FUGRO TECHNICAL SERVICES LIMITED
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MateriaLab

Client Ref. : --
Report No. : 113700ST110717(1)

REPORT ON PULL OUT STRENGTH TEST OF E8, E10 AND E12 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

Sample Description

Information Supplied by Client

Client	:	Sunway Metal Manufactory Limited
Project	:	Pull Out Strength Test of Anchor Bolt C30 Concrete
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	: 30 N/mm²

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) : 306 kgf/cm²

Laboratory Information

Location of Test	:	Product Testing Laboratory of MateriaLab
Lab. Sample I.D.	:	ST110717/15-28
Date Received	:	16 November 2011
Date Specimens Fixed	:	11 December 2011
Date Tested	:	13 January2012
Span of Support	:	240 mm
Test Method	:	BS 5080 : Part 1 : 1993 and In accordance with our in-house method STMS-2991 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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Test Method

METHOD STATEMENT FOR PULL OUT STRENGTH OF AN ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

(In-house method which referes 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/cm² 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 up vertically by a hydraulic jack with using a coupler in according to BS 5080 : Part 1 : 1993.

9. All recorded test force and displacement shall be reported.

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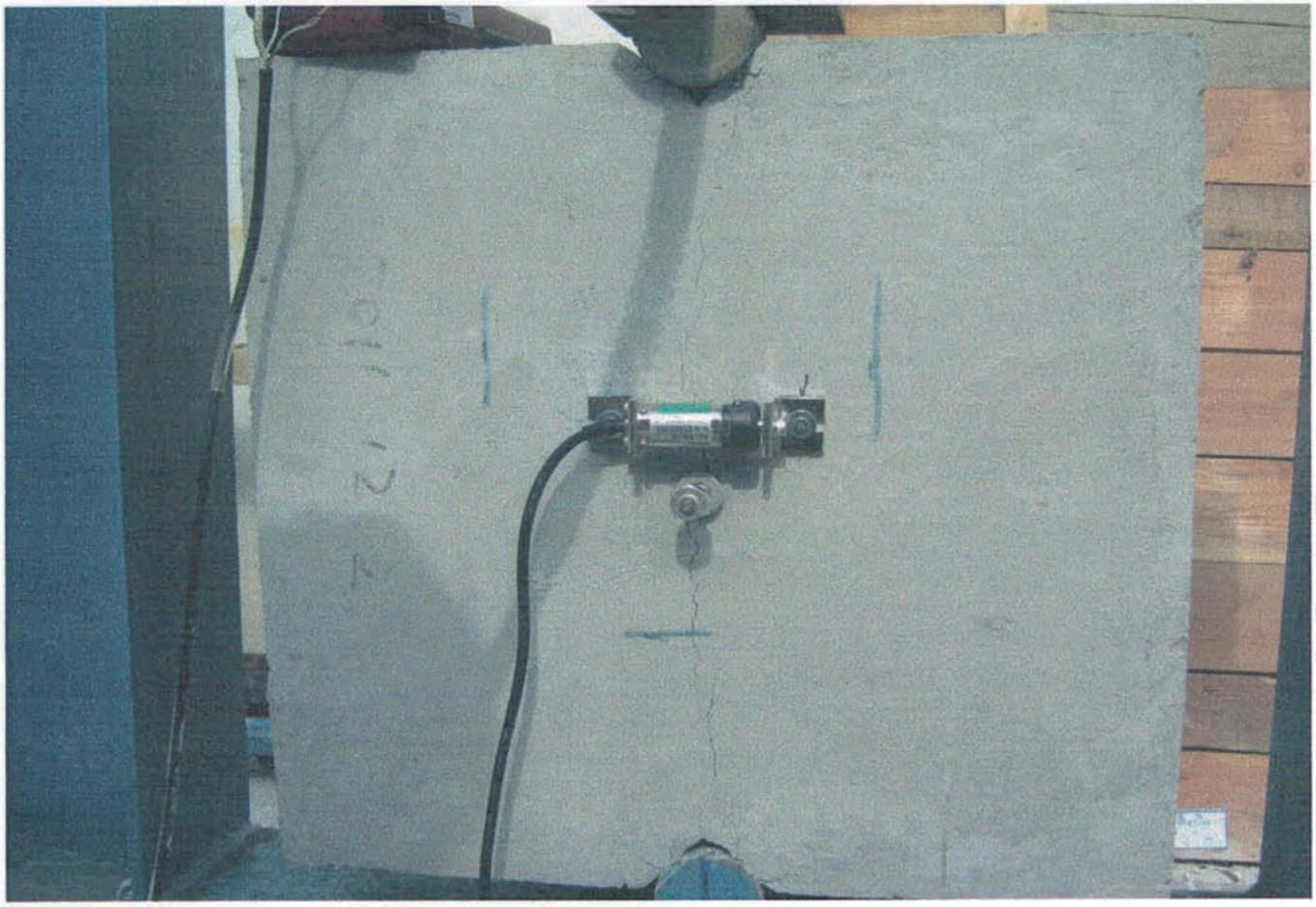
Test Method



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

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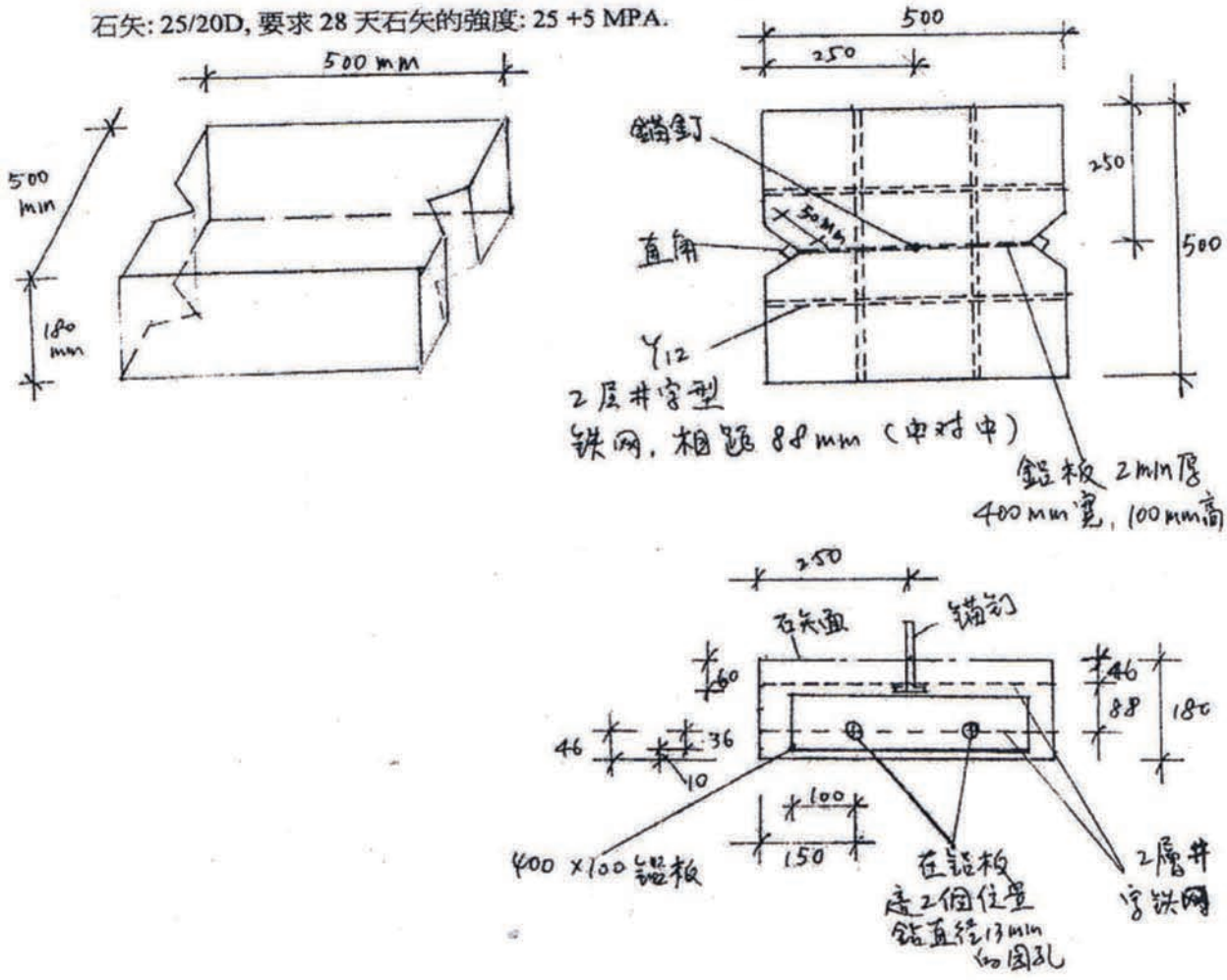
Test Method



Sketch 1 : The specified concrete structure

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REPORT ON PULL OUT STRENGTH TEST OF E8, E10 AND E12 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

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

Lab. Sample I.D.	Applied Force at Initial Relative Movement of 0.2 mm (kN)	Force Interval (kN) / Displacement (mm)							Ultimate Force (max.) (kN)
		3 kN	6 kN	9 kN	12 kN	15 kN	18 kN	21 kN	
ST110717/15	4.90	0.06	0.65	1.50	2.58	4.77	--	--	16.50
ST110717/17	0.21	0.35	0.58	1.23	2.51	--	--	--	13.00
ST110717/18	0.13	1.81	2.72	3.82	6.62	--	--	--	14.50
ST110717/20	0.35	0.73	1.02	9.41	16.64	--	--	--	13.10
ST110717/21	0.33	1.41	1.39	2.83	3.61	--	--	--	14.00
ST110717/22	1.55	1.33	2.60	5.48	8.17	--	--	--	13.07
ST110717/23	2.71	0.30	0.53	0.89	2.63	--	--	--	13.08
ST110717/24	0.77	0.66	0.92	1.99	3.09	--	--	--	12.44
ST110717/25	0.53	1.09	1.72	2.44	3.45	7.08	--	--	16.77
ST110717/27	1.00	0.38	0.67	1.23	2.21	3.29	--	--	16.04
Mean	**1.25**	--	--	--	--	--	--	--	**14.25**
Standard Deviation	**1.50**	--	--	--	--	--	--	--	**1.62**

Remarks : 1.) The test results relate only to the samples tested.
2.) The test configuration is shown in the photographs on page 6 of this report.

Checked by : Egor Date : 16/2/2012 Certified by : Date : 16.2.2012.
Chan Chun Wai Ivan
Manager (Product Testing Laboratory)

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Client Ref. : --
Report No. : 113700ST110717(1)

Testing Configuration in Cracking
Sample I.D. : ST110717/15-28

Testing Configuration in Tensile
Sample I.D. : ST110717/15-28

** End of Report **

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MateriaLab

Client Ref. : --
Report No : 124675ST130008(3)

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

Sample Description

Information Supplied by Client

Client	:	Sunway Metal Manufactory Limited
Project	:	Tensile 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/mm²

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/cm²

Laboratory Information

Location of Test	:	Product Testing Laboratory of MateriaLab
Lab. Sample I.D.	:	ST130008/8-9, 14 & 41-42
Date Received	:	03 January 2013
Date Specimens Fixed	:	25 March 2013
Date Tested	:	22 April 2013
Span of Reaction Support	:	240 mm
Test Method	:	BS 5080 : Part 1 : 1993 and In accordance with our in-house method STMS-2991 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 TENSILE STRENGTH TEST OF E8 ANCHOR BOLT EMBEDDED IN CRACKED CONCRETE

Test Method (STMS-2991)

METHOD STATEMENT FOR TENSILE 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^2 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 verticaally by a hydraulic jack with using a coupler in according to BS 5080 : Part 1 : 1993.

9. All recorded test force and displacement shall be reported.

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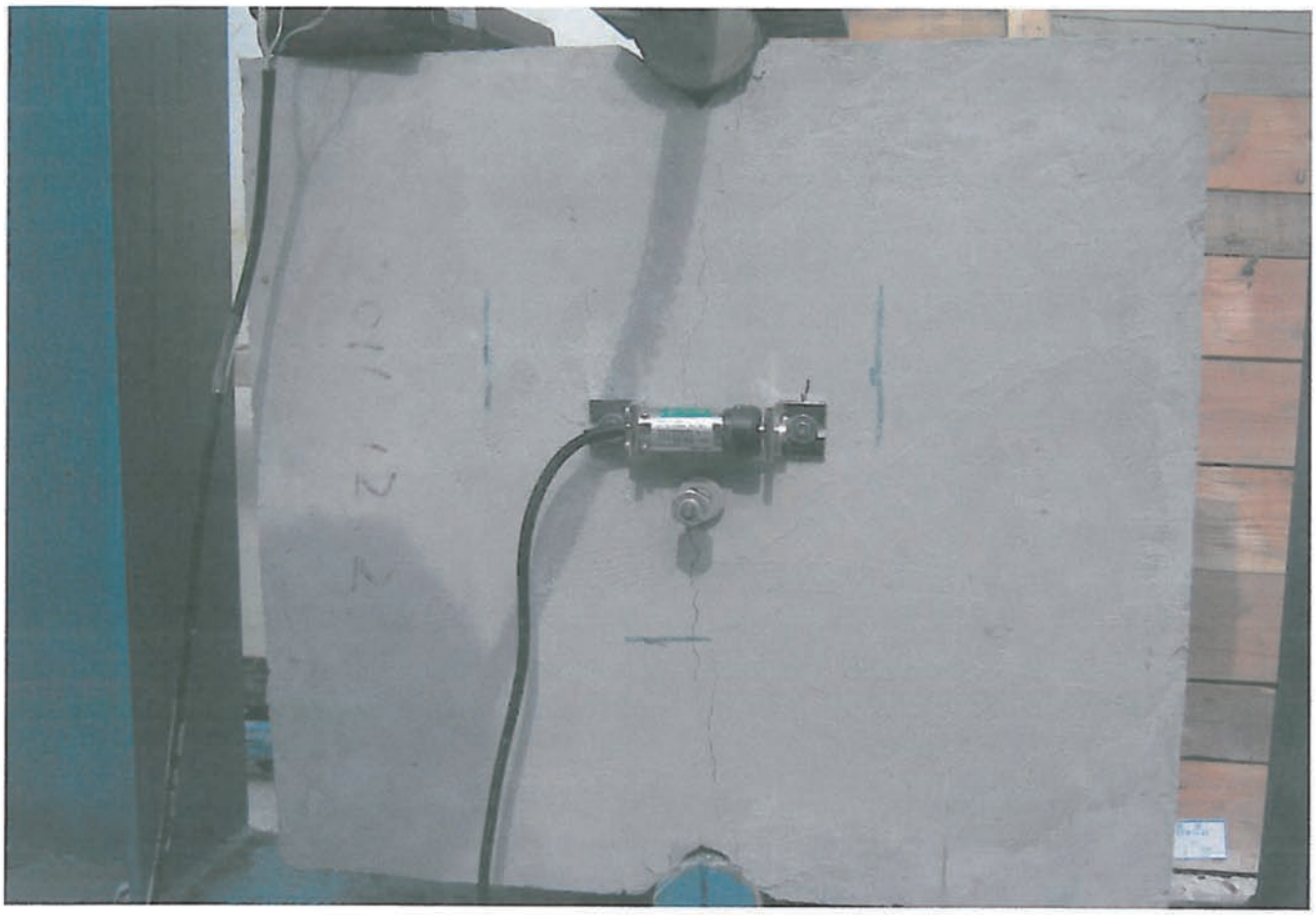
Test Method



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

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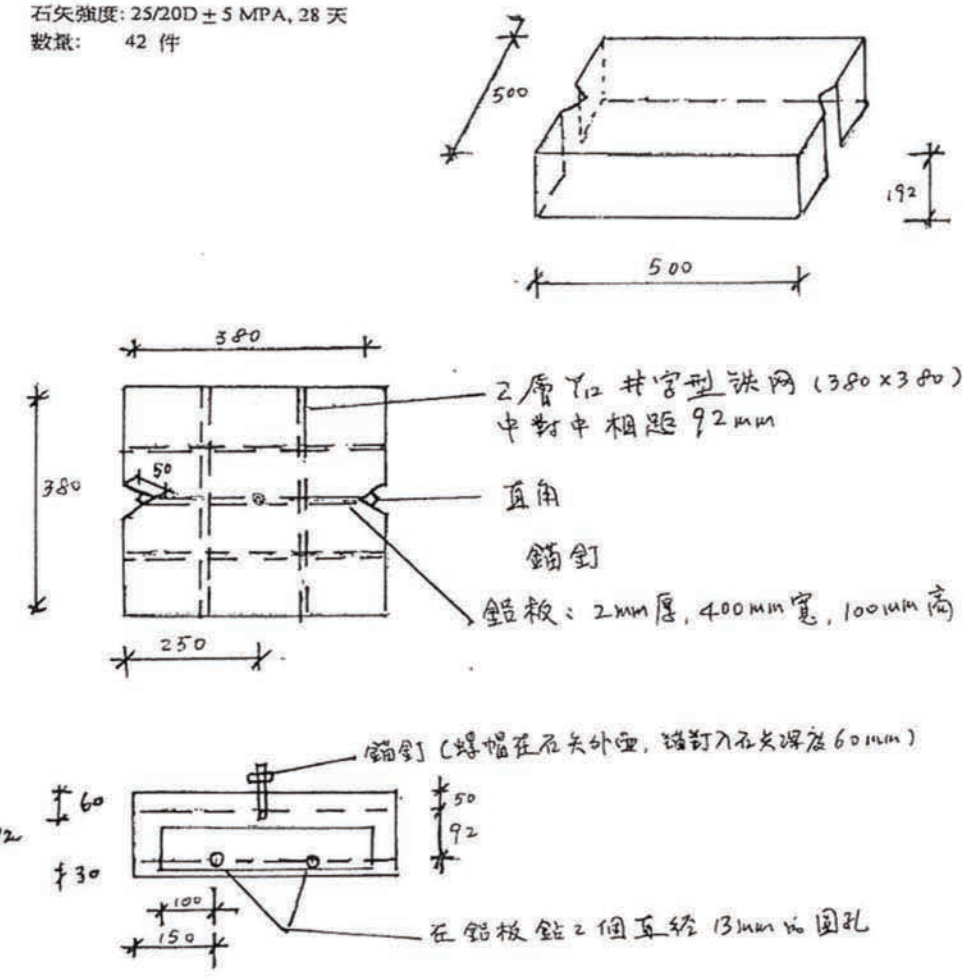
Test Method



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

Lab. Sample I.D.	Applied Force at Initial Relative Movement of 0.2mm (kN)	Force Interval (kN) / Displacement (mm)								Ultimate Force (max.) (kN)
		3 kN	6 kN	9 kN	12 kN	15 kN	18 kN	21 kN	24 kN	
ST130008/8	5.44	0	0.312	1.136	2.532	--	--	--	--	12.07
ST130008/9	6.39	0	0.148	0.981	2.164	--	--	--	--	12.16
ST130008/14	3.75	0.990	0.360	4.520	--	--	--	--	--	10.98
ST130008/41	4.14	0.480	0.870	3.200	--	--	--	--	--	11.04
ST130008/42	2.77	0.290	1.140	2.120	--	--	--	--	--	10.93
Mean	--	--	--	--	--	--	--	--	--	**11.44**
Standard Deviation	--	--	--	--	--	--	--	--	--	**0.62**

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

Checked by : _____ Date : 28/5/2013 Certified by : _____ Date : 28.5.2013

Chan Chun Wai Ivan
Manager (Product Testing Laboratory)

** End of Report **