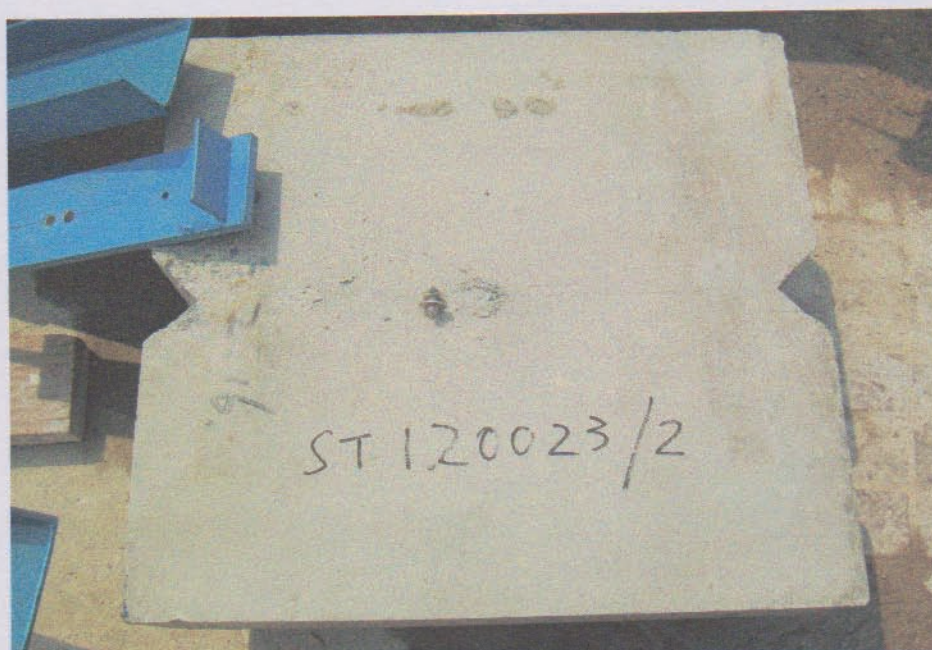
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After Test  
Sample I.D. : ST120023/1



After Test  
Sample I.D. : ST120023/2



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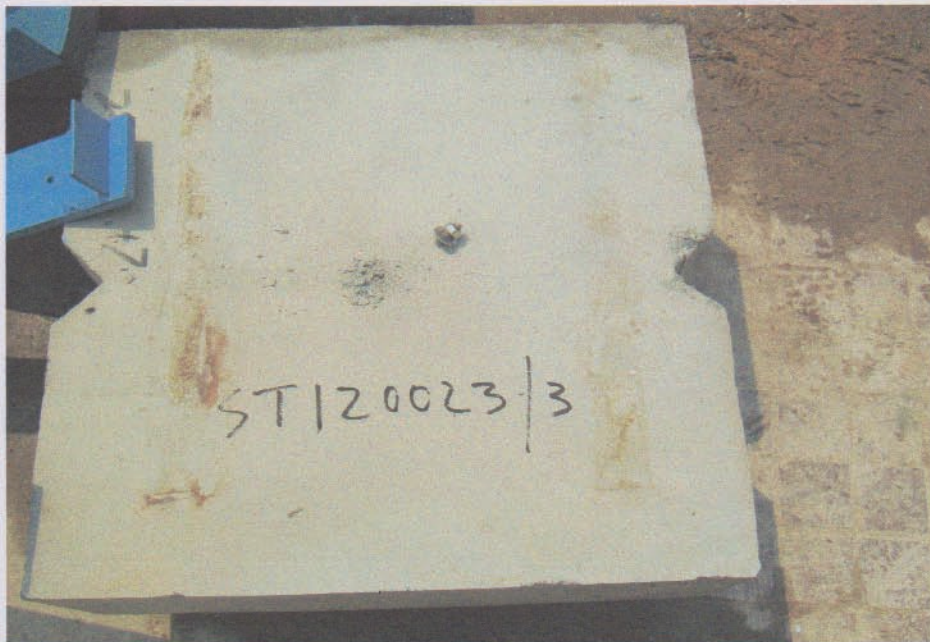
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After Test  
Sample I.D. : ST120023/3



After Test  
Sample I.D. : ST120023/4



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After Test  
Sample I.D. : ST120023/5



After Test  
Sample I.D. : ST120023/6



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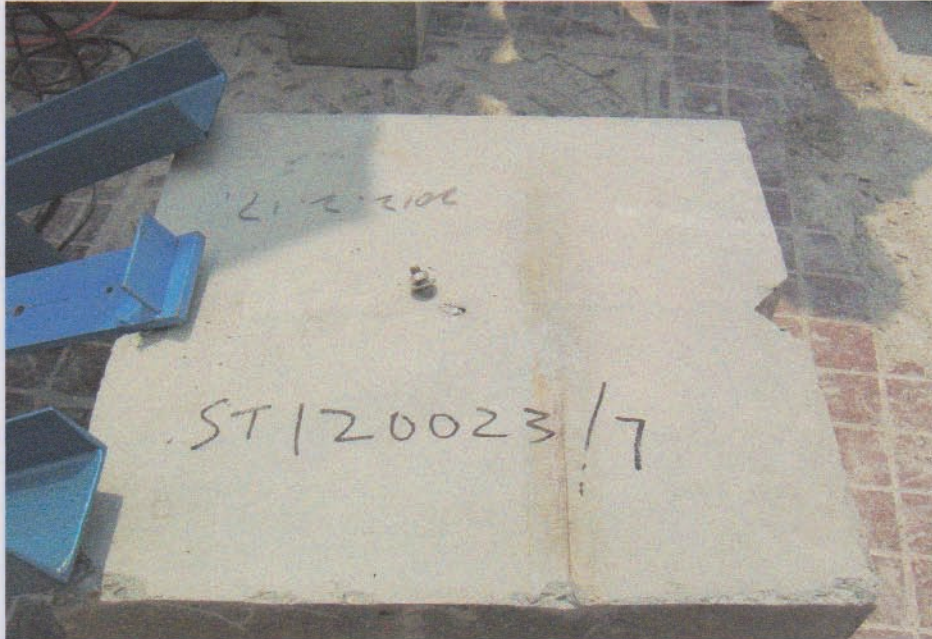
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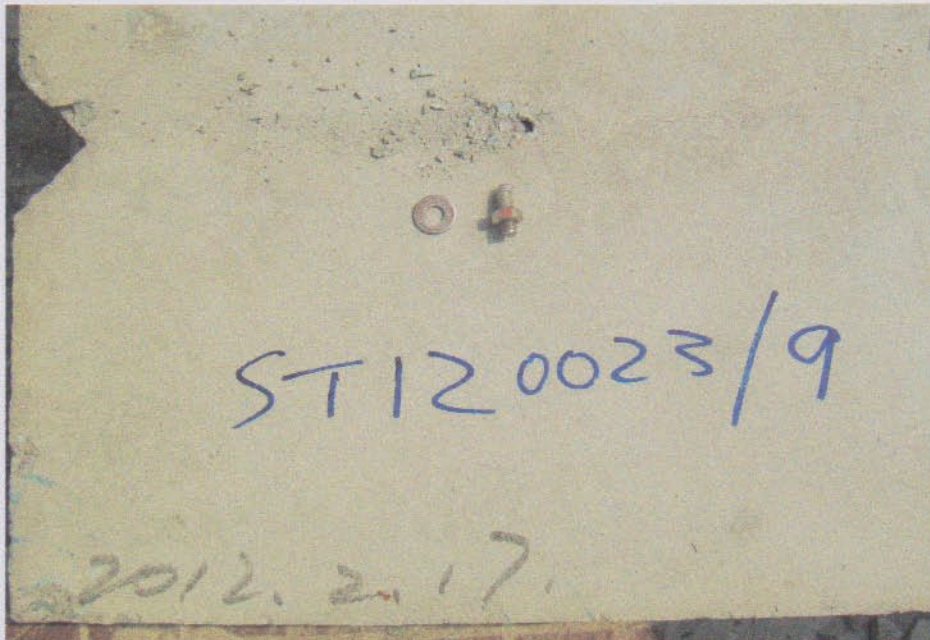
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After Test  
Sample I.D. : ST120023/7



After Test  
Sample I.D. : ST120023/9



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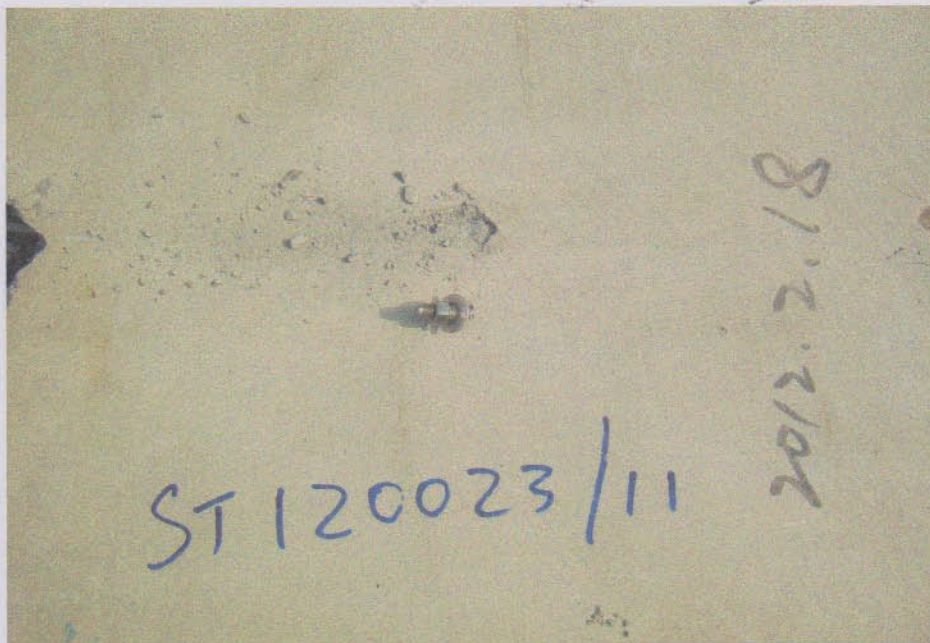
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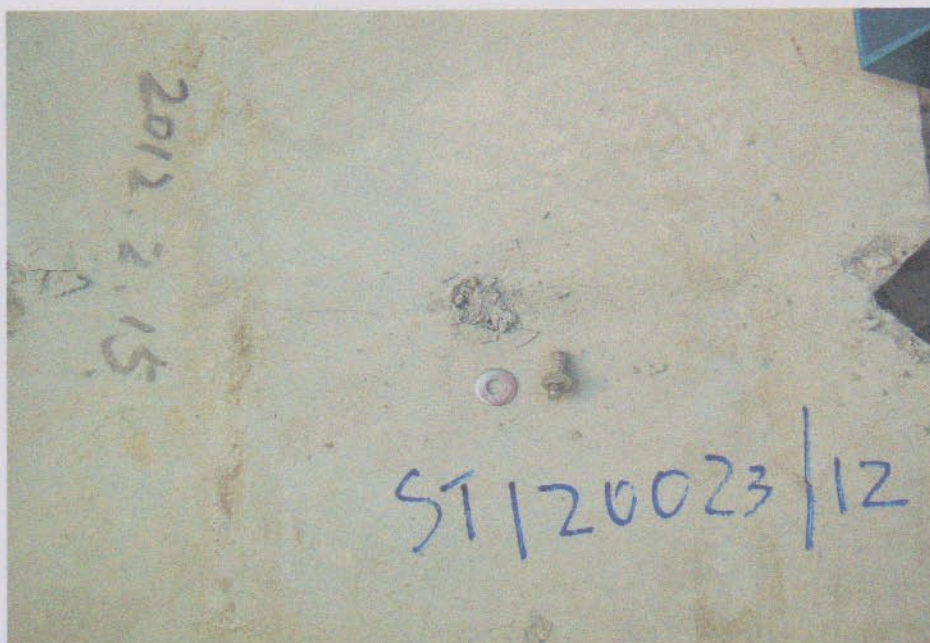
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After Test  
Sample I.D. : ST120023/11



After Test  
Sample I.D. : ST120023/12

**\*\* End of Report \*\***