TESTECH SDN. BHD. (207361-H)

Materials, Structures and Geotechnical Testing

8, Jalan 30B/146, Desa Tasik, Sg. Besi, 57000 Kuala Lumpur, West Malaysia.
Tel: 03-90593587, 90593589 Fax: 03-90593455
E-mail: inquiry@testech.com.my Website: www.testech.com.my
North Office: 48, Jalan Perusahaan Jelutong 1, 11600 Pulau Pinang, West Malaysia.
Tel: 04-2886551, 2886552 Fax: 04-2886550
E-mail: testech@tm.net.my / penang@testech.com.my

TEST REPORT

ISSUED BY : KUALA LUMPUR OFFICE
DATE : 7-Feb-13
REPORT NO. : CON 204/12/R 1542
PAGE NO. : 1 OF 3

1. Test Requested :
   1) Reference Concrete
   2) Effect of Concrete
   3) Vebe Test
   4) Compressive Strength
   5) Flexural Strength
   6) Degree of Compactability
   7) LOP, CMOD Test

2. Customer :
   TIMURAN ENGINEERING SDN. BHD.
   16th Floor, Surian Tower,
   1, Jalan PJU 7/3,
   Mutiara Damansara,
   47810, Petaling Jaya
   Selangor Darul Ehsan

3. Project : Nil

4. Date of Testing : 3-Dec-12

5. Place of Testing : Permanent Laboratory (Kuala Lumpur Office).

6. Method of Testing :
   1) BS EN 14845-1 : 2007
   2) BS EN 14845-2 : 2006
   3) BS EN 12350-3 : 2009
   4) BS EN 12390-3 : 2009
   5) BS EN 12390-5 : 2009
   6) BS EN 12350-4 : 2009
   7) BS EN 14651 : 2005 +A1 : 2007

7. Remarks :
   a. No Copy Of This Report Is Valid Without Original Special Red Stamp.
   b. Results relate only to the sample as received. Testech holds no responsible for correctness of sampling.

The accuracy of test measurements are probability at 95% confidence level.

THE EFFECT OF FIBLES ON THE CONSISTANCE OF REFERENCE CONCRETE

Customer : TIMURAN ENGINEERING SDN. BHD.
Project : Nil
Sample Description : **0.75mmϕ x 60mm Length Steel Fibre**
Sample Reference : STAHCON
Source : Timuran Engineering Sdn Bhd
Date Tested : 3-Dec-12

Tested by : Ken & Anuar
Verified by : Yap S. K.

Test Environmental Condition :- Temperature (Min.) 28.0 °c (Max.) 28.7 °c
Relative Humidity (RH) (Min.) 59.0 % (Max.) 61.0 %

TEST METHOD :
1) **BS EN 14845-1 : 2007 (Reference Concrete)**
2) **BS EN 14845-2 : 2006 (Effect on Concrete)**
3) **BS EN 12350-3 : 2009 (Vebe Test)**
4) **BS EN 12390-3 : 2009 (Compressive Strength)**
5) **BS EN 12390-5 : 2009 (Flexural Strength)**
6) **BS EN 12350-4 : 2009 (Degree of Compactability)**
7) **BS EN 14651 : 2005 +A1 : 2007 (LOP, CMOD Test)**

Details of Fibre for Testing :

Type	Straight pieces of cold-drawn steel wire		
Manufacturer	Timuran Engineering Sdn. Bhd.		
Equivalent Diameter, mm	0.75	Length, mm	60.0
Shape	Bunding of fibres		
Aspect Ratio	80	Tensile Strength of Fibre, MPa	1100

Reference Concrete Details

Mix Reference	Mixing Volume (m^3)	Specified Flexural Tensile Strength (MPa)	Max. Agg. Size (mm)	Cement Content (kg/m^3)	Fibre Content (kg/m^3)
C25/30	0.1	4.3 ± 0.3	8 - 10	350	25
			Water Cement Ratio 0.55		

Materials

Type of Cement	Admixture	Aggregate	Consistency	
			Vebe Time, h (Seconds)	Degree of Compactability,C (Class)
YTL - CEM I / 42.5R	BASF Pozzolith 322N	Granite - Grading Comply to BS EN 1766-2000	7	C2
			BS EN 14845-1 Specification	
			V3 (10s - 6s)	C2 (1.25 - 1.11)

Specimen Curing Temperature : 24hours 20 ± 2°C with RH > 95%, 1 - 28 days water temperature 27 ± 2°C.

Cube Compressive Strength (Without Fibre)

Cube Ref.	Date Cast	Date Tested	Age (days)	Mass (kg)	Measured Size (mm) L x W x H	Density	Max. Load (kN)	Compressive Strength (to nearest 0.1) (MPa)	Type of Failure
1	4-Nov-12	2-Dec-12	28	8.10	150 x 150 x 150	2400	1202	**53.4**	Satisfactory
2	4-Nov-12	2-Dec-12	28	8.16	150 x 150 x 150	2420	1176	**52.3**	Satisfactory
3	4-Nov-12	2-Dec-12	28	8.13	150 x 150 x 150	2410	1196	**53.2**	Satisfactory
							AVG	**52.9**	

Flexural Strength Test (Without Fibre)

Beam Ref.	Casting Date	Testing Date	Age (days)	Mass (kg)	L (mm)	d_1 (mm)	d_2 (mm)	Density (kg/m^3)	Max Load (kN)	Flexural Strength (N/mm^2)	Distance of Fracture (mm)
1	4-Nov-12	2-Dec-12	28	41.38	750	151	151	2420	35.19	**4.6**	340
2	4-Nov-12	2-Dec-12	28	40.77	751	150	151	2400	35.96	**4.7**	348
3	4-Nov-12	2-Dec-12	28	41.29	751	151	151	2410	33.66	**4.4**	370
									AVG	**4.6**	

Flexural Tensile Strength Test [Limit of Proportionality (LOP), Residual] For Metallic Fibered Concrete BS EN 14651 : 2005 (Amd. 2007)

Specimen Reference	**0.75mmϕ x 60mm Length Hook Type Steel Fibre - 1**				
Dimension of Specimen (L x B x H), mm	750mm x 150mm x 150mm				
Moisture Condition of Specimen at Test	Surface Dry				
Rate of Loading (*CMOD*)	0.05 mm/min to 0.1mm, thereafter 0.2 mm/min				
Specimen Conditioning Procedure	By Customer				
Content of Metallic Fibre	25 kg/m^3				
Date cast of the Specimen	4-Nov-12				
Date Tested	3-Dec-12	Age of Specimen		29	Days
Test Environmental Condition :-	Temperature	(Min.)	27.2°C	(Max.)	27.8°C
	Relative Humidity (RH)	(Min.)	59.0%	(Max.)	61.0%

Reference		Specimen Dimension (mm)			Limit of Proportionality, *LOP* (MPa)	Residual Flexural Tensile Strength (MPa) *CMOD*$_j$			
Specimen Ref.	Trial Mix.	*b*	*h*	*x*		0.5mm	1.5mm	2.5mm	3.5mm
B1	C25/30	150.9	150.1	3.4	6.5	5.8	3.8	2.6	1.7
B2		154.1	150.7	3.3	6.5	5.5	4.3	3.4	2.5
B3		154.7	149.8	3.4	6.5	3.8	2.5	1.6	1.2
B4		151.3	150.5	3.4	7.1	5.4	4.1	2.9	2.3
B5		154.4	150.7	3.4	7.4	6.0	3.7	2.3	1.8
B6		152.2	149.3	3.4	7.0	5.8	4.1	2.7	2.4
B7		153.3	150.1	3.4	6.7	5.2	3.9	2.9	1.8
B8		151.1	151.5	3.4	7.3	5.9	4.1	2.8	2.5
B9		151.9	150.2	3.3	7.6	6.2	4.5	3.0	2.5
B10		149.3	153.1	3.3	7.3	5.7	4.3	3.0	2.4
B11		150.6	151.9	3.4	7.2	5.1	3.3	1.7	1.2
B12		153.1	149.9	3.4	7.1	7.0	4.4	3.1	2.5
				Median (MPa)	7.1	5.8	4.1	2.9	2.4
				Minimum, (MPa)	6.5	3.8	2.5	1.6	1.2
				Maximum, (MPa)	7.6	7.0	4.5	3.4	2.5
				Coefficient Variation, (MPa)	1.1	3.2	2.0	1.8	1.3

Conclusion

By using 25kg/m^3 fibre content the test meet the requirement of minimum residual flexural strength of particular deformation levels as stated in MS 2338 : 2010 Clause 5.8.

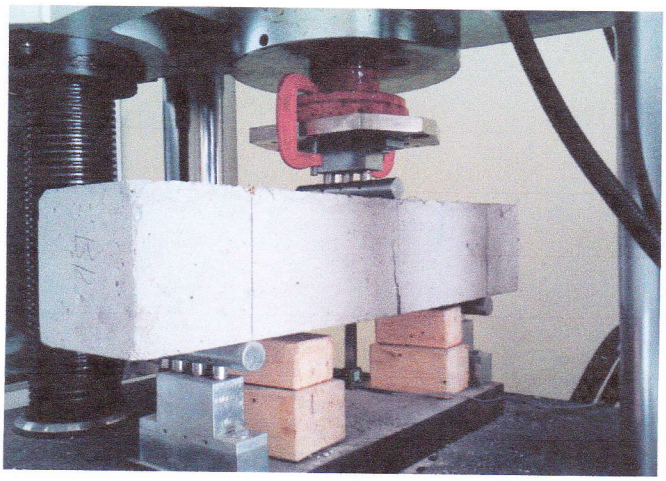
Certified by,

TESTECH SDN. BHD. MALAYSIA 207361-H

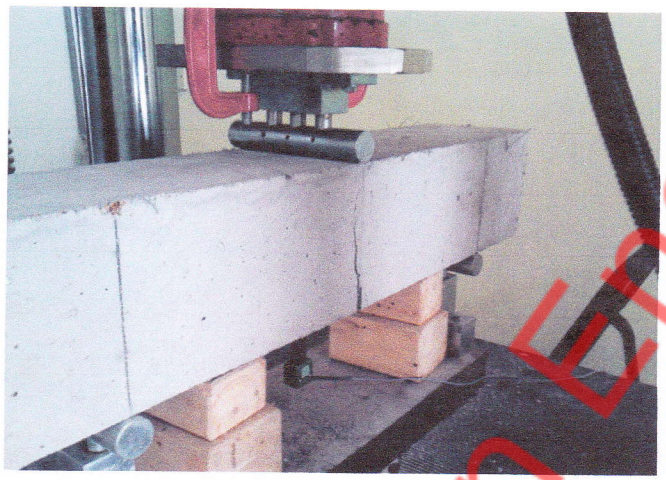
Yap Seow Keong
Technical Manager

Prepared by : Fadila

PHOTOGRAPH



Show that the LOP testing in progress by using Universal Testing Machine.



Show that the LOP testing in progress by using Universal Testing Machine.

Show that CMOD attach underneath the beam for measurement of crack mount opening at the notch.

TESTECH SDN. BHD. MALAYSIA 207361-H

TESTECH SDN.BHD . (20736-H)

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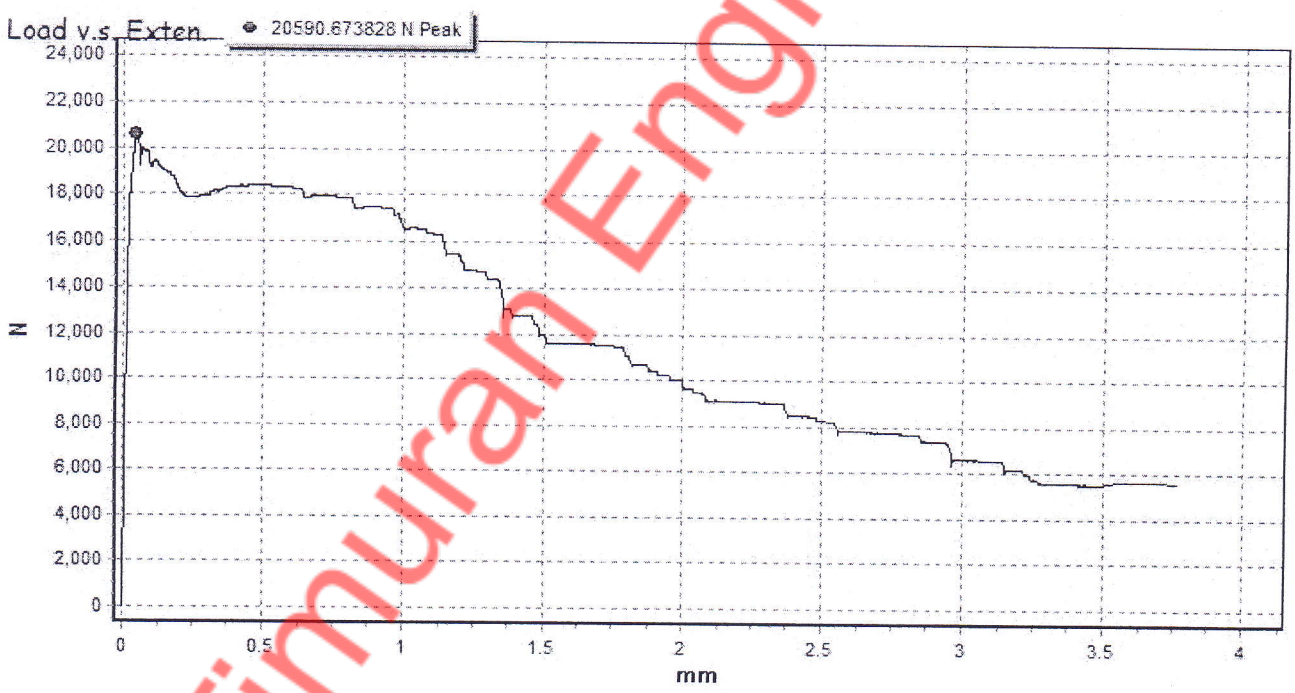
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 1
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 20512.223

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 1	150.88	125.56	20590.674	0.046	18387.332	11996.777	8260.918	5496.382



C730-12 Beam - 1-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

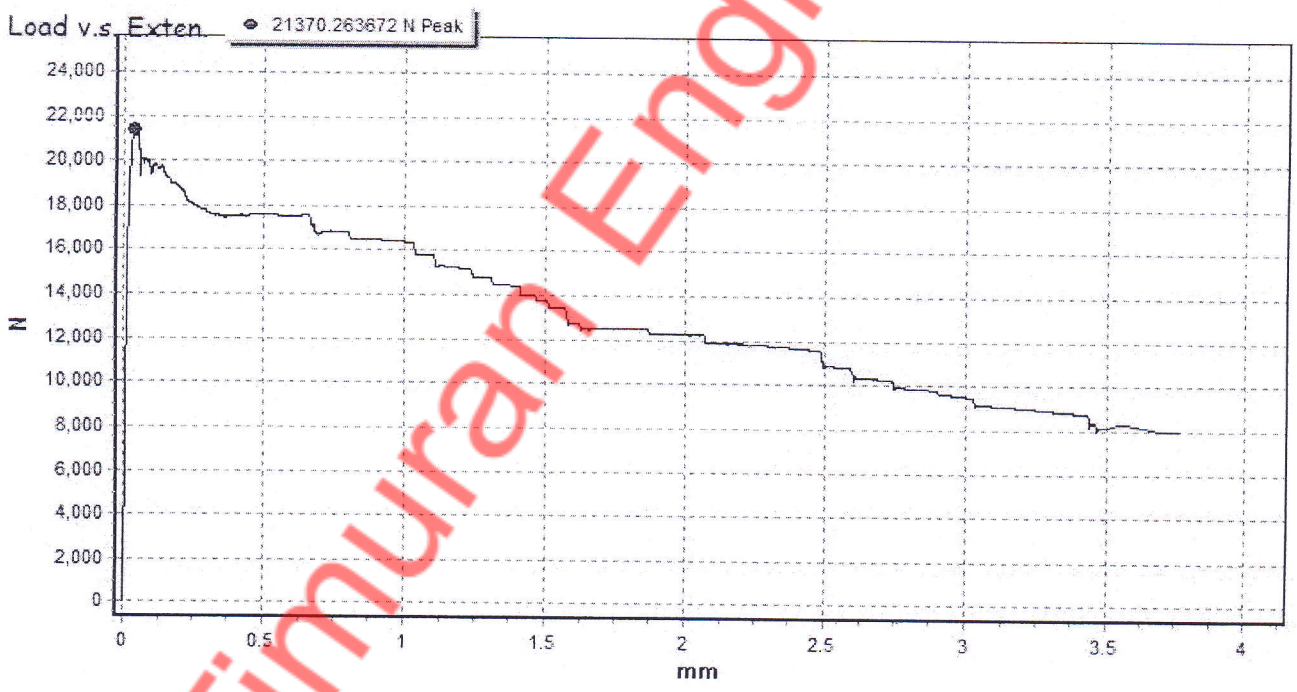
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 2
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 21070.486

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 2	154.11	125.19	21370.264	0.039	17614.893	13766.64	10819.981	8111.484



C730-12 Beam - 2-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

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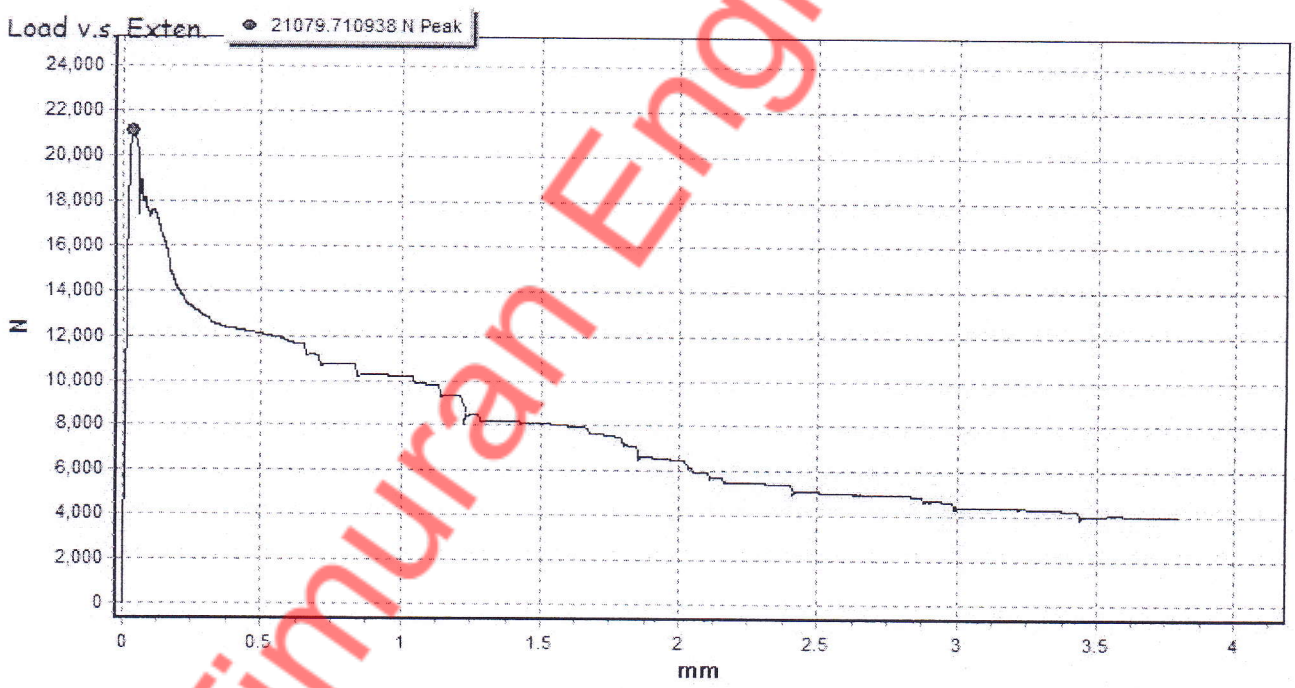
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 3
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 20812.152

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 3	154.73	124.87	21079.711	0.037	12108.853	8102.144	5071.429	3997.369



C730-12 Beam - 3-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

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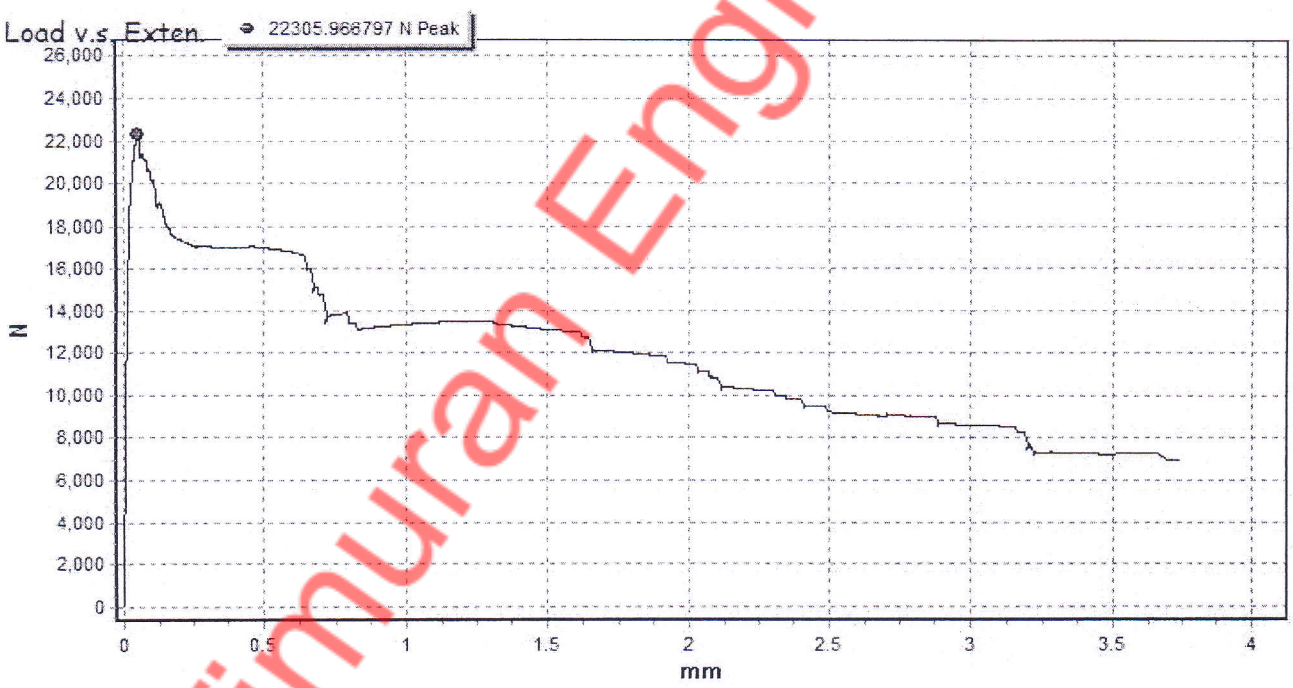
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 4
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 22292.145

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 4	151.26	125.14	22305.967	0.052	16994.705	13098.827	9297.599	7205.522



C730-12 Beam - 4-001

Remarks : _____

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Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

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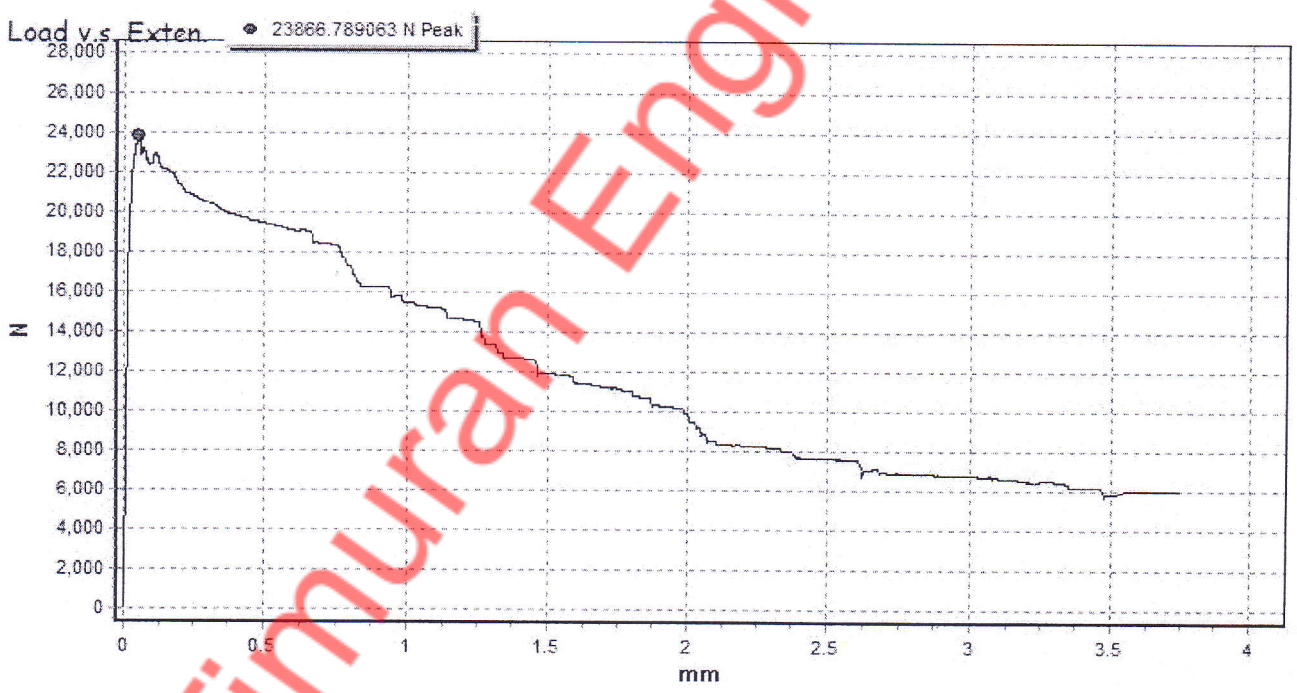
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 5
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 23866.789

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 5	154.37	125.54	23866.789	0.049	19459.523	11912.72	7621.152	5795.251



C730-12 Beam - 5-001

Remarks : _____

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Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

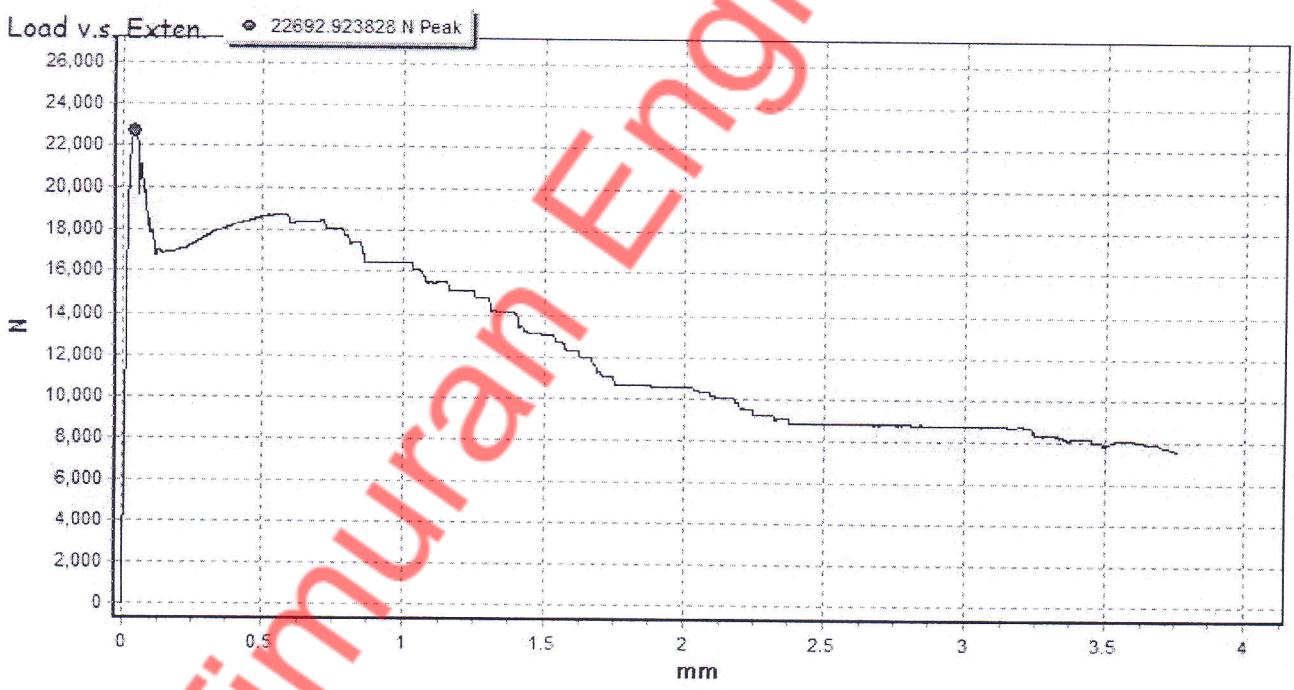
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 6
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 22586.984

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 6	152.16	126.03	22692.924	0.046	18664.723	13084.846	8821.297	7863.983



C730-12 Beam - 6-002

Remarks : _____

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Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

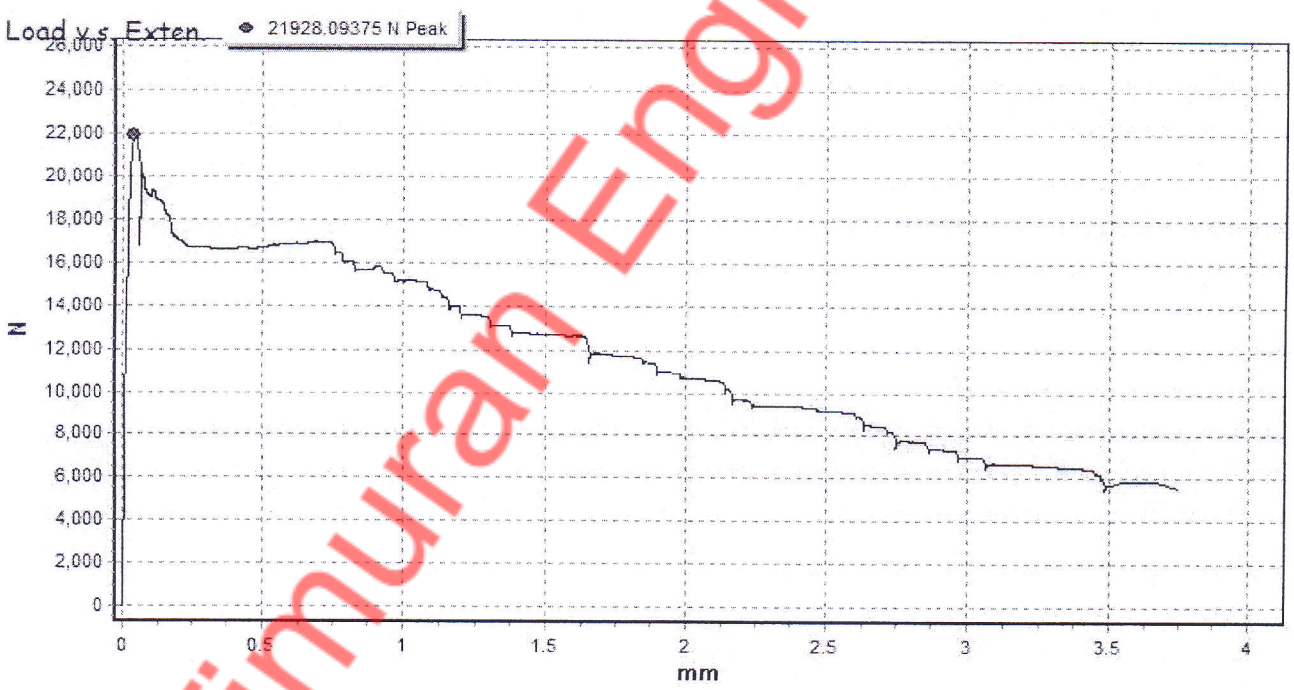
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 7
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 21646.908

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 7	153.26	125.42	21928.094	0.041	16656.693	12683.241	9185.543	5692.515



C730-12 Beam - 7-001

Remarks : _____

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Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

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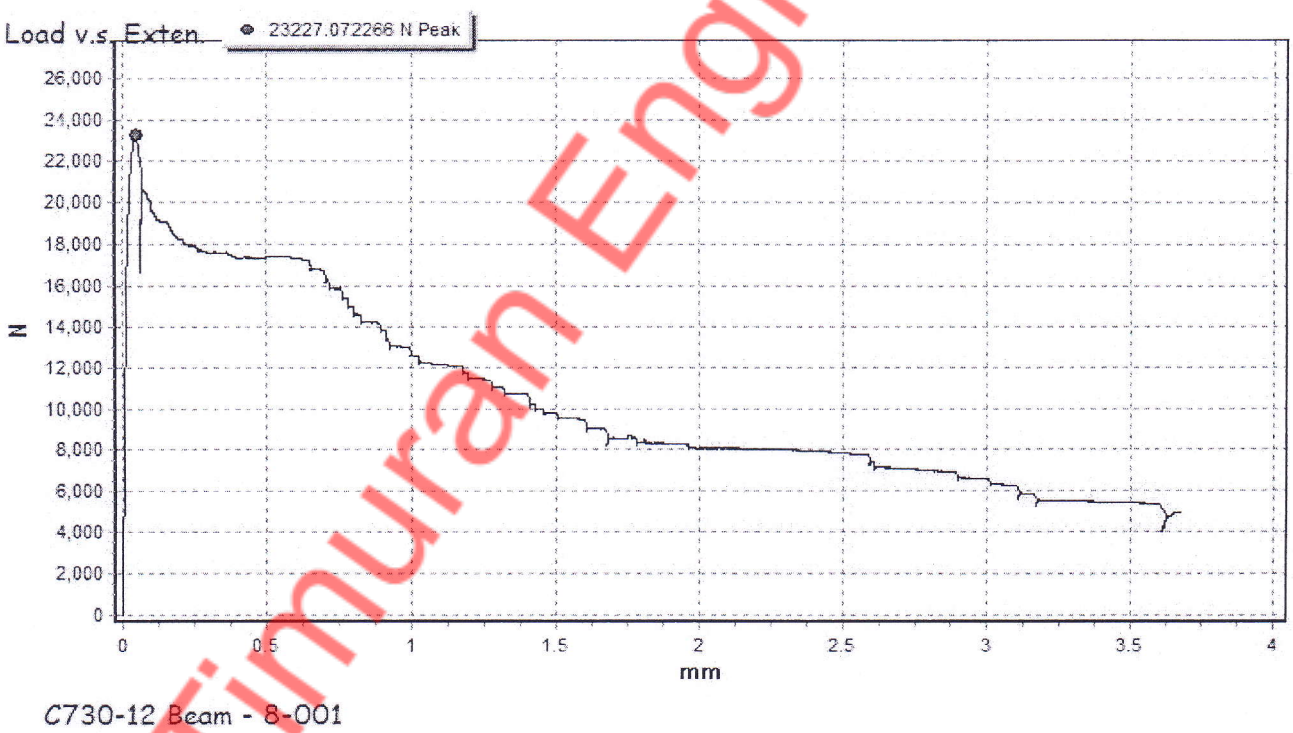
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 8
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 23185.639

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 8	151.06	125.59	23227.072	0.048	18664.723	13084.846	8821.297	7863.983



C730-12 Beam - 8-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

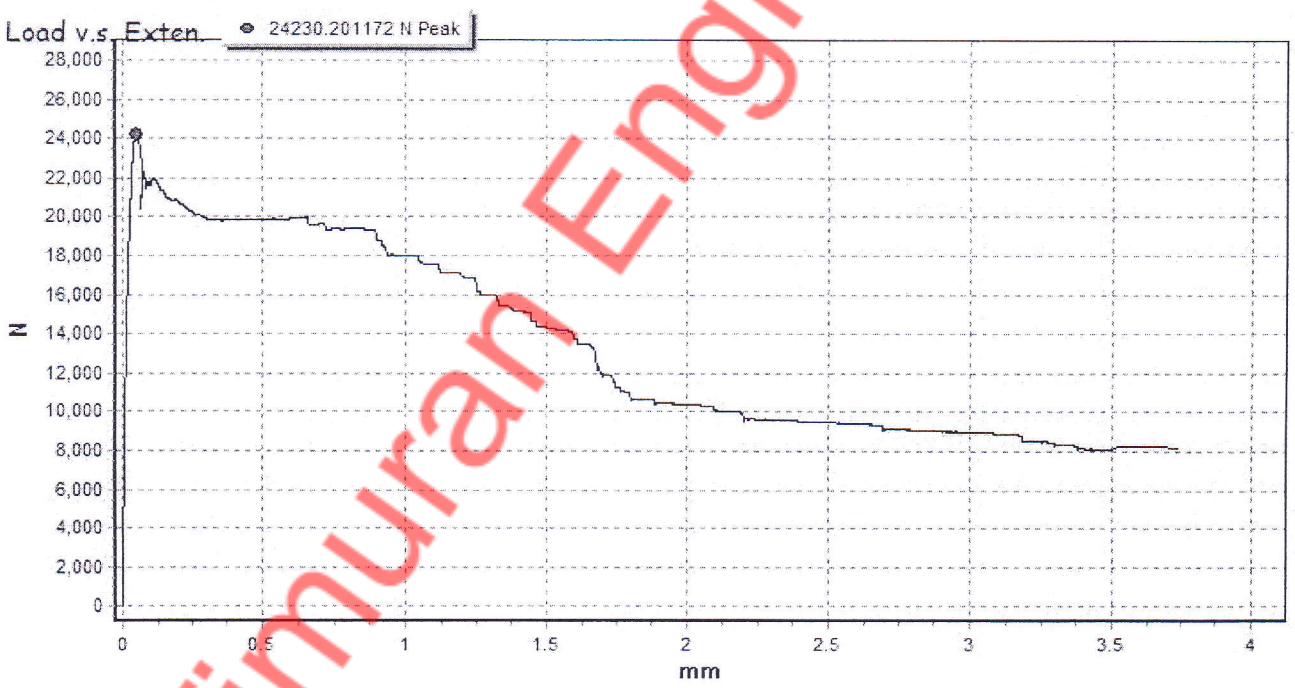
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 9
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 24221.004

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 9	151.94	125.52	24230.201	0.053	19842.859	14327.019	9484.412	8088.135



C730-12 Beam - 9-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

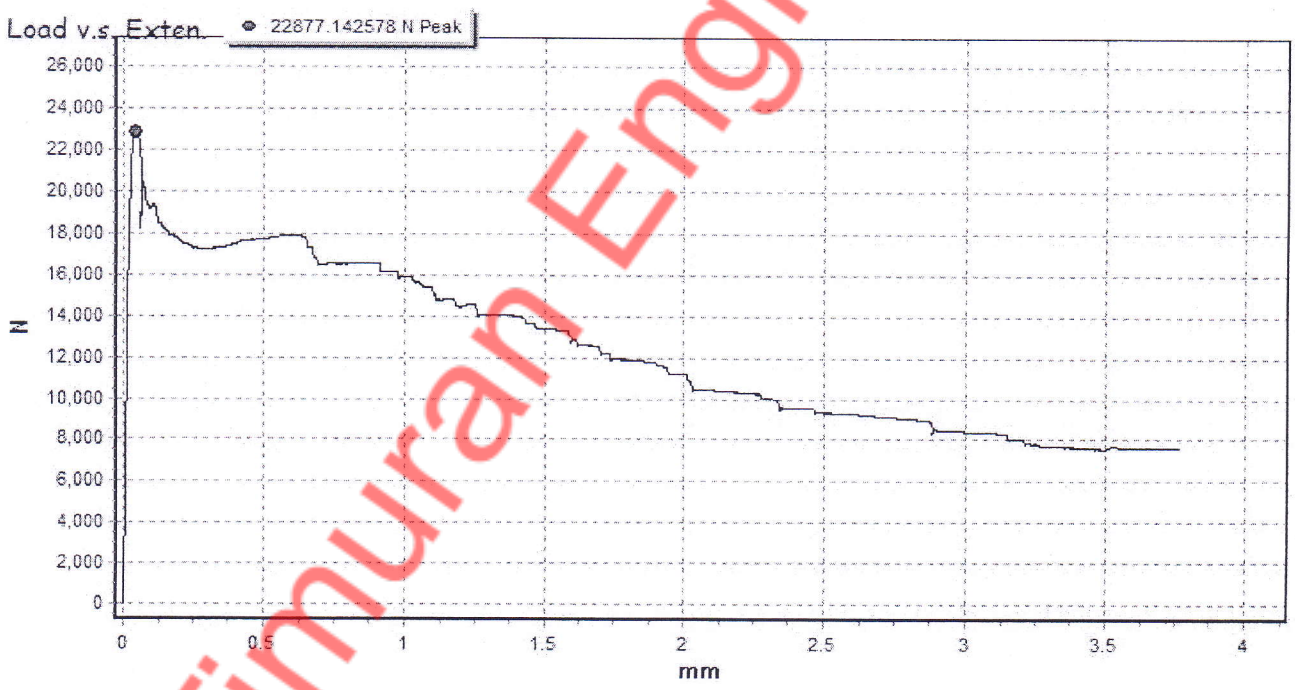
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 10
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 22780.432

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 10	149.26	125.37	22877.143	0.045	17716.682	13397.724	9348.987	7551.105



C730-12 Beam - 10-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

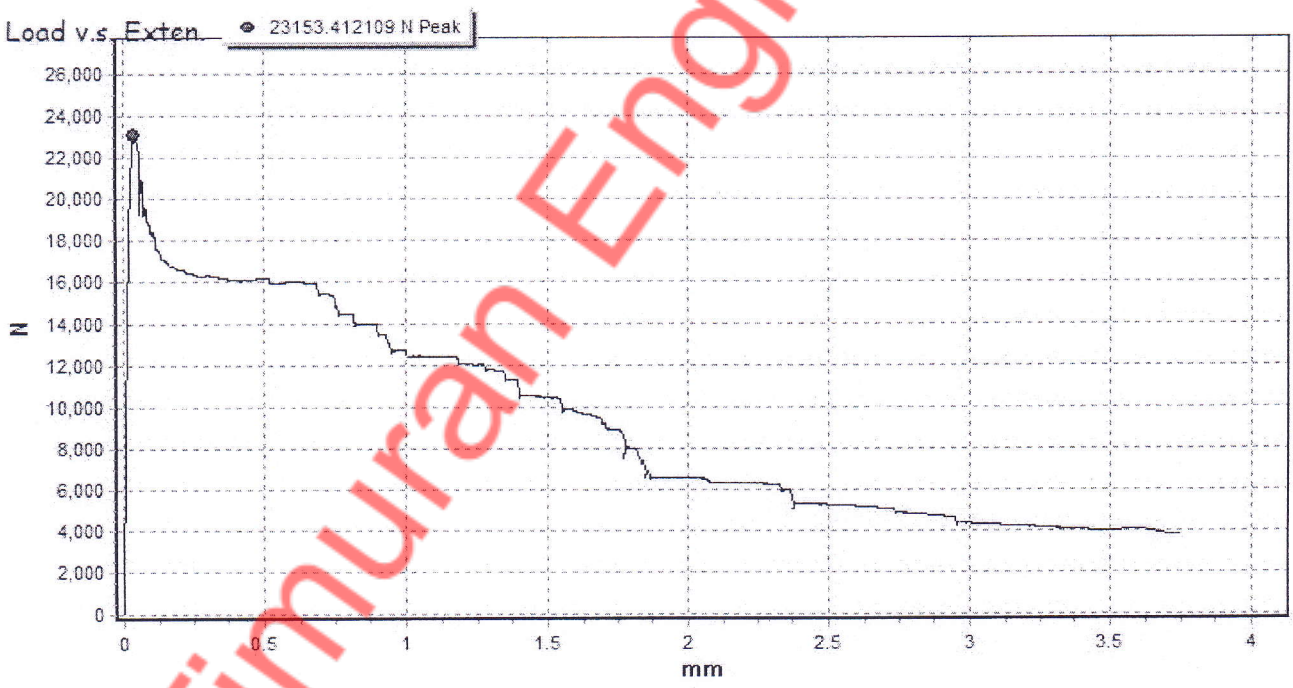
NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 11
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012
TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan
First Crack at 0.05mm = 22808.066

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 11	150.64	125.5	23153.412	0.041	16193.498	10460.405	5244.212	3946.001



C730-12 Beam - 11-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)

TESTECH SDN.BHD . (20736-H)

Materials ,Structures and Geotechnical Testing

NO 8 , JALAN 30B/146,DESA TASIK, SG. BESI,57000 KUALA LUMPUR, WEST MALAYSIA.
TEL: 03-90593587 FAX: 03-90593455

Tensile Test Report

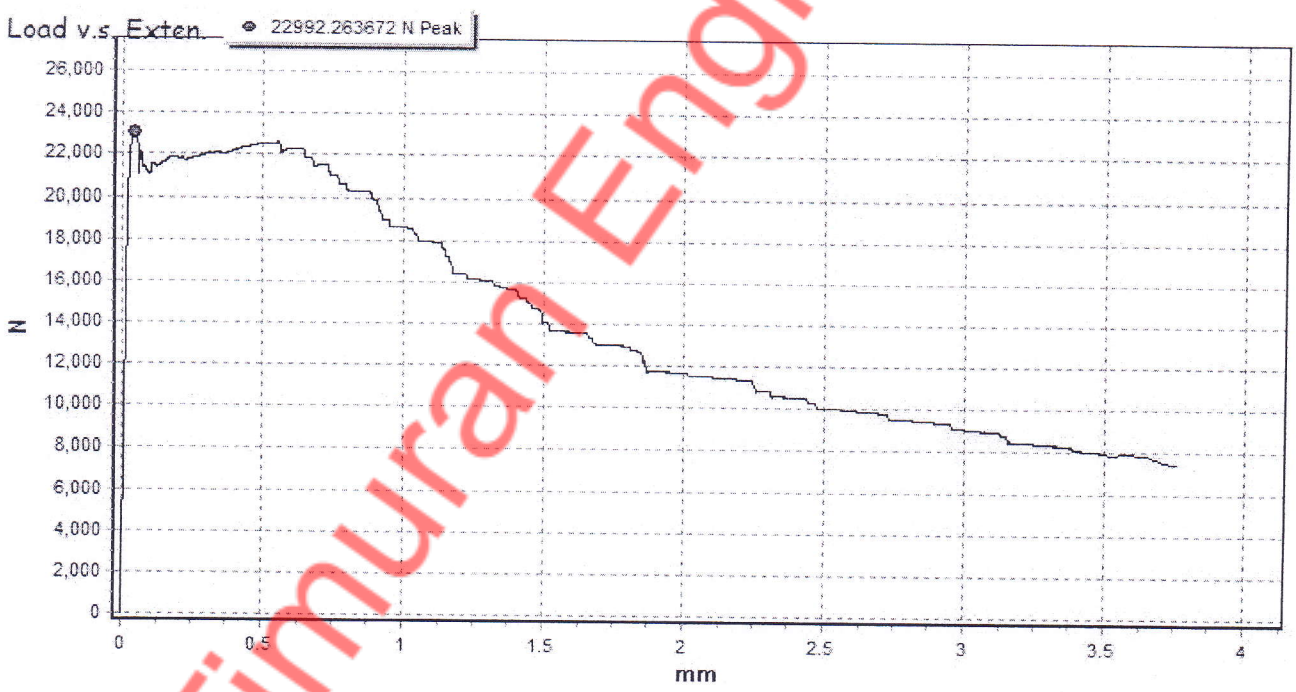
CUSTOMER : Timuran Engineering Sdn Bhd
PROJECT : -
SAMPLE : 0.75mmDia. x 60mm Length Hook Type Steel Fibre - 12
SOURCE : Timuran Eng Sdn Bhd
LAB REF : C730/12
DATE TESTED 3 Dec 2012

DATE CASTED : 4 Nov 2012
MACHINE NO 1575
TESTED BY : Anuar + Tan

TEST METHOD : BS EN 14651 : 2005 (Amd.2007)

First Crack at 0.05mm = 22863.328

Specimen	Dimension (mm)		Maximum		Load @ (N)			
	Width	Thickness	Load (N)	Load @ Deflection (mm)	0.5 (mm)	1.5 (mm)	2.5 (mm)	3.5 (mm)
C730-12 Beam 12	153.1	125.49	22992.264	0.043	22522.498	14088.858	10040.121	7952.709



C730-12 Beam - 12-001

Remarks : _____

_____

Witness by : _____ (Name)

_____ (Company)

_____ (Date)