

Lampiran 1 : Spesimen Sebelum Pengelasan





Lampiran 2 Spesimen Setelah Pengelasan













Lampiran 3 : Spesimen Uji Tarik





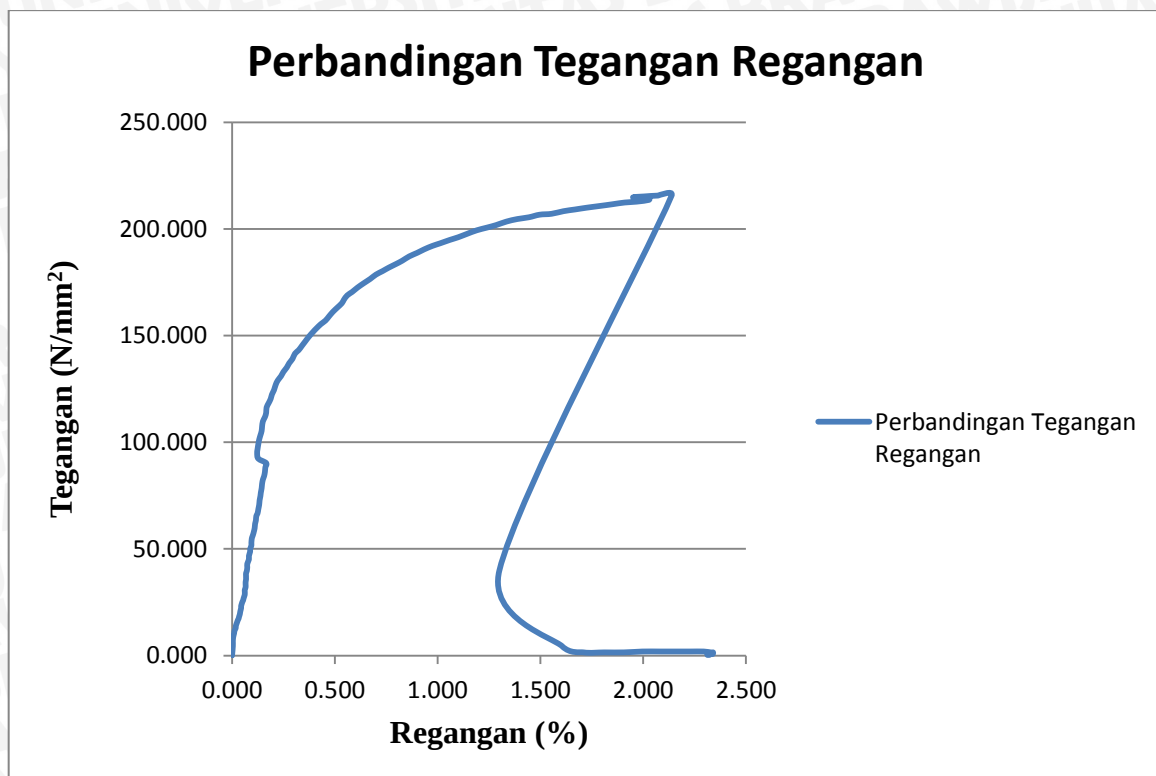




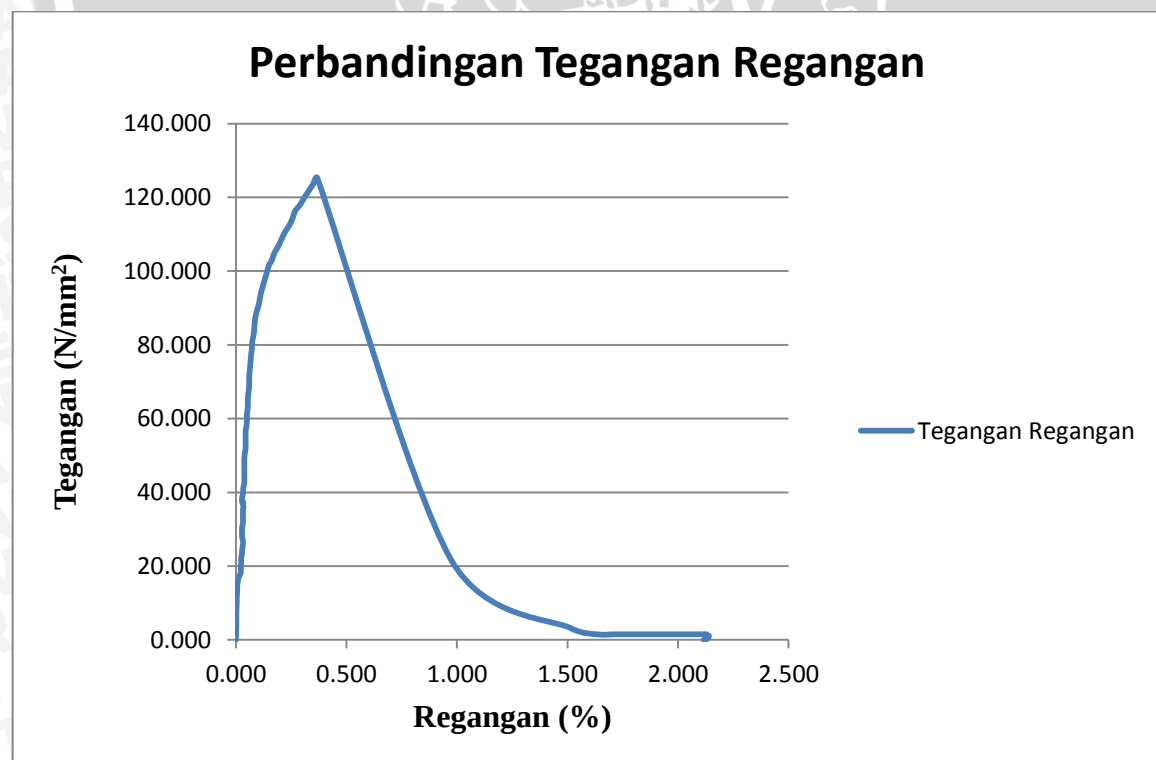




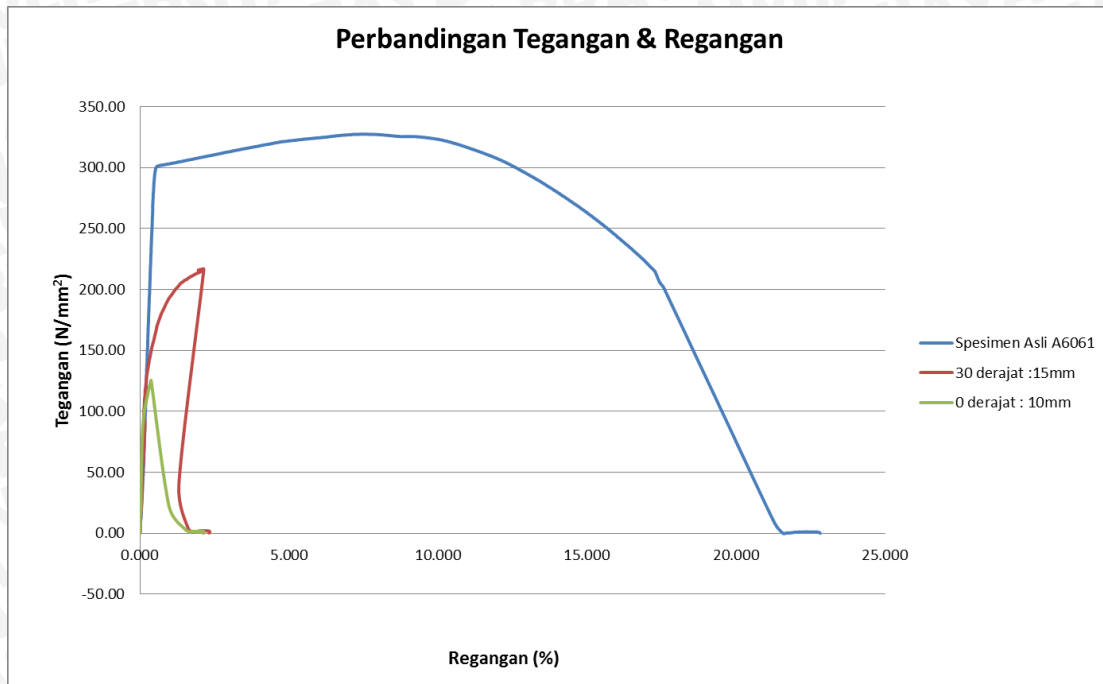
Lampiran 4 : Grafik Tegangan Regangan



Grafik Tegangan Regangan Kekuatan Tarik Tertinggi



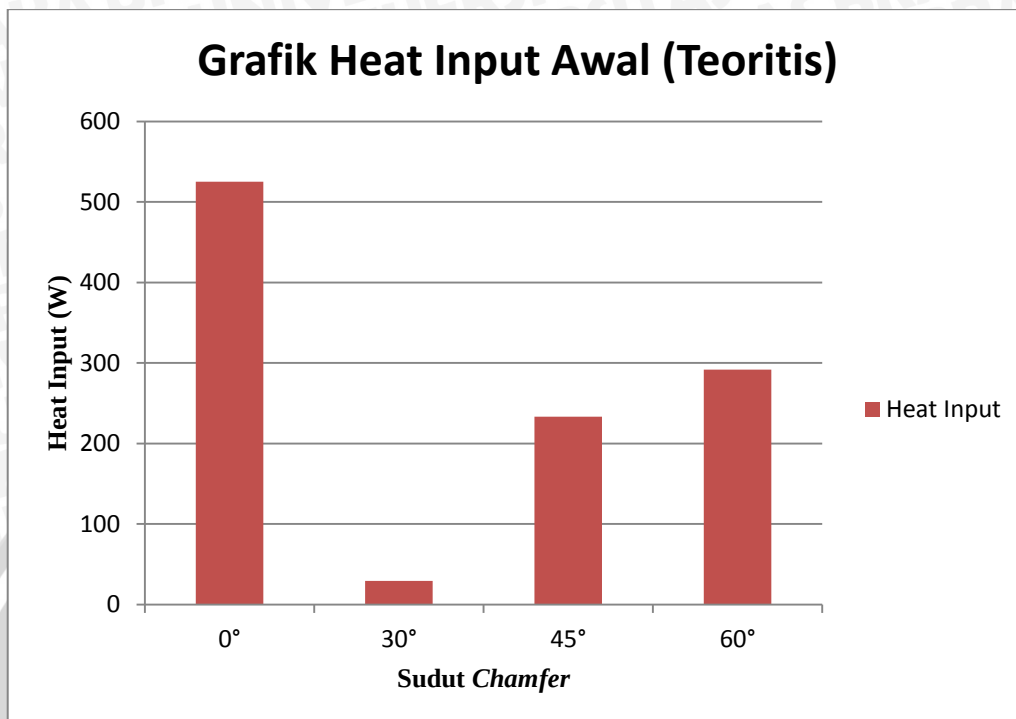
Grafik Tegangan Regangan Kekuatan Tarik Terendah



Grafik Tegangan Regangan



Lampiran 5 : Grafik Heat Input



Lampiran 6 : Tabel Komposisi Material

FROM :SUTINDO

FAX NO. :

12 Apr. 2016 12:07PM P1

SPECTRO

Up = Baby

Method:
Comment:

AI-SS
AI-Base SS

Element Concentration

Sample ID:
9091

	Si	Pb	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.344	0.276	0.348	0.0234	0.007	0.0016	0.0408	0.0144
2	0.587	0.289	0.264	0.0209	0.009	0.0010	0.0604	0.0134
3	0.970	0.278	0.348	0.0234	0.003	0.0017	0.0408	0.0144

	Mo	Cb	Ni	Pb	P	Sn	Sb	Br
	%	%	%	%	%	%	%	%
1	0.00000	0.00019	0.0078	0.0030	< 0.00040	0.00070	< 0.00040	0.00018
2	0.00000	0.00019	0.0081	0.0030	< 0.00040	0.00071	< 0.00040	0.00018
3	0.00000	0.00021	0.0078	0.0030	< 0.00040	0.00070	< 0.00040	0.00015

	Be	Zr	Ba	Co	Al
	%	%	%	%	%
1	0.00000	0.0014	< 0.00030	< 0.00010	97.8
2	0.00007	0.0014	< 0.00030	< 0.00010	97.8
3	0.00007	0.0014	< 0.00030	< 0.00010	97.8

PT KRAKATAU STEEL (PERSERO) Tbk.

(5 ton) batch St 41 ϕ 13 mm, ϕ 14 mm

KRAKATAU STEEL

MILL CERTIFICATE

SUPPLIER : PT. POSKAPAN STEEL,
COMMODITY : WIRE ROD SIZE DIA 13 MM
SPECIFICATION : S70K15

RS-W003-000 ISSUE NO : 4 ISSUE DATE : 21/02/2003

CERTIFICATE NO. : 1256/ME/00-AR/RSJ/11/2013
DATE : September 22, 2014
ORDER SHEET NO. : 6006029100-000050

No	Heat No.	Size (mm)	Qty (coil)	Coil (kg)	C	Si	Mn	P	S	Remark
1	436998	15	24	27121	0.08	0.02	0.56	0.005	0.007	GOOD
2	441442	15	10	11263	0.05	0.09	0.50	0.007	0.011	GOOD
3	426295	15	3	5652	0.07	0.07	0.55	0.005	0.023	GOOD
4	426285	15	4	4544	0.05	0.08	0.50	0.005	0.019	GOOD
5	436924	15	1	1114	0.08	0.05	0.54	0.007	0.015	GOOD
6	4368900	15	2	2265	0.07	0.07	0.54	0.006	0.011	GOOD
TOTAL QUANTITY : 45		COIL MASS : 51970 kg								

NOTE : THIS MASS IS CORRECT BEFORE TAKING SAMPLE AND IT IS FOR TECHNICAL NOT COMMERCIAL PURPOSES.
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HERE IN HAS BEEN TESTED AND INSPECTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENT OF THE ABOVE SPECIFICATION. ROD WITHOUT SPALLING IS GUARANTEED.

QUALITY CONTROL
Supervisor

Calibration Certificate



SNI ISO/IEC 17025:2008
(ISO/IEC 17025:2005)



www.easternproengineering.com
e-mail : service@easternproengineering.com

Certificate Number
4796.EPE.10.14

Order Number : 500.14.227
Received Date : October 02, 2014

Company Name : Lab. Stuktur Teknik Sipil Fakultas Teknik Universitas Negeri Malang
Address : Jl. Semarang No. 5 - Malang

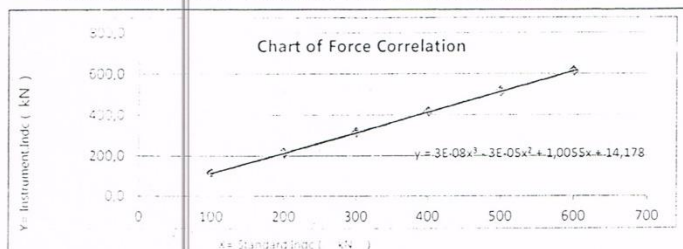
Equipment Name : Universal testing Machine
Manufacture : Kai Wei
Type / Model : -
Serial Number : 068
Capacity : 1000 kN
Resolution : 0,1 kN

Environment Condition of Calibration
Temperature : 25 ± 2 °C
Humidity : 54 ± 5 %
Reference : SMM-WI-F-01
Calibration Date : October 02, 2014
Calibration Location : Lab. Stuktur Teknik Sipil
Fakultas Teknik Universitas
Negeri Malang

Calibration Report

Standard Indication	Unit Under Test Indication		Correction		Error	
	Before Adjusting	After Adjusting	Before Adjusting	After Adjusting	Before Adjusting	After Adjusting
kN	kN	kN	kN	kN	kN	%
0	13,2	-	-13,2	-	0,0	-
100	114,5	-	-14,5	-	-14,5	-
200	214,4	-	-14,4	-	-7,2	-
300	314,4	-	-14,4	-	-4,8	-
400	413,9	-	-13,9	-	-3,5	-
500	514,2	-	-14,2	-	-2,8	-
600	614,6	-	-14,6	-	-2,4	-
700	715,6	-	-15,6	-	-2,2	-
Uncertainty 95% ± :			0,96 %			

The Uncertainty is taken at a Confidence Level 95 % and Coverage Factor (k) = 2



Calibrator used

Calibrator Name	Manufacture	Type	Serial Number	Traceable to SI Through
1. Loadcell	ELE	LI-SWI		LK - 013 - IDN

Calibrated By

Asih M. N. E.
Technician

Date of Issued
October 08, 2014

Ir Sukiswanto
Director

-End of Certificate-

This certificate applies only for the item specified above
It is prohibited to quote/reproduce and/or publish part of this certificate without written permission from PT. EASTERN PRO ENGINEERING
This certificate is valid when issued by PT. EASTERN PRO ENGINEERING

Kawasan Wangsa Niaga Wetan No. 27 Kota Baru Parahyangan - Bandung Barat
Phone : (022) 680 3053 - Fax : (022) 6803053



Lampiran 7 Pengujian Tarik



LABORATORIUM STRUKTUR

JURUSAN TEKNIK SIPIL

FAKULTAS TEKNIK UNIVERSITAS NEGERI MALANG

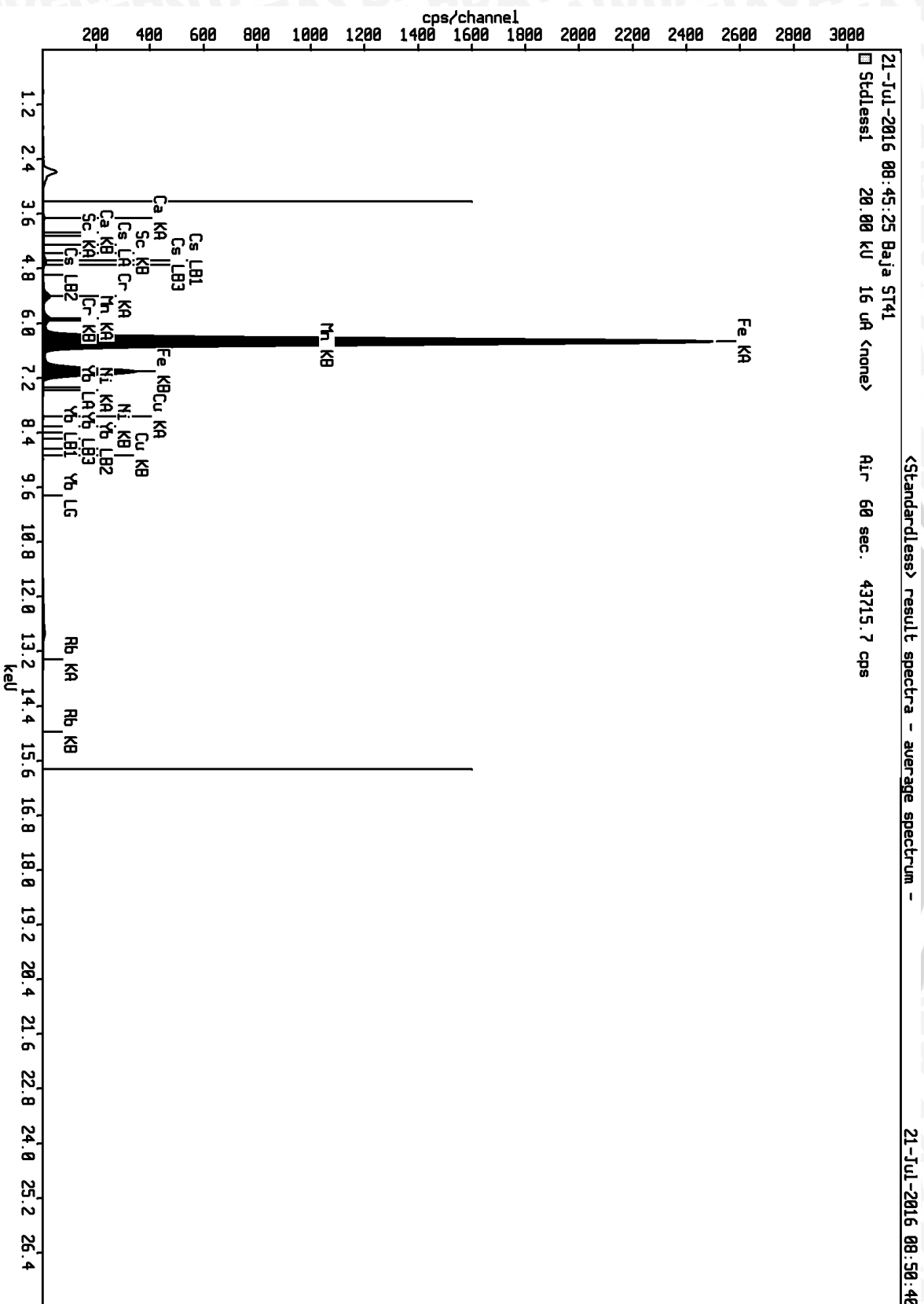
Gedung D9 Lt 2 Kampus UM Jl. Semarang No. 5 Malang Telp/Fax: (0341) 587 082 Ext. 2051

The Learning University

Data Hasil Pengujian Tarik

Burn of Length	Sudut	pcs	F_{max} (N)	D (mm)		F_{max} (N)	A (mm ²)		K.T
10	0	1	29895	13		16695	132.665		125.8433
		2	32554	13		19354	132.665		145.8863
		3	32662	13		19462	132.665		146.7003
	30	1	34278	13		21078	132.665		158.8814
		2	32746	13		19546	132.665		147.3335
		3	33572	13		20372	132.665		153.5597
	45	1	35646	13		22446	132.665		169.1931
		2	31577	13		18377	132.665		138.5218
		3	30655	13		17455	132.665		131.572
	60	1	33259	13		20059	132.665		151.2004
		2	35972	13		22772	132.665		171.6504
		3	29624	13		16424	132.665		123.8006
15	0	1	33313	13		20113	132.665		151.6074
		2	31523	13		18323	132.665		138.1148
		3	36243	13		23043	132.665		173.6931
	30	1	39010	13		25810	132.665		194.5502
		2	37437	13		24237	132.665		182.6932
		3	41940	13		28740	132.665		216.6359
	45	1	32011	13		18811	132.665		141.7932
		2	32934	13		19734	132.665		148.7506
		3	33167	13		19967	132.665		150.5069
	60	1	32717	13		19517	132.665		147.1149
		2	32104	13		18904	132.665		142.4943
		3	31849	13		18649	132.665		140.5721
20	0	1	30980	13		17780	132.665		134.0218
		2	32771	13		19571	132.665		147.522
		3	34182	13		20982	132.665		158.1578
	30	1	36786	13		23586	132.665		177.7862
		2	39065	13		25865	132.665		194.9648
		3	39607	13		26407	132.665		199.0502
	45	1	36352	13		23152	132.665		174.5148
		2	34995	13		21795	132.665		164.286
		3	35446	13		22246	132.665		167.6855
	60	1	34127	13		20927	132.665		157.7432
		2	35646	13		22446	132.665		169.1931
		3	36057	13		22857	132.665		172.2911





Sample results - Averages

Sample ident
Baja ST41

Application	<Standardless>
Sequence	Average of 3
Measurement period - start	21-Jul-2016 08:38:55
Measurement period - end	21-Jul-2016 08:45:25
Position	1

Compound	Ca	Sc	Cr	Mn	Fe	Ni
Conc	0.18 +/- 0.002	0.088 +/- 0.004	0.429 +/- 0.003	0.56 +/- 0.008	97.72 +/- 0.17	0.12 +/- 0.01
Unit	%	%	%	%	%	%

Compound	Rb	Cu	Cs	Yb
Conc	0.65 +/- 0.03	0.056 +/- 0.005	0.31 +/- 0.02	0.02 +/- 0.01
Unit	%	%	%	%





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LABORATORIUM STRUKTUR
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FAKULTAS TEKNIK UNIVERSITAS NEGERI MALANG
Gedung D9 Lt 2 Kampus UM Jl. Semarang No. 5 Malang Telp/Fax: (0341) 587 082 Ext. 205

SURAT KETERANGAN

No. 13a.07.2016

Yang bertandatangan di bawah ini Laboran / Teknisi Laboratorium Jurusan Teknik Sipil Fakultas Teknik Universitas Negeri Malang, menerangkan bahwa,

Nama : Faldi Hadyan

NIM : 115060207111016-62

Instansi : Jurusan Teknik Mesin – Fakultas Teknik – Universitas Brawijaya

Telah melakukan pengujian tarik sambungan Las *Dissimilar Friction Welding* a6061-ST41 sebanyak 36 benda uji pada tanggal 28 Juni 2016 di Laboratorium Struktur - Teknik Sipil – FT - UM.

Demikian keterangan ini dibuat untuk dipergunakan sebagaimana mestinya.

Mengetahui,
Kepala Laboratorium
Teknik Sipil-FT-UM



Dr. Karyadi, M.P., M.T
NIP. 19610312 198703 1 001

Malang, 13 Juli 2016
Koordinator Uji
Laboratorium Struktur-FT-UM

Lusti Mustikasari, Amd
NIP. -