

Hilti Cast-in Socket - HCS

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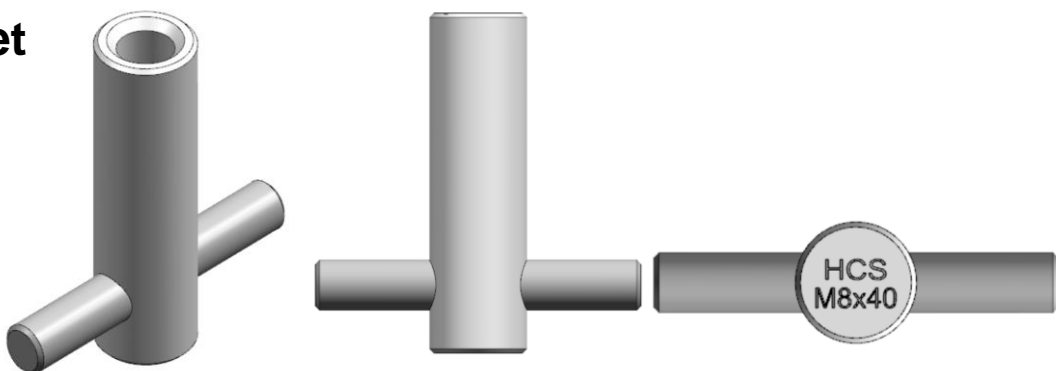
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Cast-in Socket HCS



Base materials

- Concrete

Application

- Façade fixing : Louver, GRC & Cladding works
- Precast panel support fixing
- Cooking bench fixing

Advantages

- Simple to locate on formwork accurately
- Shallow embedment depth required
- No stress impose on the concrete during pouring
- Clear marking for inspection

Technical data of HCS

Head configuration	Inner thread
Type of fastening	Cast-in anchor point
HCS – Material Composition	Carbon steel
HCS – Material, Corrosion	Zinc plating 5µ
HCS-R – Material Composition	Steel, A4 (SS316)

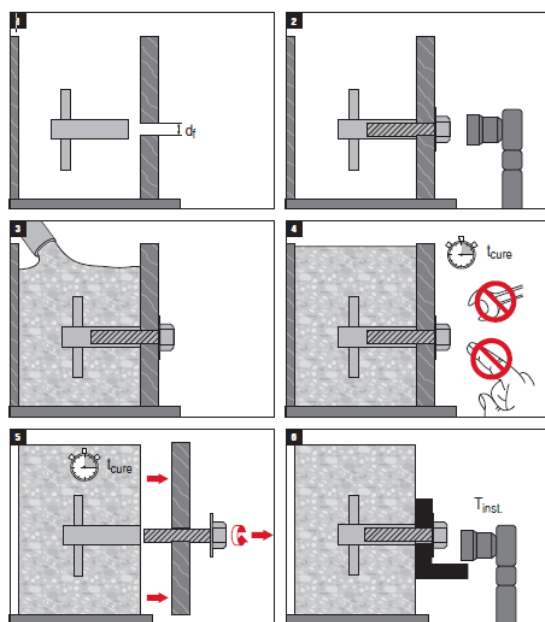
Technical data

Recommended load (kN), non-cracked concrete at 25 N/mm², safety factor (γ)=3

Model	Load Type	M8	M10	M12	M16
HCS (8.8)	Tensile Load, N _{rec}	3.0	4.2	5.8	6.9
	Shear Load, V _{rec}	4.3	7.1	9.7	12.3
HCS-R (A4-70)	Tensile Load, N _{rec}	3.0	4.2	5.8	6.9
	Shear Load, V _{rec}	4.3	6.8	9.9	13.7

Remarks:

- All the data applies to no edge distance, spacing and other influences
- The loading performance varies depends on the steel grade of the screw or rod.
- The bracket after HCS naming states the data for the steel grade of the screw or rod used.
- For detail design method please refer to Fastening Technology Manual

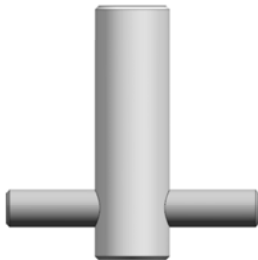


These are abbreviated instructions which may vary according to the application.

Ordering designation	Overall Anchor length	Outside Diameter	Allowable Screwing Depth	Effective Anchorage Depth	Max. tightening torque	Clearance hole	Sales pack quantity	Item number
HCS M8x40	40 mm	12 mm	10 / 21 mm	29 mm	8 Nm	9 mm	100 pc	2123086
HCS M10x50	50 mm	16 mm	12 / 23 mm	36 mm	15 Nm	12 mm	50 pc	2123087
HCS M12x60	60 mm	19 mm	14 / 26 mm	45 mm	25 Nm	14 mm	50 pc	2123088
HCS M16x70	70 mm	22 mm	19 / 33 mm	50 mm	50 Nm	18 mm	25 pc	2123089
HCS-R M8x40	40 mm	12 mm	10 / 21 mm	29 mm	8 Nm	9 mm	100 pc	2123350
HCS-R M10x50	50 mm	16 mm	12 / 23 mm	36 mm	15 Nm	12 mm	50 pc	2123351
HCS-R M12x60	60 mm	19 mm	14 / 26 mm	45 mm	25 Nm	14 mm	50 pc	2123352
HCS-R M16x70	70 mm	22 mm	19 / 33 mm	50 mm	50 Nm	18 mm	25 pc	2123353

HCS Cast-in socket

Anchor version	Benefits
HCS Carbon steel	- simple & well proven design
HCS-R stainless steel	- easy installation to formwork
	- for use with bolts or threaded rods
	- available in 5µm galvanised or stainless steel A4 to suit environmental conditions
	- HCS-R with head markings for easy identification



Concrete



Corrosion resistance

Basic loading data (for a single anchor)

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete as specified in the table
- Steel failure
- Minimum base material thickness
- Concrete C 20/25, $f_{t,c,base} = 25 \text{ N/mm}^2$
- screw or rod with steel grade 8.8 (carbon steel) and/or A4-70 (stainless steel)
- For the loading data of screw or rod with steel grade 4.6 (carbon steel) and/or A4-50 (stainless steel), please refer to the simplified design method.

For details see Simplified design method

Mean Ultimate Resistance

Anchor Size	M8x40	M10x50	M12x60	M16x70
Tensile $N_{Rt,um}$				
HCS (8.8)	12.1	16.7	23.4	27.4
HCS-R (A4-70)	12.1	16.7	23.4	27.4
Shear $V_{Rt,um}$				
HCS (8.8)	14.2	24.4	31.9	40.4
HCS-R (A4-70)	13.5	21.3	31.0	54.5

Characteristic Resistance

Anchor Size	M8x40	M10x50	M12x60	M16x70
Tensile N_{Rk}				
HCS (8.8)	9.1	12.6	17.5	20.6
HCS-R (A4-70)	9.1	12.6	17.5	20.6
Shear V_{Rk}				
HCS (8.8)	13.0	21.4	29.1	36.9
HCS-R (A4-70)	12.8	20.4	29.6	41.1

Design Resistance

Anchor Size	M8x40	M10x50	M12x60	M16x70
Tensile N_{Rd}				
HCS (8.8)	6.1	8.4	11.7	13.7
HCS-R (A4-70)	6.1	8.4	11.7	13.7
Shear V_{Rd}				
HCS (8.8)	8.6	14.3	19.4	24.6
HCS-R (A4-70)	8.5	13.6	19.7	27.4

Recommended loads a)

Anchor Size	M8x40	M10x50	M12x60	M16x70
Tensile $N_{R,ec}$				
HCS (8.8)	3.0	4.2	5.8	6.9
HCS-R (A4-70)	3.0	4.2	5.8	6.9
Shear $V_{R,ec}$				
HCS (8.8)	4.3	7.1	9.7	12.3
HCS-R (A4-70)	4.3	6.8	9.9	13.7

a) With overall partial safety factor for action $\gamma = 3$. The partial safety factor for action depend on the type of loading and shall be taken from national regulations.

b) The loading performance varies depends on the steel grade of the screw or rod. For example, HCS (8.8) states the data for the use of Hilti HCS with steel grade 8.8 screw or rod only.

Material properties of HCS

Anchor Size	M8x40	M10x50	M12x60	M16x70
Nominal tensile strength f_{tk} [N/mm ²]				
Anchor body	HCS	430		
Anchor pin	HCS	430		
Anchor body	HCS-R	580		
Anchor pin	HCS-R	580		
Stressed cross-section A_s [mm ²]				
Hexagon Bolt	36.6	58	84.3	157

7 / 2015

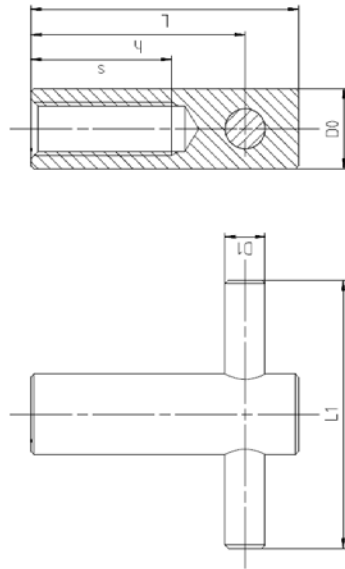
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Material quality

Part	Material
Anchor body	Steel Fe/Zn5 galvanized to min. 5µm
Anchor pin	Steel Fe/Zn5 galvanized to min. 5µm
Anchor body	Stainless Steel A4
Anchor body	Stainless Steel A4



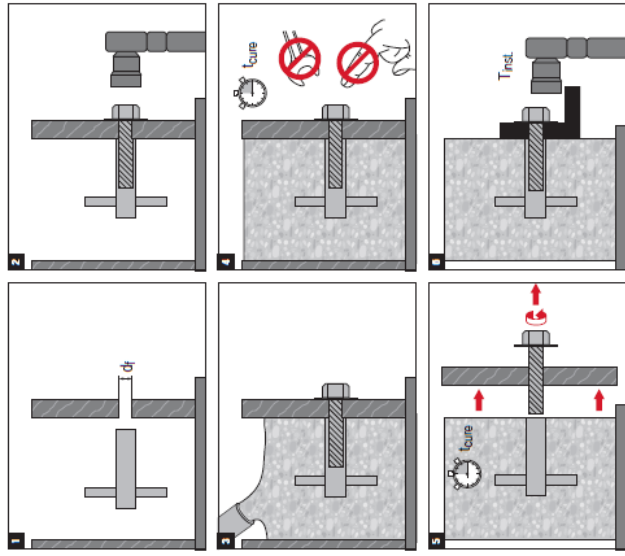
Anchor dimensions

Anchor Size	M8x40	M10x50	M12x60	M16x70
Anchor body diameter	12	16	18	22
Anchor Length	40	50	60	70
Anchor pin diameter	6	8	8	12
Anchor pin position from top	32	40	50	56
Allowable Screwing Depth	10	12	14	19
Anchor pin length	21	23	26	33
Maximum torque moment	40	50	60	90
	8	15	25	50

Base material thickness, anchor spacing and edge distance

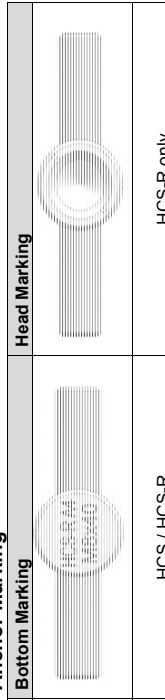
Anchor Size	M8x40	M10x50	M12x60	M16x70
Nominal embedment depth	40	50	60	70
Effective anchorage depth	29	36	45	50
Min. base material thickness	100	100	100	100
Minimum spacing	58	72	90	100
Minimum edge distance	44	54	68	75
Critical spacing	3 h _{ef}			
Critical edge distance	1.5 h _{ef}			

Setting instruction



For detailed information on installation see instruction for use given with the package of the product.

Anchor Marking



Simplified design method

Simplified version of the design method according ETAG 001, Annex C.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors.

The design method is based on the following simplification:

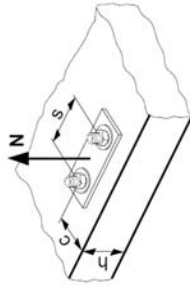
- No different loads are acting on individual anchors (no eccentricity)

The values are valid for one anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Concrete pull-out resistance: $N_{Rd,p} = N^0_{Rd,p} \cdot f_b$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):
 $N_{Rd,sp} = N^0_{Rd,c} \cdot f_b \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$



Basic design tensile resistance

Anchor size	$\gamma_{Ms} \geq 1.5$				
	M8	M10	M12	M16	M16
HCS (4.6)	7,3	11,6	16,9	31,4	31,4
HCS (6.8)	9,3	16,6	20,5	31,9	31,9
HCS-R (A4-50)	6,4	10,2	14,8	27,5	27,5
HCS-R (A4-70)	11,0	21,1	24,7	31,3	31,3

Design pull-out resistance $N_{Rd,p} = N^0_{Rd,p} \cdot f_b$

Anchor size	M8	M10	M12	M16
$N^0_{Rd,p}$ [kN]			No pull-out failure	

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_b \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$

Design splitting resistance $N_{Rd,sp} = N^0_{Rd,c} \cdot f_b \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$

Anchor size	$\gamma_{Ms} = 1.5$		
	M8	M10	M12
$N^0_{Rd,c}$ [kN]	6,1	8,4	11,7
$N^0_{Rd,sp}$ [kN]			13,7

Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_b = (f_{ck,cube}/25N/mm^2)^{1/2}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

$c/c_{Cr,N}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$c/c_{Cr,sp}$										
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{Cr,N} \leq 1$		0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97
$f_{1,sp} = 0,7 + 0,3 \cdot c/c_{Cr,sp} \leq 1$										
$f_{2,N} = 0,5 \cdot (1 + c/c_{Cr,N}) \leq 1$		0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95
$f_{2,sp} = 0,5 \cdot (1 + c/c_{Cr,sp}) \leq 1$										

a) The edge distance shall not be smaller than the minimum edge distance c_{min} given in the table with the setting details. These influencing factors must be considered for every edge distance.

Influence of anchor spacing a)

$s/s_{Cr,N}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$s/s_{Cr,sp}$										
$f_{3,N} = 0,5 \cdot (1 + s/s_{Cr,N}) \leq 1$		0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95
$f_{3,sp} = 0,5 \cdot (1 + s/s_{Cr,sp}) \leq 1$										

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min} given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

Influence of base material thickness

h/h_{gr}	2,0	2,2	2,4	2,6	2,8	3,0	3,2	3,4	3,6	$\geq 3,68$
$f_{h,sp} = [h/(2 \cdot h_{gr})]^{2,3}$	1	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,5

Influence of reinforcement

Anchor size	M8	M10	M12	M16
$f_{re,N} = 0,5 + h_{ef}/200mm \leq 1$	0,65 ^{a)}	0,7 ^{a)}	0,75 ^{a)}	0,78 ^{a)}

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N} = 1$ may be applied.

Influence of edge distance ^{a)}

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min} .

Combined tension and shear loading

For combined tension and shear loading refer to section "Anchor Design" in Hilti Fastening Technology Manual.



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 Fax : 2695 3944 Web site : www.ets-testconsult.com



Form CFCR/07/Issue 1 (1/1) (06/06)

TEST REPORT
Tensile Load Test on Anchor Bolt

Customer : Hiti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : *
 Test Location : ETL Laboratory
 Anchor Type : HCS M8x40, Cast-in Socket
 Amb. Temperature : 20°C
 Report No. : FDA20611
 Test Date : 08-Mar-12
 Report Date : 26-Mar-12
 Page No. : 2 of 3
 Test Method : BS 5080 Part 1:1993 Cl 7.1
 Test Procedure : TPF/003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
1.0	0.00	0.00	0.00	0.00	0.00
2.0	0.02	0.01	0.00	0.01	0.01
3.0	0.03	0.02	0.00	0.02	0.01
4.0	0.04	0.06	0.01	0.03	0.02
5.0	0.04	0.09	0.02	0.04	0.03
6.0	0.05	0.10	0.03	0.06	0.03
7.0	0.06	0.14	0.04	0.07	0.05
8.0	0.08	0.16	0.05	0.08	0.07
9.0	0.09	0.18	0.07	0.11	0.08
10.0	0.13	0.21	0.09	0.12	0.09
11.0	0.17	0.24	0.10	0.15	0.12
12.0	0.20	0.27	0.16	0.20	0.13
13.0	0.22	0.30	0.20	0.20	0.14
14.0	0.25	0.33	0.24	0.22	0.19
15.0	0.27	0.34	0.28	0.25	0.26
16.0	0.31	0.39	0.33	0.27	0.29
17.0	0.35	0.41	0.37	0.30	0.31
18.0	0.45	0.44	0.41	0.32	0.33
19.0	0.54	0.47	0.47	0.34	0.38
20.0	0.59	0.49	0.54	0.38	0.42
21.0	0.62	0.60	0.65	0.45	0.52
22.0	-	-	-	0.55	-
23.0	-	-	-	-	-
Failure Load (kN)	21.8	21.7	22.0	22.3	21.8
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	21.9				
Standard Deviation (kN)	0.2				

A) Test Apparatus : Load Cell : Compression Load Cell C3000, 50kN (ET/9500201)
 Hydraulic Cylinder : Hydraulic Cylinder RCH 151 (ET/60374)
 Hydraulic Cylinder : Hydraulic Cylinder RCH 151 (ET/60374)
 Digital Dial Gauge : Mitutoyo Digital Indicator (ET/61525)
 30 ± 3 MPa
 29-Feb-12
 P = No sign of failure in anchor and/or structural member
 F1 = Failure of anchor or its accessories
 F2 = Failure in structural member
 F3 = Failure of structural member in a shear cone
 F4 = Failure in structural member with crack radiates outward from anchor
 F5 = Failure by continuous displacement or decreasing load
 F6 = Failure in structural member with crack radiates outward from anchor
 F7 = Other failure modes) Anchor Breaking

B) Concrete Grade :
 C) Anchor installed date :
 D) Failure Modes :
 E) Distance between reaction frame and centre of the fixing (mm) : 150
 F) Distance between the centre of fixing and free edge (mm) : 150
 G) Socket Length (mm) : 30

Tested By : YU, Shui Ming / CHAN, Ka Wai
 Approved Signatory : MONG, Seng Ming

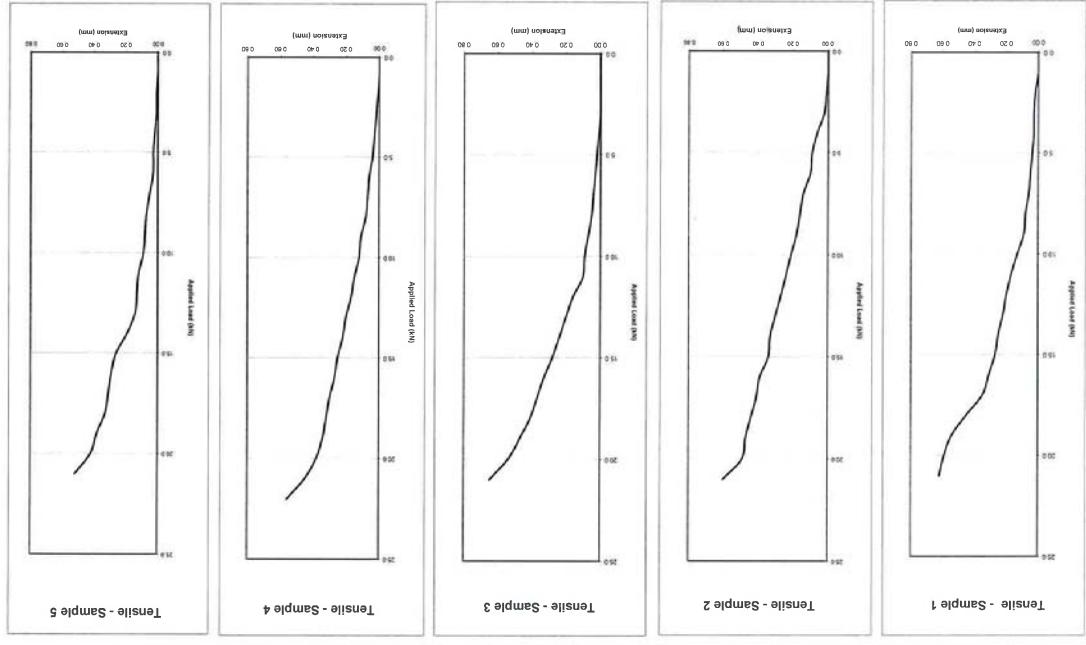
Checked By : PANG, Ting Pong / LIN, Meng Yang
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 ETS-TESTCONSULT LIMITED

Report No: FDA20611

HCS M8x40, Cast-in Socket



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 -END OF REPORT-

Report Issued Date: 26-Mar-12



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Form CFB082/Issue 1 (1/1) (10/10)

TEST REPORT

Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hilli (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : -
 Test Location : ETL Laboratory
 Anchor Type : HCS M8x40, Cast-in Socket
 Amb.Temperature : 20°C

Lab Information

Report No : FDA20614
 Test Date : 08-Mar-12
 Report Date : 26-Mar-12
 Page No : 2 of 3
 Test Method : BS 5080 Part 2:1986 Cl 7.2

Load (kN)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
2.0	0.00	0.05	0.06	0.05	0.09
4.0	0.04	0.19	0.11	0.08	0.14
6.0	0.09	0.27	0.16	0.13	0.18
8.0	0.18	0.38	0.22	0.19	0.21
10.0	0.27	0.47	0.29	0.24	0.28
12.0	0.36	0.59	0.43	0.36	0.40
14.0	0.66	0.69	0.62	0.48	0.59
16.0	0.85	0.80	0.80	0.78	0.78
18.0	1.29	1.31	1.32	1.10	1.07
20.0	-	-	-	-	-
22.0	-	-	-	-	-
Failure Load (kN)	18.0	19.5	19.8	19.6	18.4
Failure Mode	F7	F7	F7	F7	F7
Average Failure Load (kN)	19.5				
Standard Deviation (kN)	0.3				

A) Test Apparatus
 Load Cell : Comp. Load cell Thames, 50 kN (ET93071101)
 Load Cell Indicator : (ET19222102)
 Cylinder: Hydraulic Cylinder RCH 252 (ET993413)
 Digital Dial Gauge : Mitutoyo Digital Indicator (ET143019)
 30 ± 3 MPa

B) Concrete Grade : 25-Feb-2012

C) Anchor installed date : 25-Feb-2012

D) Failure Modes
 P = No sign of failure in anchor and/or structural member
 F2 = Failure in structural member
 F4 = Failure of structural member in a shear cone
 F6 = Failure in structural member with crack, radially outward from anchor
 F7 = Other failure mode(s) : Anchor Breaking

E) Distance between reaction frame and centre of the fixing (mm)
 300

F) Distance between the centre of fixing and free edge (mm)
 150

G) Socket Length (mm)
 40

F1 = Failure of anchor or its accessories
 F3 = Pull out of anchor
 F5 = Failure by continuous displacement or decreasing load

Tested By : CHOI, Chung Lung / CHAN, Hon Kwan
 Checked By : PANG, Ting Pong/LIN, Meng Yang
 Approved Signatory: MONG, Seng Ming

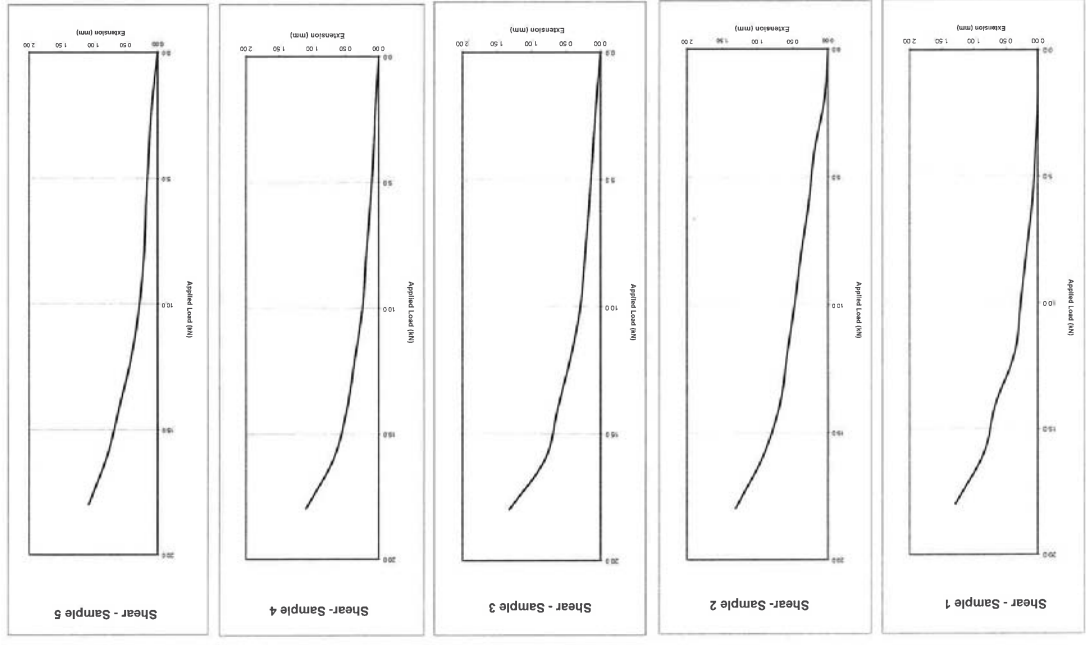
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東業德勤测试顾问有限公司
 ETS-TESTCONSULT LIMITED

Report No: FDA20614

HCS M8x40, Cast-in Socket





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Form C/PDR/77/Issue 1 (1/1) (06/06)

TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hiti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project :
 Test Location : ETL Laboratory
 Anchor Type : HCS M10x50, Cast-in Socket
 Amb. Temperature : 20°C
 Report No. : FDA20613
 Test Date : 09-Mar-12
 Report Date : 26-Mar-12
 Page No. : 2 of 3
 Test Method : BS 5080 Part 1:1983 cl7.1
 Test Procedure : TPF/003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
1.5	0.00	0.00	0.00	0.00	0.00
3.0	0.00	0.00	0.00	0.00	0.00
4.5	0.00	0.01	0.00	0.01	0.01
6.0	0.01	0.04	0.02	0.02	0.03
7.5	0.04	0.07	0.03	0.03	0.05
9.0	0.05	0.10	0.06	0.07	0.08
10.5	0.09	0.13	0.08	0.10	0.11
12.0	0.10	0.15	0.10	0.13	0.14
13.5	0.13	0.19	0.12	0.15	0.17
15.0	0.16	0.23	0.15	0.19	0.21
16.5	0.19	0.26	0.19	0.22	0.24
18.0	0.22	0.30	0.21	0.24	0.25
19.5	0.24	0.34	0.25	0.29	0.33
21.0	0.26	0.37	0.28	0.33	0.38
22.5	0.28	0.41	0.31	0.37	0.40
24.0	0.30	0.44	0.36	0.43	0.44
25.5	0.33	0.49	0.39	0.48	0.52
27.0	0.35	0.54	0.52	0.60	0.61
28.5	0.38	0.65	0.62	0.74	0.61
30.0	*	*	*	*	*
31.5	*	*	*	*	*
Failure Load (kN)	29.3	29.1	29.1	28.9	29.5
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	29.2				
Standard Deviation (kN)	0.2				

A) Test Apparatus
 Load Cell : Comp Load Cell YZC-219, 100kN (ET/9300/0001)
 Load Cell Indicator : (ET/9300/16/02) SN : 50603015
 Cylinder : Hydraulic Cylinder RCH 121 (ET/902/14)
 Digital Dial Gauge : Mitutoyo Digital Indicator (ET/915/35) SN : 2372
 30.4, 3 MPa
 29-Feb-12
 P = No sign of failure in anchor and/or structural member
 F1 = Failure of anchor or its accessories
 F2 = Pull out of anchor
 F3 = Failure of structural member
 F4 = Failure of structural member in a shear cone
 F5 = Failure in structural member with crack radiates outward from anchor
 F7 = Other failure mode(s) - Anchor Breaking

B) Concrete Grade : 30.4, 3 MPa
 C) Anchor installed date : 29-Feb-12
 D) Failure Modes :
 E) Distance between reaction frame and centre of the fixing (mm) : 175
 F) Distance between the centre of fixing and free edge (mm) : 175
 G) Socket Length (mm) : 40

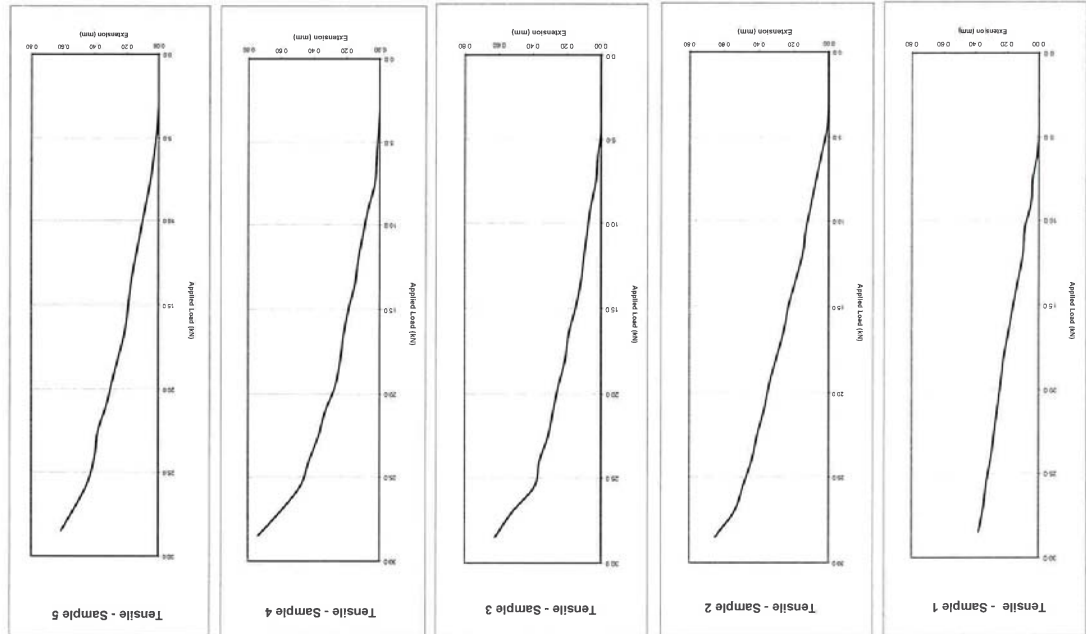
Tested By : YU, Shui Ming / CHAN, Ka Wai
 Checked By : PANG, Ting Pong / LIN, Meng Yang
 Approved Signatory : IMKNG, Seng Ming

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東業德勤测试顾问有限公司
 ETS-TESTCONSULT LIMITED

Report No. FDA20613



HCS M10x50, Cast-in Socket



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Form CTR0603Issue 1 (1/1) (10/10)

TEST REPORT
Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hilti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre,
 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : -
 Test Location : ETL Laboratory
 Anchor Type : HCS M10x50, Cast-in Socket
 Amb. Temperature : 20°C

Lab Information

Report No. : FDA20615
 Test Date : 08-Mar-12
 Report Date : 26-Mar-12
 Page No. : 2 of 3
 Test Method : BS 5880:Part 2:1986 Cl 7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
3.0	0.03	0.03	0.02	0.04	0.05
6.0	0.13	0.07	0.06	0.16	0.12
9.0	0.33	0.13	0.09	0.22	0.14
12.0	0.54	0.20	0.20	0.29	0.29
15.0	0.78	0.28	0.39	0.32	0.38
18.0	0.99	0.50	0.52	0.41	0.47
21.0	1.18	0.64	0.87	0.46	0.53
24.0	1.39	0.90	1.07	0.50	0.61
27.0	1.52	1.03	1.20	0.85	0.95
30.0	1.95	1.32	1.65	1.20	1.47
33.0	-	-	-	-	-
36.0	-	-	-	-	-
Failure Load (kN)	31.7	32.2	31.5	32.0	31.9
Failure Mode	F7	F7	F7	F7	F7
Average Failure Load (kN)	31.9				
Standard Deviation (kN)	0.3				

A) Test Apparatus	Load Cell - Comp. Load cell Thames, 50 kN (ET793011/01) Load Cell Indicator : (ET193022/02) Cylinder - Hydraulic Cylinder ROH 202 (ET1969/13) Digital Dial Gauge - Mitutoyo Digital Indicator (ET1430/19) 30 ± 3 MPa 29-Feb-2012	S/N : 227183 S/N : - S/N : C0899C S/N : C2354						
B) Concrete Grade	F1 = Failure of anchor or its accessories F3 = Pull out of anchor F5 = Failure by continuous displacement or decreasing load							
C) Anchor installed date	P = No sign of failure in anchor and/or structural member F2 = Failure in structural member F4 = Failure of structural member in a shear cone F6 = Failure in structural member with crack radiates outward from anchor F7 = Other failure mode(s) - Anchor Breaking							
D) Failure Modes	<table border="1"> <tr><td>E) Distance between reaction frame and centre of the fixing (mm)</td><td>300</td></tr> <tr><td>F) Distance between the centre of fixing and free edge (mm)</td><td>150</td></tr> <tr><td>G) Socket Length (mm)</td><td>50</td></tr> </table>		E) Distance between reaction frame and centre of the fixing (mm)	300	F) Distance between the centre of fixing and free edge (mm)	150	G) Socket Length (mm)	50
E) Distance between reaction frame and centre of the fixing (mm)	300							
F) Distance between the centre of fixing and free edge (mm)	150							
G) Socket Length (mm)	50							

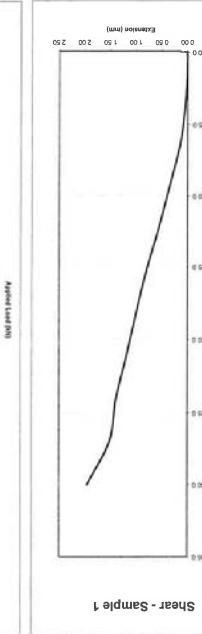
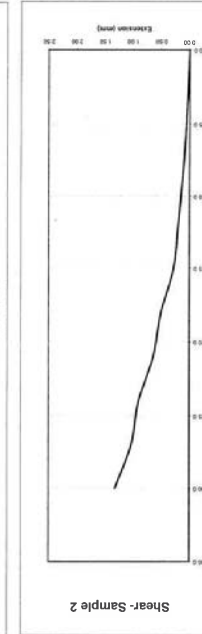
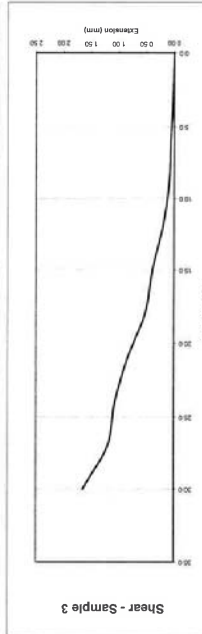
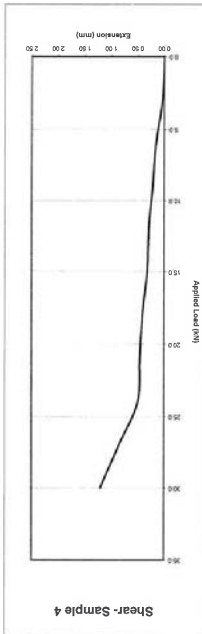
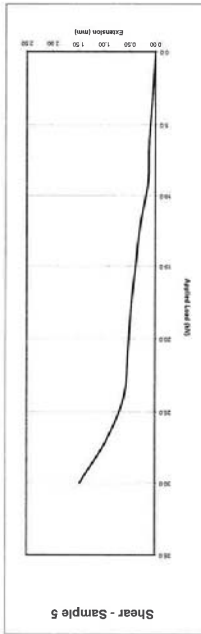
Tested By : CHOI, Chung Lung / CHAN, Hon Kwan
 Checked By : PANG, Ting Pong/LIN, Meng Yang
 Approved Signatory: MONG, Sang Ming

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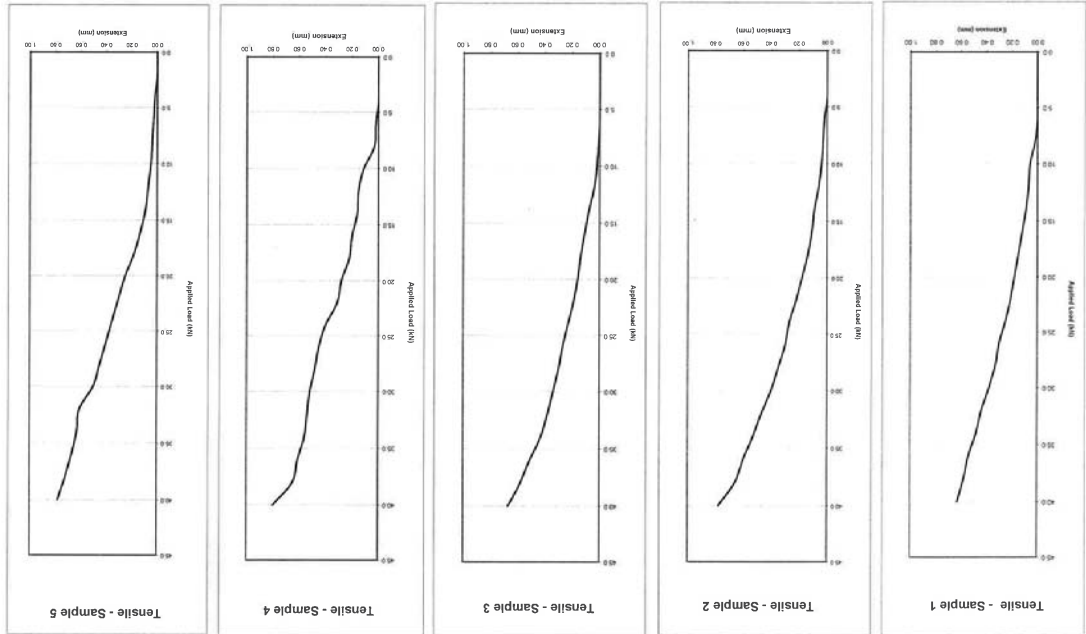


東業德勤测试顾问有限公司
 ETS-TESTCONSULT LIMITED

Report No: FDA20615



HCS M10x50, Cast-in Socket



HCS M12x60, Cast-in Socket



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E-mail : etl@ets-testconsult.com
Web site : www.ets-testconsult.com

TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
Project : *
Test Location : ETL Laboratory
Anchor Type : HCS M12x60, Cast-in Socket
Amb. Temperature : 20°C
Report No. : FDA20612
Test Date : 08-Mar-12
Report Date : 26-Mar-12
Page No. : 2 of 3
Test Method : BS 5950 Part 1:1993 Cl 7.1
Test Procedure : TPF/003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
2.0	0.00	0.00	0.00	0.00	0.00
4.0	0.00	0.00	0.00	0.00	0.00
6.0	0.00	0.00	0.00	0.00	0.00
8.0	0.02	0.03	0.01	0.03	0.04
10.0	0.06	0.04	0.02	0.11	0.05
12.0	0.07	0.06	0.04	0.15	0.07
14.0	0.09	0.09	0.08	0.16	0.09
16.0	0.12	0.11	0.11	0.20	0.13
18.0	0.15	0.14	0.14	0.22	0.18
20.0	0.18	0.18	0.16	0.26	0.25
22.0	0.21	0.22	0.19	0.31	0.30
24.0	0.25	0.27	0.23	0.40	0.35
26.0	0.30	0.30	0.27	0.45	0.40
28.0	0.33	0.35	0.30	0.48	0.45
30.0	0.38	0.40	0.34	0.52	0.50
32.0	0.44	0.47	0.38	0.54	0.61
34.0	0.46	0.53	0.43	0.56	0.63
36.0	0.54	0.60	0.51	0.61	0.67
38.0	0.58	0.66	0.58	0.65	0.72
40.0	0.63	0.78	0.67	0.80	0.78
42.0	-	-	-	-	-
44.0	-	-	-	-	-
Failure Load (kN)	F4	F4	F4	F4	F4
Average Failure Load (kN)	41.5	40.9	41.1	41.3	41.0
Standard Deviation (kN)	F4	F4	F4	F4	F4
			41.2		
			0.2		

A) Test Apparatus
Load Cell : Compression Load Cell C3000, 50kN (E179300201)
Load Cell Indicator : XT1500/232 (E179301202)
Cylinder : Hydraulic Cylinder RCH-121 (E1796314)
Digital Dial Gauge : Mitutoyo Digital Indicator (E1791535)
30 ± 3 MPa
29-Feb-12
P = No sign of failure in anchor and/or structural member
F1 = Failure of anchor or its accessories
F2 = Failure in structural member
F3 = Failure of support member in a shear cone
F4 = Failure of support member in a shear cone
F5 = Failure by continuous displacement or decreasing load
F6 = Failure by continuous displacement or decreasing load
F7 = Other failure modes (Anchor Beaking)

B) Concrete Grade : 30 ± 3 MPa
C) Anchor Installed date : 29-Feb-12
D) Failure Modes :
E) Distance between reaction frame and centre of the fixing (mm) : 200
F) Distance between the centre of fixing and free edge (mm) : 200
G) Socket Length (mm) : 50

Tested By : YU, Shui Ming / CHAN, Ka Wai
Approved Signatory : MONG, Seng Ming

Checked By : PANG, Ting Pong / LIN, Meng Yang
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Form CFE083/Issue 1 (1/1) (10/04)

TEST REPORT
Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hiti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : -
 Test Location : ETL Laboratory
 Anchor Type : HCS M12x60, Cast-in Socket
 Amb. Temperature : 20°C

Lab Information

Report No. : FDA20616
 Test Date : 08-Mar-12
 Report Date : 26-Mar-12
 Page No. : 2 of 3
 Test Method : BS 5080:Part 2:1986 Cl 7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
4.5	0.05	0.01	0.06	0.10	0.08
9.0	0.23	0.07	0.10	0.25	0.14
13.5	0.38	0.18	0.21	0.37	0.26
18.0	0.50	0.29	0.32	0.46	0.37
22.5	0.62	0.40	0.38	0.57	0.42
27.0	0.82	0.59	0.49	0.70	0.53
31.5	0.94	0.68	0.59	0.84	0.64
36.0	1.08	0.82	0.75	1.15	0.78
40.5	1.26	0.99	1.02	1.36	0.90
45.0	1.89	1.73	1.91	2.10	1.74
49.5	-	-	-	-	-
54.0	-	-	-	-	-
Failure Load (kN)	47.8	46.9	47.3	46.0	46.9
Failure Mode	F7	F7	F7	F7	F7
Average Failure Load (kN)					
Standard Deviation (kN)					

A) Test Apparatus
 Load Cell : Compression Load Cell, 300kN (ET79501201)
 Load Cell Indicator : (ET18902202)
 Cylinder : Hydraulic Cylinder RCH-202 (ET190313)
 Digital Dial Gauge : Mitutoyo Digital Indicator (ET143019)
 30 ± 3 MPa
 29-Feb-2012

B) Concrete Grade
 C) Anchor installed date
 D) Failure Modes

E) Distance between reaction frame and centre of the fixing (mm)
 300
 150
 60

F) Distance between the centre of fixing and free edge (mm)
 150
 60

G) Socket Length (mm)
 60

F1 = Failure of anchor or its accessories
 F3 = Pull out of anchor
 F5 = Failure by continuous displacement or decreasing load

P = No sign of failure in anchor and/or structural member
 F2 = Failure in structural member
 F4 = Failure of structural member in a shear cone
 F6 = Failure in structural member with crack indicates outward from anchor
 F7 = Other failure modes (Anchor breaking)

Tested By : CHOI Chung Lung / CHAN Hon Kwan
 Approved Signatory : MONG Sang Ming

Checked By : PANG Ting Pong/LIN Meng Yang

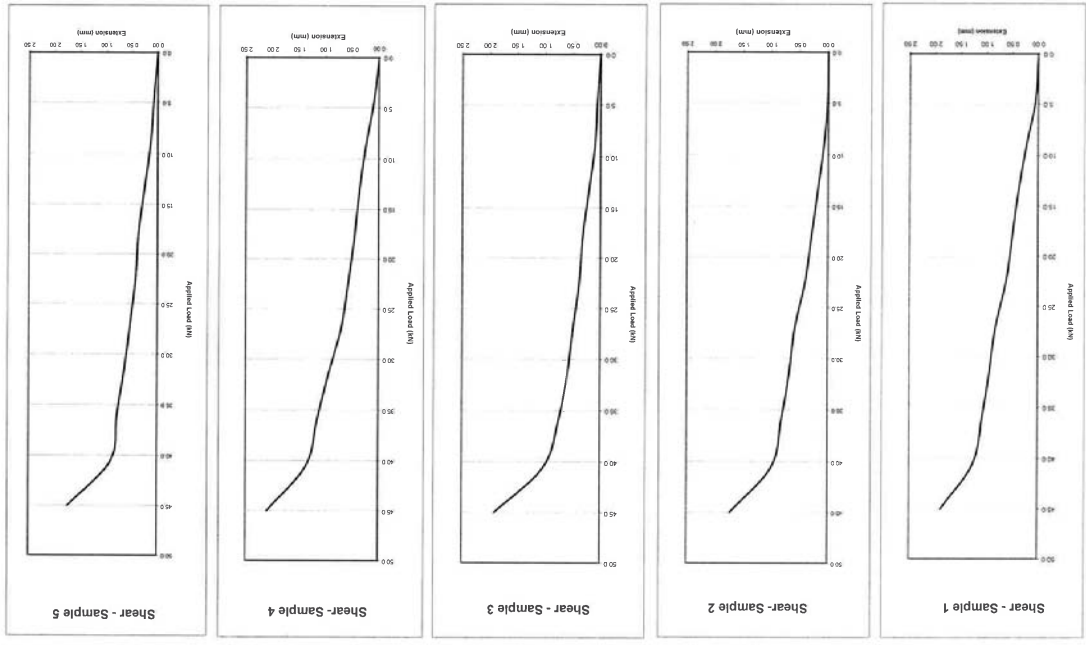
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 ETS-TESTCONSULT LIMITED

Report No: FDA20616

HCS M12x60, Cast-in Socket





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TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hilti (Hong Kong) Ltd
 Address : 17/F, Tower 6, China HK City, 33 Canton Road, TST
 Project : -
 Test Location : ETL's Laboratory
 Anchor Type * : HCS, M16 x 70
 Amb. Temperature : 24°C
 Report No. : FDA90426
 Test Date : 08-Apr-09
 Report Date : 17-Apr-09
 Page No. : 2 of 3
 Test Method : BS 5080:Part 1:1983 Cl 7.1

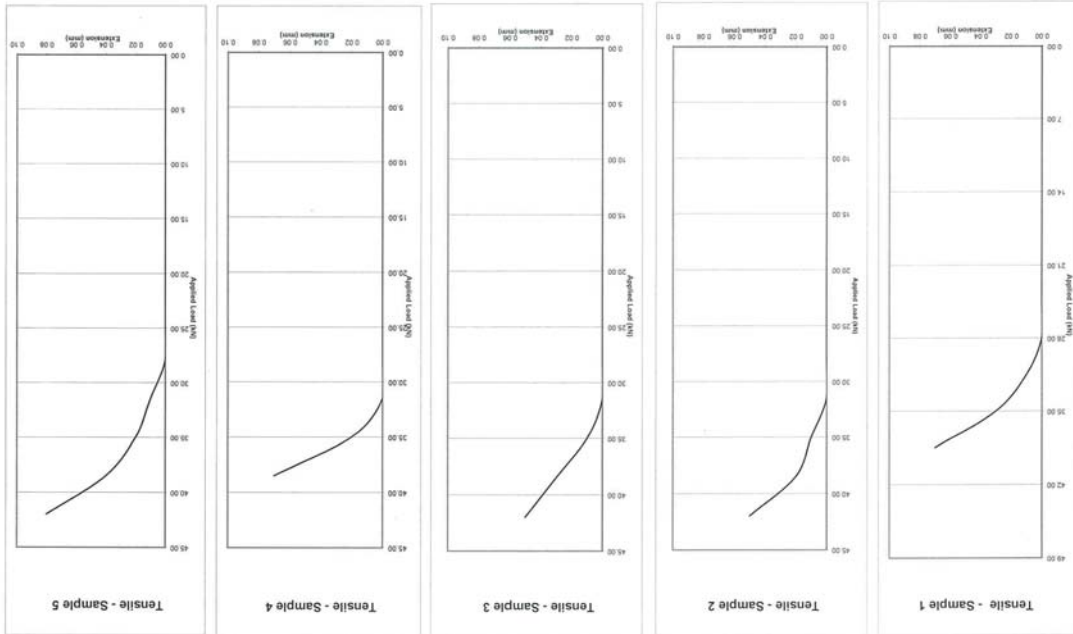
Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00
10.50	0.00	0.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	0.00	0.00
17.50	0.00	0.00	0.00	0.00	0.00
21.00	0.00	0.00	0.00	0.00	0.00
24.50	0.00	0.00	0.00	0.00	0.00
28.00	0.00	0.00	0.00	0.00	0.00
31.50	0.01	0.00	0.00	0.00	0.01
35.00	0.03	0.01	0.01	0.02	0.02
38.50	0.07	0.03	0.03	0.07	0.04
42.00	-	0.05	0.05	-	0.08
45.50	-	-	-	-	-
49.00	-	-	-	-	-
52.50	-	-	-	-	-
56.00	-	-	-	-	-
59.50	-	-	-	-	-
63.00	-	-	-	-	-
Failure Load (kN)	41.5	42.4	43.0	41.8	42.7
Failure Mode	F6	F6	F4	F6	F4
Average Failure Load (kN)	42.28				
Standard Deviation (kN)	0.62				

A) Test Apparatus
 Load Cell : Comp. Load cell C3000, 200kN (ET/930/0701) SN : 1000136752
 Load Cell Indicator : Load indicator AD813 (ET/930/0702) SN : -
 Cylinder : Hydraulic Cylinder RCH-202 (ET/903/13) SN : C3696C
 Digital Dial Gauge : ET/915/05
B) Concrete Grade : 30 ± 3 MPa
C) Anchor installed date : 08-Apr-09
D) Failure Modes
 P = No sign of failure in anchor and/or structural member
 F1 = Failure of anchor or its accessories
 F2 = Failure in structural member
 F3 = Pull out of anchor
 F4 = Failure of structural member in a shear cone
 F5 = Failure in structural member with crack radiates outward from anchor
 F6 = Failure by continuous displacement or decreasing load
 F7 = Other failure mode(s) / Anchor Breaking
E) Span width(mm) : 600
F) Edge distance(mm) : 300
G) Embedded Length(mm) : 70

* Information provided by customer
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東業德勤测试顾问有限公司
ETS-TESTCONSULT LIMITED
 Report No. FDA90426



HCS, M16 x 70



東業德勤测试顾问有限公司
ETS-TESTCONSULT LIMITED

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 Fax : 2695 3944 Web site : www.ets-testconsult.com

TEST REPORT

Shear Load Test on Anchor Bolt

Customer : Hilti (Hong Kong) Ltd Report No. : FDA90442
 Address : 17/F, Tower 6, China HK City, 33 Canton Road, TST Test Date : 08-Apr-09
 Project : - Report Date : 17-Apr-09
 Test Location : ETL's Laboratory Page No. : 2 of 3
 Anchor Type : HCS, M16 x 70 Test Method : BS 5080:Part 2:1986 Cl. 7.2
 Amb. Temperature : 24°C

Load (kN)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
7.0	0.00	0.00	0.00	0.00	0.00
14.0	0.03	0.05	0.06	0.07	0.07
21.0	0.24	0.10	0.13	0.12	0.28
28.0	0.43	0.28	0.32	0.41	0.42
35.0	0.59	0.51	0.39	0.63	0.69
42.0	0.79	0.76	0.55	0.81	0.82
49.0	1.03	1.07	0.70	1.06	1.07
56.0	1.29	1.43	0.98	1.28	1.36
63.0	1.69	1.85	1.25	1.66	1.71
70.0	2.15	2.26	1.62	2.13	2.24
77.0	-	-	-	-	-
84.0	-	-	-	-	-
91.0	-	-	-	-	-
98.0	-	-	-	-	-
105.0	-	-	-	-	-
112.0	-	-	-	-	-
119.0	-	-	-	-	-
126.0	-	-	-	-	-
Failure Load (kN)	75.8	76.5	76.2	76.4	76.2
Failure Mode	F5	F5	F5	F5	F5
Average Failure Load (kN)	76.22				
Standard Deviation (kN)	0.27				

A) Test Apparatus	Load Cell : Comp. Load cell C3000, 200kN (ET/9300701) SIN : 1000136752 Load Cell Indicator : Load indicator AD813 (ET/9300702) SIN : - Cylinder : Hydraulic Cylinder RCH 202 (ET/903413) SIN : C3966C Digital Dial Gauge : ET/91535
B) Concrete Grade	30 ± 3 MPa
C) Anchor installed date	08-Apr-09
D) Failure Modes	P = No sign of failure in anchor and/or structural member F2 = Failure in structural member F4 = Failure of structural member in a shear cone F6 = Failure in structural member with crack radiates outward from anchor F7 = Other failure mode(s) : Anchor Breaking F1 = Failure of anchor or its accessories F3 = Pull out of anchor F5 = Failure by continuous displacement or decreasing load
E) Span width(mm)	600
F) Edge distance(mm)	300
G) Embedded Length(mm)	70

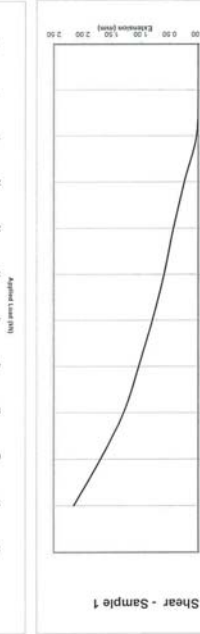
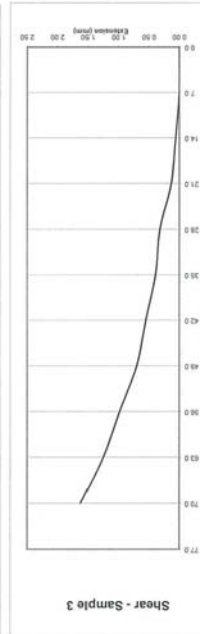
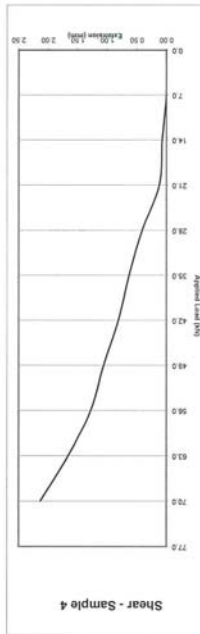
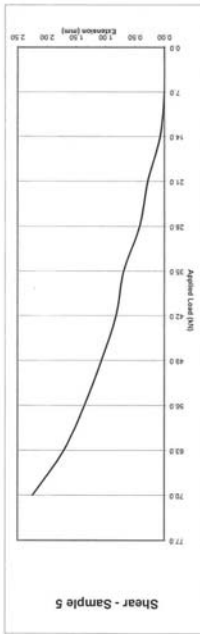
* Information provided by customer



東業德勤测试顾问有限公司
 ETS-TESTCONSULT LIMITED

Report No: FDA90442

HCS, M16 x 70





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Form CPT0077/Issue 1 (1/1) (06/09)

TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hilti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : -
 Test Location : ETL Laboratory
 Anchor Type : HCS-R, M8
 Amb. Temperature : 24°C
 Report No. : FDA41912
 Test Date : 01-Dec-2014
 Report Date : 04-Dec-2014
 Page No. : 3 of 4
 Test Method : BS 5080:Part 1:1993.C1.7.1
 Test Procedure : TPF1003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
2.0	0.00	0.00	0.00	0.00	0.00
4.0	0.00	0.00	0.00	0.00	0.00
6.0	0.00	0.00	0.00	0.00	0.00
8.0	0.00	0.02	0.00	0.01	0.06
10.0	0.00	0.06	0.01	0.05	0.09
12.0	0.04	0.08	0.04	0.02	0.13
14.0	0.10	0.15	0.10	0.11	0.18
16.0	0.22	0.28	0.15	0.19	0.29
18.0	-	-	-	-	-
20.0	-	-	-	-	-
22.0	-	-	-	-	-
24.0	-	-	-	-	-
26.0	-	-	-	-	-
28.0	-	-	-	-	-
30.0	-	-	-	-	-
32.0	-	-	-	-	-
34.0	-	-	-	-	-
Failure Load (kN)	16.7	16.4	16.5	16.8	16.4
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	16.6				
Standard Deviation (kN)	0.2				

A) Test Apparatus
 Load Cell : Comp. Load Cell GS429-5L, 50kN (ET19302101)
 Load Cell Indicator : XCH35A-1-B (ET193034002)
 Cylinder : RCH1211 (ET1930318)
 Digital Dial Gauge : Digital Indicator (ET1915552)
 302000
 25-Nov-2014
B) Concrete Grade
C) Anchor installed date
D) Failure Modes
 P = No sign of failure in anchor and/or structural member
 F1 = Failure of structural member
 F2 = Failure of structural member in a shear cone
 F3 = Failure of structural member with crack radiates outward from anchor
 F4 = Failure in structural member with crack radiates outward from anchor
 F5 = Other failure mode(s) : Anchor Breaking
E) Min. distance between reaction frame and centre of the fixing (mm) : 96
F) Min. distance between the centre of fixing and free edge (mm) : 144
G) Anchor Length, l_f (mm) : 40
H) Anchor Diameter, d_s (mm) : 12

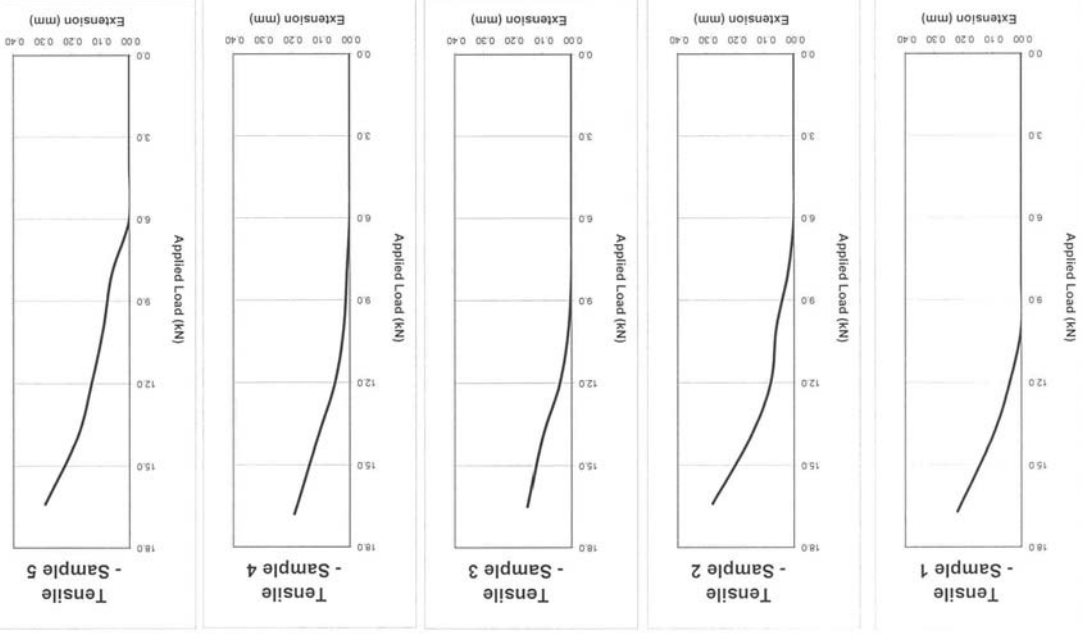
A) Test Apparatus
 SIN : 04
 SIN : -
 SIN : B0502C
 SIN : 102889
 F1 = Failure of anchor or its accessories
 F2 = Pull out of anchor
 F3 = Failure by continuous displacement or decreasing load

Tested By : SO, Hin Ting/CHOI, Chung Lung
 Checked By : So (Assistant Engineer)
 Approved Signatory : MONG, Seng Ming
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Report No. FDA41912



HCS-R, M8



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Form CFB083/Issue 1 (1/11/10/09)

TEST REPORT
Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hili (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : ETL Laboratory
Anchor Type : HCS-R, M8
Amb. Temperature : 24°C

Lab Information

Report No. : FDA41900
Test Date : 01-Dec-2014
Report Date : 02-Dec-2014
Page No. : 3 of 4
Test Method : BS 5880-Part 2:1986 Cl 7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
2.0	0.04	0.03	0.00	0.00	0.01
4.0	0.09	0.10	0.04	0.03	0.11
6.0	0.12	0.13	0.09	0.06	0.14
8.0	0.19	0.17	0.12	0.10	0.21
10.0	0.30	0.25	0.16	0.14	0.33
12.0	0.40	0.35	0.26	0.30	0.44
14.0	0.56	0.53	0.39	0.42	0.59
16.0	0.72	1.13	0.67	0.70	0.78
18.0	1.05	1.59	1.24	1.25	1.11
20.0	1.76	2.27	1.91	1.97	1.80
22.0	-	-	-	-	-
24.0	-	-	-	-	-
26.0	-	-	-	-	-
28.0	-	-	-	-	-
30.0	-	-	-	-	-
32.0	-	-	-	-	-
34.0	-	-	-	-	-
Failure Load (kN)	F7	F7	F7	F7	F7
Average Failure Load (kN)	21.2	20.9	21.3	21.6	21.5
Standard Deviation (kN)	-	-	21.3	-	-
	-	-	0.3	-	-

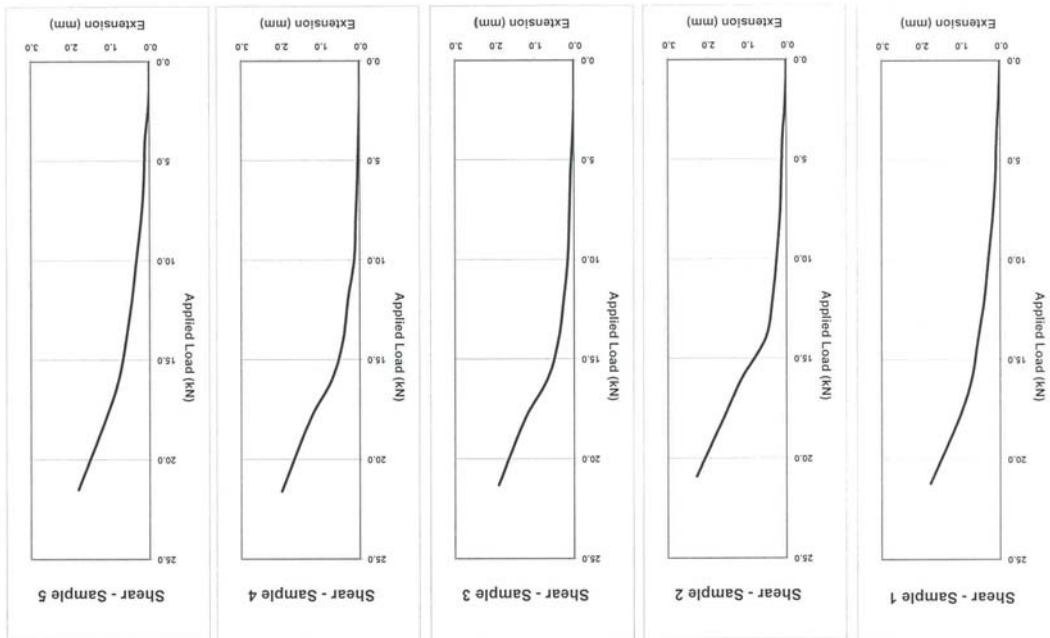
A) Test Apparatus	Load Cell : Compression Load Cell CWFK-10t, 100kN Load Cell Indicator : XG315A1-8 Cylinder : Hydraulic Cylinder RICH 121 Digital Dial Gauge : Digital Indicator 3020D	(E1790021701) (E1790034002) (E179002115) (E17915053)	SN : 04 SN : - SN : - SN : 1301344
B) Concrete Grade	24-Nov-2014		
C) Anchor installed date	P = No sign of failure in anchor and/or structural member F2 = Failure in structural member F4 = Failure of structural member in a shear cone F6 = Failure in structural member with crack radiates outward from anchor F7 = Other failure mode(s) ; Anchor breaking		F1 = Failure of anchor or its accessories F3 = Pull out of anchor F5 = Failure by continuous displacement or decreasing load
D) Failure Modes			
E) Min. distance between reaction frame and centre of the fixing (mm)			96
F) Min. distance between the centre of fixing and free edge (mm)			96
G) Anchor Length, l_f (mm)			40
H) Anchor Diameter, d_n (mm)			12

Tested By : KAN, Chi Wai / CHOI, Chung Lung
Checked By : So
Approved Signatory : MONG, Seng Ming

(Assistant Engineer)
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HCS-R, M8



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 Fax : 2695 3944 Web site : www.ets-testconsult.com



Form CTR77/Issue 1 (11) (06/08)

TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hilti (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : --
 Test Location : ETL Laboratory
 Anchor Type : HCS-R, M10
 Amb Temperature : 24°C
 Report No. : FDA41913
 Test Date : 01-Dec-2014
 Report Date : 04-Dec-2014
 Page No. : 3 of 4
 Test Method : BS 5080:Part 1:1993, Cl 7.1
 Test Procedure : TPF003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
2.5	0.00	0.00	0.00	0.00	0.00
5.0	0.00	0.00	0.00	0.00	0.00
7.5	0.00	0.00	0.00	0.00	0.00
10.0	0.00	0.00	0.00	0.00	0.00
12.5	0.00	0.00	0.00	0.01	0.00
15.0	0.00	0.03	0.02	0.02	0.03
17.5	0.01	0.09	0.06	0.05	0.07
20.0	0.10	0.15	0.14	0.09	0.12
22.5	0.20	0.24	0.22	0.17	0.22
25.0	-	-	-	-	-
27.5	-	-	-	-	-
30.0	-	-	-	-	-
32.5	-	-	-	-	-
35.0	-	-	-	-	-
37.5	-	-	-	-	-
40.0	-	-	-	-	-
42.5	-	-	-	-	-
Failure Load (kN)	23.8	23.4	23.3	24.0	23.7
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	23.6				
Standard Deviation (kN)	0.3				

A) Test Apparatus
 Load Cell : Comp. Load Cell GS429-5L, 50kN (ET/930721/01)
 Load Cell Indicator : XIC315A-1-8 (ET/930244/02)
 Cylinder : RCH1211 (ET/903218)
 Digital Dial Gauge : Digital Indicator (ET/915452)
 30/200
 25-Nov-2014
 P = No sign of failure in anchor and/or structural member
 F2 = Failure in structural member
 F4 = Failure of structural member in a shear cone
 F6 = Failure in structural member with crack radiates outward from anchor
 F7 = Other failure mode(s) / Anchor Breaking

B) Concrete Grade : 25-Nov-2014
 C) Anchor installed date : 25-Nov-2014
 D) Failure Modes :
 F1 = Failure of anchor or its accessories
 F3 = Pull out of anchor
 F5 = Failure by continuous displacement or decreasing load

E) Min. distance between reaction frame and centre of the fixing (mm) : 128
 F) Min. distance between the centre of fixing and free edge (mm) : 192
 G) Anchor Length, ℓ (mm) : 50
 H) Anchor Diameter, d (mm) : 16

Tested By : SO, Hin Ting/GHOI, Chung Lung
 Checked By : SO (Assistant Engineer)
 Approved Signatory : MCKG, Seng Ming

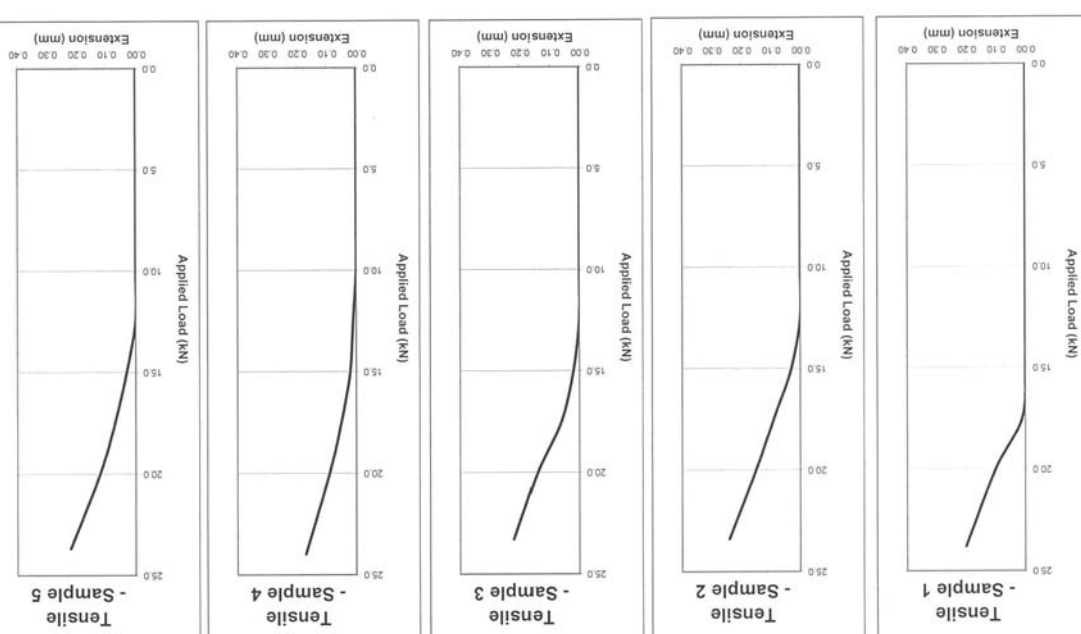
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Form CTR77/Issue 1 (11) (06/08)



HCS-R, M10



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Form CR08/03/Issue 1 (1/11/10)1019

TEST REPORT
Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hilli (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwan Tong, Kowloon
Project : -
Test Location : ETL Laboratory
Anchor Type : HCS-R, M10
Amb. Temperature : 24°C
Lab. Information
Report No. : FDA41901
Test Date : 01-Dec-2014
Report Date : 02-Dec-2014
Page No. : 3 of 4
Test Method : BS 5980-Part 2:1986 Cl 7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
3.0	0.01	0.04	0.00	0.09	0.00
6.0	0.06	0.08	0.05	0.19	0.02
9.0	0.11	0.10	0.11	0.30	0.09
12.0	0.14	0.16	0.16	0.42	0.11
15.0	0.19	0.21	0.21	0.50	0.14
18.0	0.31	0.30	0.29	0.68	0.20
21.0	0.42	0.46	0.37	0.63	0.25
24.0	0.61	0.62	0.46	0.72	0.32
27.0	0.91	0.90	0.71	0.89	0.55
30.0	1.49	1.50	1.45	1.06	1.30
33.0	-	-	-	-	-
36.0	-	-	-	-	-
39.0	-	-	-	-	-
42.0	-	-	-	-	-
45.0	-	-	-	-	-
48.0	-	-	-	-	-
51.0	-	-	-	-	-
Failure Load (kN)	F7	F7	F7	F7	F7
Average Failure Load (kN)	31.6	32.3	32.6	32.3	32.6
Standard Deviation (kN)	-	-	-	-	-

A) Test Apparatus : Load Cell : Compression Load Cell CWFK-10t, 100kN
Load Cell Indicator : XG315A1-B
Cylinder : Hydraulic Cylinder RCH 121
Digital Dial Gauge : Digital Indicator
30200
24-Nov-2014
P = No sign of failure in anchor and/or structural member
F2 = Failure in structural member
F4 = Failure of structural member in a shear cone
F6 = Failure in structural member with crack radiates outward from anchor
F7 = Other failure mode(s) / Anchor Breaking

B) Concrete Grade :
C) Anchor installed date :
D) Failure Modes :
E) Min. distance between reaction frame and centre of the fixing (mm) : 128
F) Min. distance between the centre of fixing and free edge (mm) : 128
G) Anchor Length, ℓ (mm) : 50
H) Anchor Diameter, d_n (mm) : 16

Load Cell : (ET/9302101) SN : 04
(ET/9303402) SN : -
(ET/930315) SN : -
(ET/91553) SN : 1301344

F1 = Failure of anchor or its accessories
F3 = Pull out of anchor
F5 = Failure by continuous displacement or decreasing load

Tested By : KAN, Chi Wai / CHOI, Chung Lung
Checked By : So (Assistant Engineer)
Approved Signatory : MONG, Seng Ming

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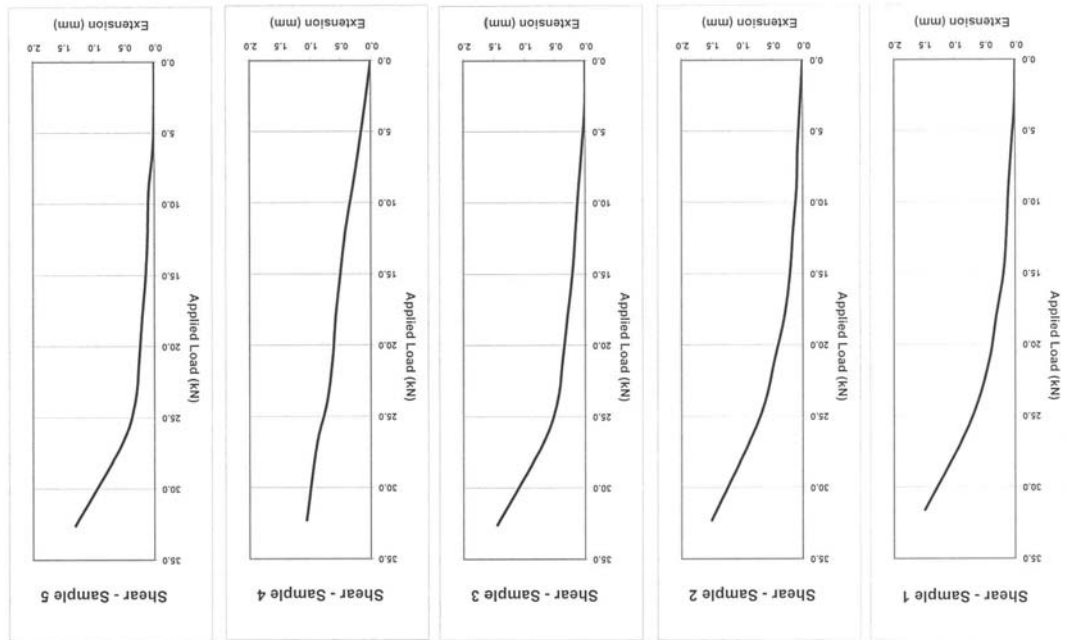


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Report No.: FDA41901

Page 4 of 4
-END OF REPORT-

Report Issued Date: 02-Dec-2014



HCS-R, M10



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Form CTR0077/Issue 1 (1/1) (06/09)

TEST REPORT

Tensile Load Test on Anchor Bolt

Customer : Hilli (Hong Kong) Ltd
 Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwun Tong, Kowloon
 Project : -
 Test Location : ETL Laboratory
 Anchor Type : HCS-R, M12
 Amb. Temperature : 24°C
 Report No. : FDA41914
 Test Date : 02-Dec-2014
 Report Date : 04-Dec-2014
 Page No. : 3 of 4
 Test Method : BS 5080:Part 1:1993 Cl 7.1
 Test Procedure : TPF003

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
3.0	0.00	0.00	0.00	0.00	0.00
6.0	0.00	0.00	0.00	0.00	0.00
9.0	0.00	0.00	0.00	0.00	0.00
12.0	0.01	0.00	0.00	0.00	0.01
15.0	0.02	0.04	0.02	0.01	0.03
18.0	0.05	0.07	0.04	0.04	0.05
21.0	0.12	0.12	0.06	0.06	0.09
24.0	0.21	0.18	0.18	0.10	0.15
27.0	0.28	0.29	0.40	0.17	0.28
30.0	0.53	0.50	0.66	0.32	0.45
33.0	-	-	-	-	-
36.0	-	-	-	-	-
39.0	-	-	-	-	-
42.0	-	-	-	-	-
45.0	-	-	-	-	-
48.0	-	-	-	-	-
51.0	-	-	-	-	-
Failure Load (kN)	31.4	31.6	31.7	32.0	31.4
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	31.6				
Standard Deviation (kN)	0.2				

A) Test Apparatus
 Load Cell : Comp. Load Cell GS-25-5k, 50kN (ET93002101)
 Load Cell Indicator : X335A1-13 (ET93003402)
 Cylinder : RCH1211 (ET930316)
 Digital Dial Gauge - Digital Indicator (ET915552)
 302000
 25-Nov-2014
 P = No sign of failure in anchor and/or structural member
 F1 = Failure of anchor or its accessories
 F2 = Failure in structural member
 F3 = Failure of structural member in a shear cone
 F4 = Failure in structural member with crack radiates outward from anchor
 F5 = Failure by continuous displacement or decreasing load
 F7 = Other failure mode(s) / Anchor breaking

B) Concrete Grade
 C) Anchor installed date
 D) Failure Modes

E) Min. distance between reaction frame and centre of the fixing (mm) : 152
 F) Min. distance between the centre of fixing and free edge (mm) : 228
 G) Anchor Length, ℓ (mm) : 60
 H) Anchor Diameter, d_a (mm) : 19

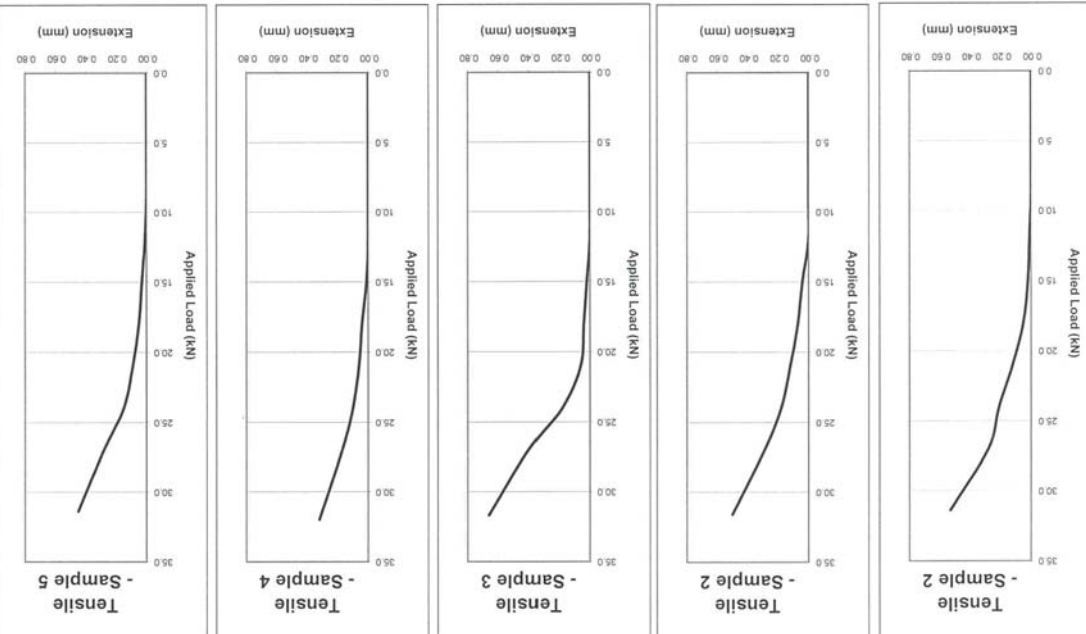
Tested By : SO, Hin Ting/CHOI, Chung Lung
 Checked By : MONG, Seng Ming (Assistant Engineer)
 Approved Signatory : MONG, Seng Ming
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Report No. FDA41914

Form CTR0077/Issue 1 (1/1) (06/09)



HCS-R, M12



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Form C/FD/08/03/Issue 1 (1/11/10/09)

TEST REPORT
Shear Load Test on Anchor Bolt

Information Provided by Customer

Customer : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Centre, 223 Wai Yip Street, Kwan Tong, Kowloon
Project : -
Test Location : ETL Laboratory
Anchor Type : HCS-R, M12
Amb. Temperature : 24°C

Lab Information

Report No. : FDA41902
Test Date : 01-Dec-2014
Report Date : 02-Dec-2014
Page No. : 3 of 4
Test Method : BS 5080-Part 2:1986 Cl 7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.0	0.00	0.00	0.00	0.00	0.00
3.0	0.02	0.01	0.00	0.00	0.00
6.0	0.15	0.03	0.02	0.00	0.00
9.0	0.25	0.06	0.06	0.04	0.03
12.0	0.36	0.09	0.10	0.05	0.06
15.0	0.56	0.12	0.15	0.08	0.08
18.0	0.79	0.15	0.25	0.11	0.18
21.0	1.03	0.22	0.32	0.14	0.26
24.0	1.21	0.32	0.40	0.20	0.30
27.0	1.30	0.44	0.49	0.24	0.39
30.0	1.42	0.58	0.58	0.34	0.41
33.0	1.58	0.68	0.66	0.62	0.56
36.0	1.90	0.86	0.83	0.69	1.69
39.0	2.08	1.15	1.05	0.80	2.02
42.0	2.68	1.79	1.52	1.27	2.40
45.0	-	-	-	-	-
48.0	-	-	-	-	-
51.0	-	-	-	-	-
Failure Load (kN)	F7	43.3	43.5	44.1	44.3
Failure Mode	F7	F7	F7	F7	F7
Average Failure Load (kN)		43.8			
Standard Deviation (kN)		0.4			

A) Test Apparatus : Load Cell : Compression Load Cell CWFK-10k, 100kN
Load Cell Indicator : XG315A1-8 (ET/93034/02)
Cylinder : Hydraulic Cylinder RCH121 (ET/93031/5)
Digital Dial Gauge : Digital Indicator (ET/915/53)
30/200
24-Nov-2014
P = No sign of failure in anchor and/or structural member
F1 = Failure of failure of its accessories
F2 = Failure in structural member
F3 = Pull out of anchor
F4 = Failure of structural member in a shear cone
F5 = Failure in structural member with crack radiates outward from anchor decreasing load
F6 = Other failure mode(s) : Anchor Breaking

E) Min. distance between reaction frame and centre of the fixing (mm) : 152
F) Min. distance between the centre of fixing and free edge (mm) : 152
G) Anchor Length, l (mm) : 60
H) Anchor Diameter, d_n (mm) : 19

Load Cell : (ET/93021/01) SIN : 04
(ET/93034/02) SIN : -
(ET/93031/5) SIN : -
(ET/915/53) SIN : 1301344

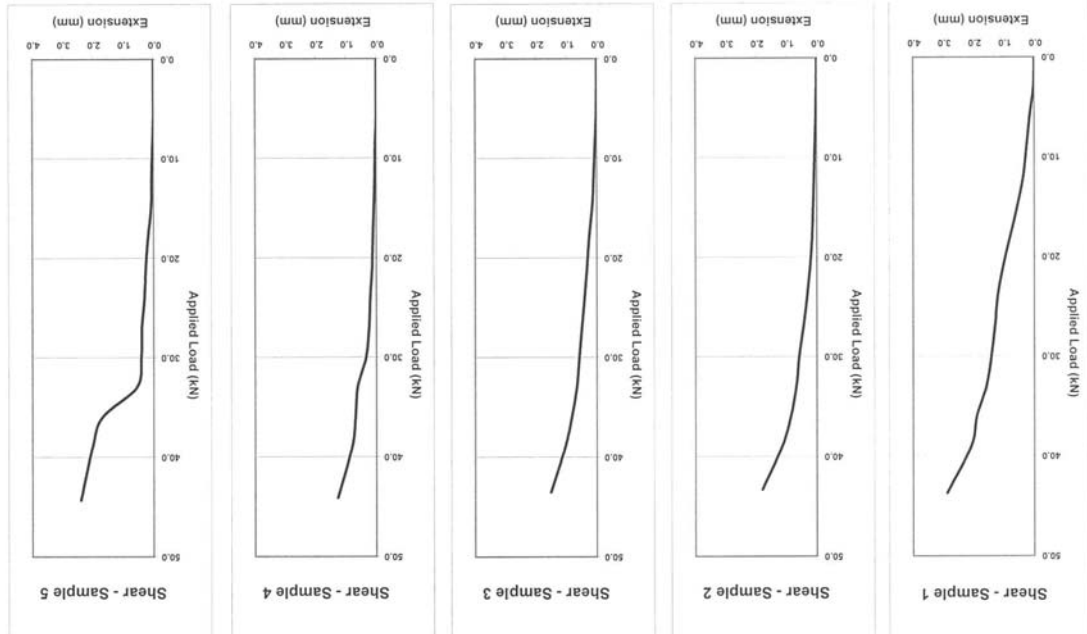
F1 = Failure of failure of its accessories
F2 = Failure in structural member
F3 = Pull out of anchor
F4 = Failure of structural member in a shear cone
F5 = Failure in structural member with crack radiates outward from anchor decreasing load
F6 = Other failure mode(s) : Anchor Breaking

Tested By : KAN, Chi Wai / CHOI, Chung Lung
Checked By : (Assistant Engineer)
Approved Signatory : MONG, Seng Ming

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HCS-R, M12



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TEST REPORT

Tensile Load Test on Anchor Bolt

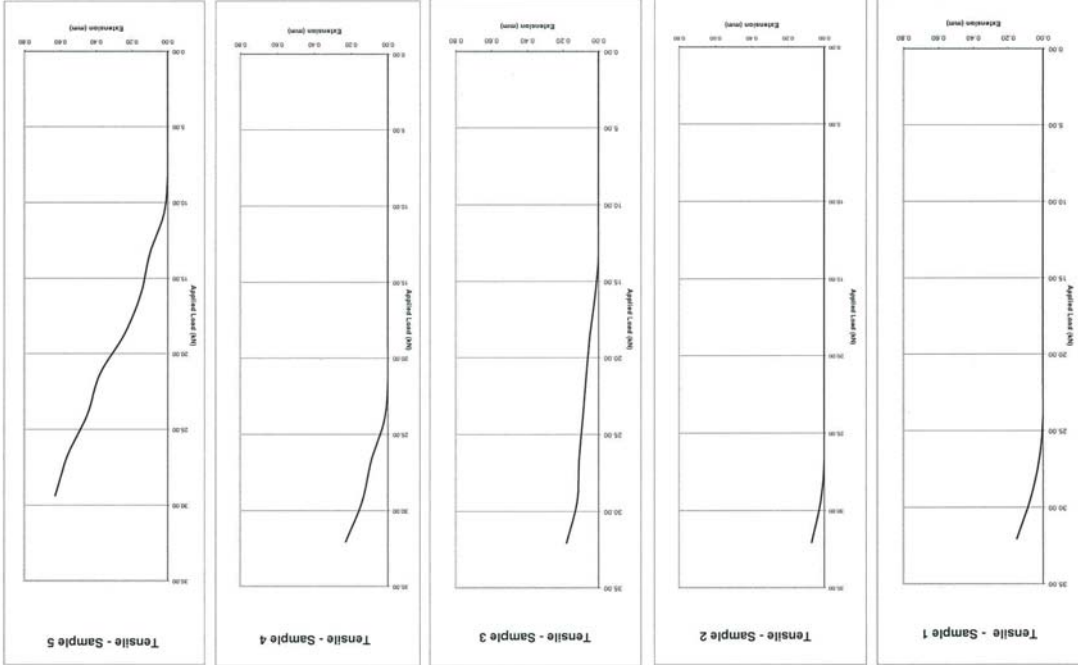
Client Hilli (Hong Kong) Ltd **Report No. :** FDA60276
Address 17/F, Tower 6, China HK City, 33 Canton Road, TST **Test Date :** 09-Mar-06
Project **Report Date :** 14-Mar-06
Test Location ETL's Laboratory **Page No. :** 2 of 3
Anchor Type HCS-R, M16 x 70 (Stainless Steel) **Test Method :** BS 5080:Part 1:1993 Cl 7.1
Amb. Temperature 22°C

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.00	0.00	0.00	0.00	0.00	0.00
2.67	0.00	0.00	0.00	0.00	0.00
5.34	0.00	0.00	0.00	0.00	0.00
8.01	0.00	0.00	0.00	0.00	0.00
10.68	0.00	0.00	0.00	0.00	0.02
13.35	0.00	0.00	0.00	0.00	0.10
16.02	0.00	0.00	0.02	0.00	0.15
18.69	0.00	0.00	0.05	0.00	0.24
21.36	0.00	0.00	0.07	0.00	0.38
24.03	0.00	0.00	0.09	0.02	0.45
26.70	0.02	0.00	0.11	0.09	0.56
29.37	0.07	0.02	0.12	0.14	0.63
32.04	0.15	0.07	0.18	0.23	-
34.71	-	-	-	-	-
37.38	-	-	-	-	-
40.05	-	-	-	-	-
42.72	-	-	-	-	-
45.39	-	-	-	-	-
48.06	-	-	-	-	-
Failure Load (kN)	34.2	34.0	33.8	34.0	31.6
Failure Mode	F4	F4	F4	F4	F4
Average Failure Load (kN)	33.52				
Standard Deviation (kN)	1.08				

A) Test Apparatus	Load Cell : Maywood C3000 (ET/930/07/01) (200kN) Load Cell Indicator : AD813 (ET/930/07/02) Cylinder : Enerpac RCH302 (ET/903/14) Digital Dial Gauge : ET/430/02	S/N : 100136752 S/N : - S/N : -
B) Concrete Grade	30 ± 3 MPa	
C) Anchor installed date	-	
D) Failure Modes	P = No sign of failure in anchor and/or structure member F2 = Failure of structural member F4 = Failure of structural member in a shear cone F6 = Failure in structural member with crack radiates outward from anchor F7 = Other failure mode(s) : Anchor Breaking	
E) Span width(mm)	600	
F) Edge distance(mm)	300	
G) Embedded Length(mm)	70	



東業德测试顾问有限公司
 ETS-TESTCONSULT LIMITED
 Report No: FDA60276



HCS-R, M16 x 70 (Stainless Steel)



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 Report No: FDA60277

TEST REPORT

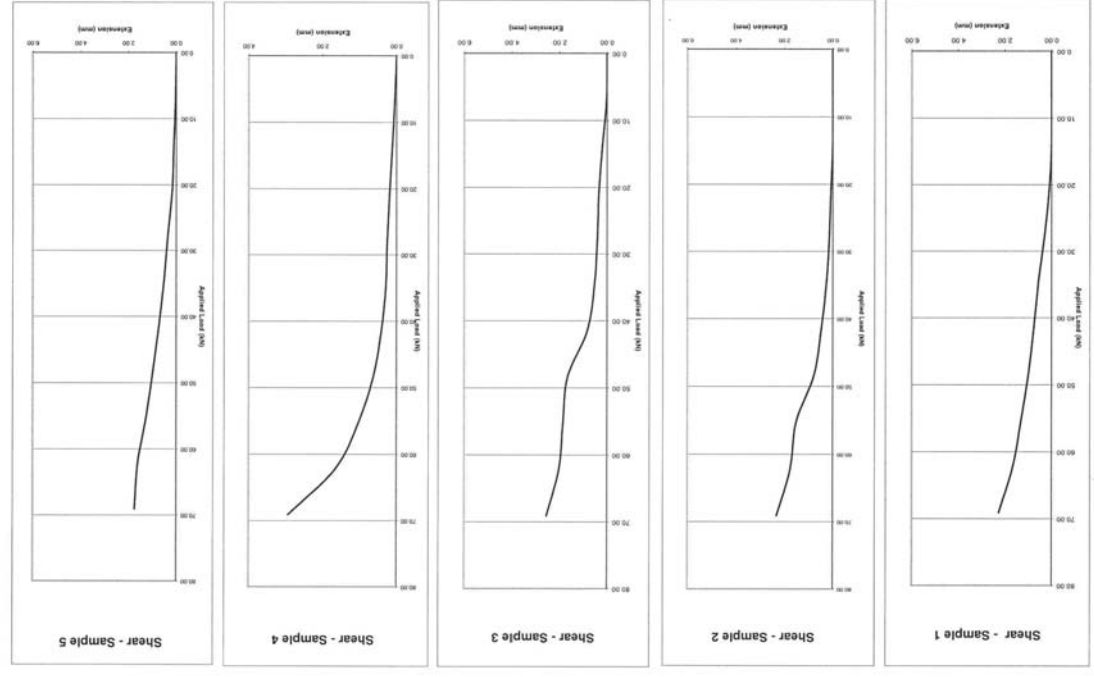
Shear Load Test on Anchor Bolt

Client : Hilti (Hong Kong) Ltd
 Address : 17/F, Tower 6, China HK City, 33 Canton Road, TST
 Project :
 Test Location : ETL's Laboratory
 Anchor Type : HCS-R, M16 x 70 (Stainless Steel)
 Amb. Temperature : 22°C
 Report No. : FDA60277
 Test Date : 09-Mar-06
 Report Date : 14-Mar-06
 Page No. : 2 of 3
 Test Method : BS 5986:Part 2:1986 Cl.7.2

Load (kN)	Dial Gauge Reading (mm)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
0.00	0.00	0.00	0.00	0.00	0.00
6.91	0.00	0.00	0.02	0.05	0.03
13.82	0.00	0.00	0.20	0.12	0.10
20.73	0.10	0.08	0.34	0.19	0.17
27.64	0.30	0.14	0.41	0.25	0.35
34.55	0.56	0.26	0.53	0.29	0.51
41.46	0.76	0.47	0.83	0.41	0.73
48.37	0.99	0.78	1.66	0.63	0.98
55.28	1.30	1.51	1.85	1.03	1.26
62.19	1.66	1.75	2.03	1.66	1.61
69.10	2.27	2.32	2.56	2.94	1.75
76.01	-	-	-	-	-
82.92	-	-	-	-	-
89.83	-	-	-	-	-
96.74	-	-	-	-	-
103.65	-	-	-	-	-
110.56	-	-	-	-	-
117.47	-	-	-	-	-
Failure Load (kN)	69.6	69.5	69.8	69.9	69.7
Failure Mode	F7	F7	F7	F7	F7
Average Failure Load (kN)	69.70				
Standard Deviation (kN)	0.16				

A) Test Apparatus	Load Cell : Maywood C5000 (ET/930/06/01) (500kN) Load Cell Indicator : AD813 (ET/930/06/02) Cylinder : Enerpac RCH302 (ET/903/07) Digital Dial Gauge : ET430/02 30 ± 3 MPa	S/N : 174529 S/N : - S/N : C3691 C
B) Concrete Grade	P = No sign of failure in anchor and/or structural member F2 = Failure in structural member F4 = Failure of structural member in a shear cone F6 = Failure in structural member with crack radiates outward from anchor F7 = Other failure mode(s) : Anchor Breaking	
C) Anchor installed date	F1 = Failure of anchor or its accessories F3 = Pull out of anchor F5 = Failure by continuous displacement or decreasing load	
D) Failure Modes	E) Span width(mm) 400 F) Edge distance(mm) 200 G) Embedded Length(mm) 70	

HCS-R, M16 x 70 (Stainless Steel)



Attention: To whom it may concern

Date: 10 Aug 2015
Ref: 046/CA/TT/15

Subject: Hilti Cast-in Socket - HCS

Dear Sir / Madam,

Enclosed please find the information of Hilti Cast0in

Brand Name : Hilti
Model Name : HCS / HCS-R
Supplier : Hilti (Hong Kong) Ltd
Address of Supplier : 701-704 & 708B, 7/F, Tower A, Manulife Financial Centre,
223 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong
Country of Origin : China

Other details can be referred to the technical data in our Fastening Technology Manual.
Should you have further questions, please do not hesitate to contact our Technical Representatives or Customer Service Hotline at 8228-8118.

Yours sincerely,



Terry Tsang
Product Manager

1. Job / Application Reference for HCS Cast-in Socket

Date	Project Name	Contractor	Product	Product Name & Application
2006	The Venetian Casino Resort, Macau	Ngo Kee (Macau) Ltd	HCS-R M8, HCS-R M10, HCS-R M12, HCS-R M16	GRC Fixing / External Façade
2007	The Venetian Casino Resort, Macau	WLS (Macau) Engineering Co. Ltd.	HCS-R M10	GRC Fixing / External Façade
2007	Le Royal Arch	ARRK (Macao) Ltd.	HCS-R M10, HCS-R M12	GRC Fixing / External Façade
2007	City of Dreams Resort, Macau	Shen Zhen Sun Wah Concrete	HCS M20	Concrete Panel
2007	Four Seasons Hotel, Macau	Architectural Precast GRC (HK) Ltd	HCS-R M10	GRC Fixing / External Façade
2008	13-15 Tai Hang Road	YKK	HCS-R M8	External Façade
2008	Venetian Phase 2	Mei Cheong	HCS-R, HCS-R M10	GRC Fixing / External Façade
2009	Tamar Development Project	BSY	HCS M16, HCS M20	M&E bracket fixing
2012	TKO 66B1	Orientfunds Precast Ltd	HCS-R M8, HCS-R M102	External Façade
2012	Composite Building at NKIL 6494, Lai Chi Kok Road	Great Harvest Construction Ltd	HCS-R M8	External Façade
2012	TKO 66B1	Luen On Alum. Eng. Co. Ltd	HCS-R M8	External Façade