

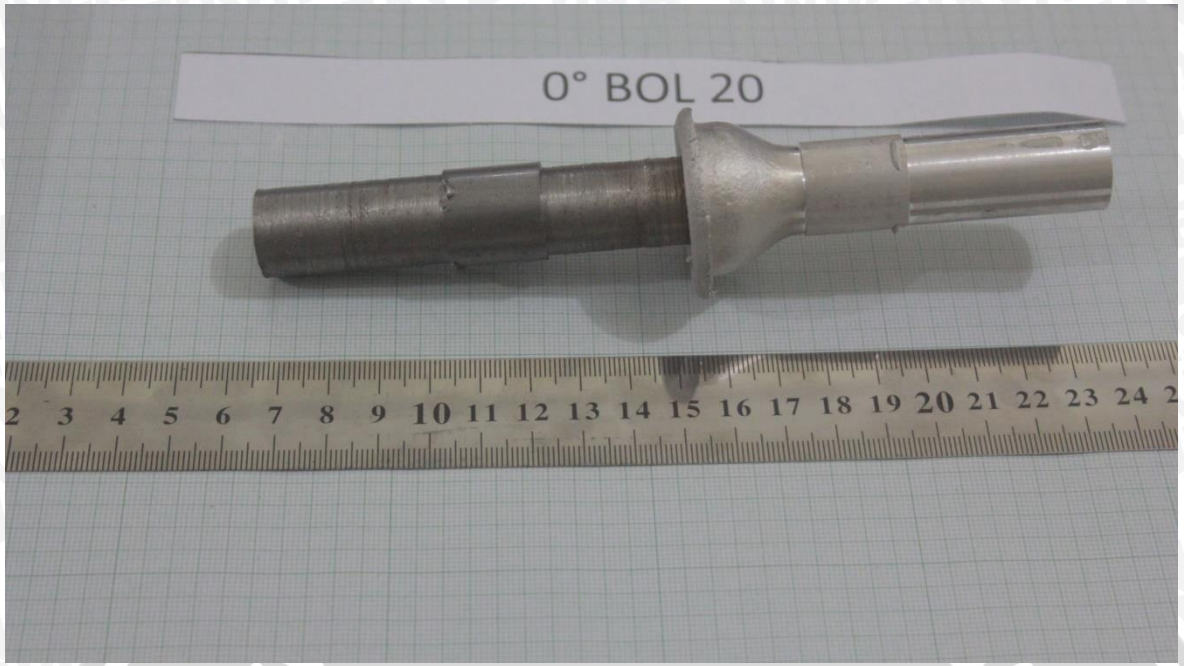
Lampiran 1 : Spesimen Sebelum Pengelasan





Lampiran 2 Spesimen Setelah Pengelasan













Lampiran 3 : Spesimen Uji Tarik





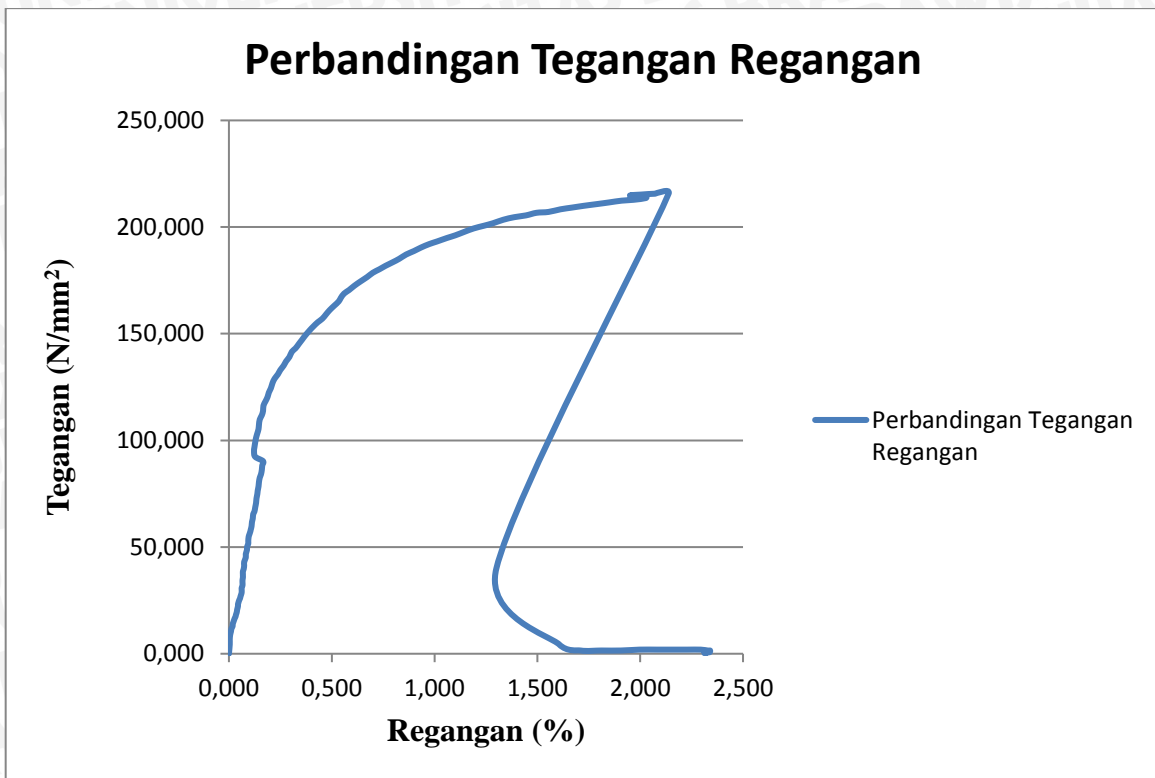




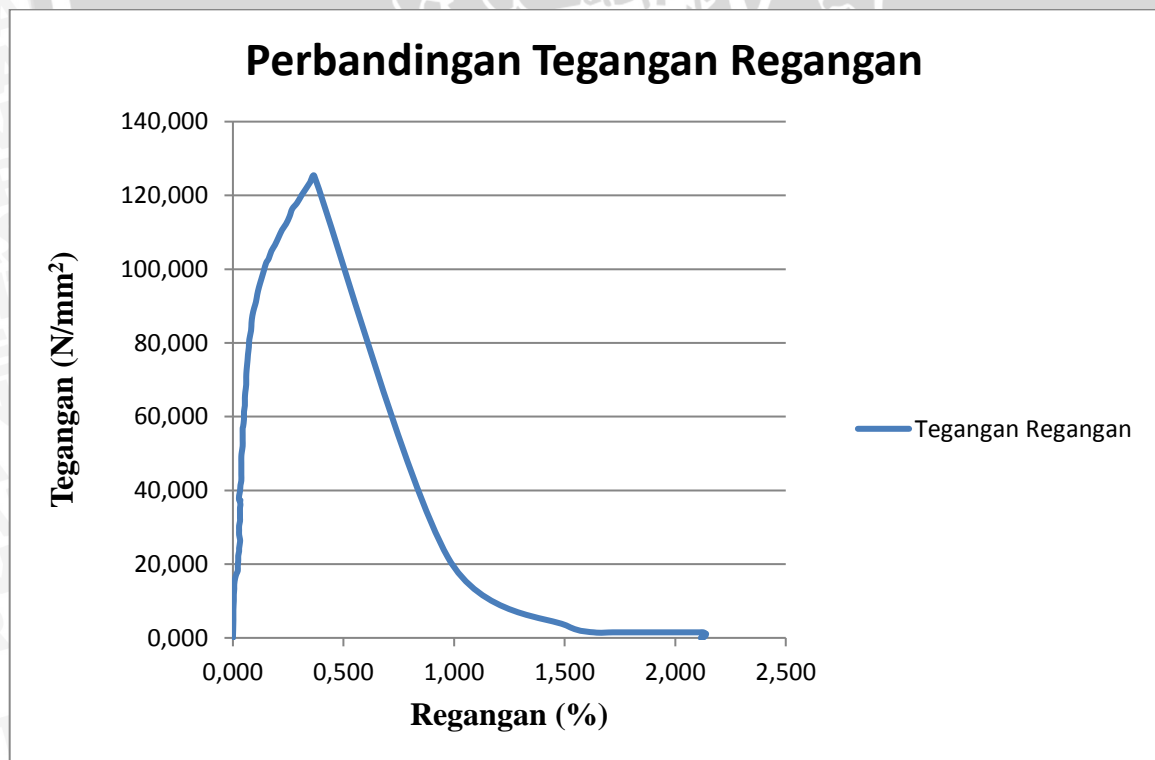




Lampiran 4 : Grafik Tegangan Regangan

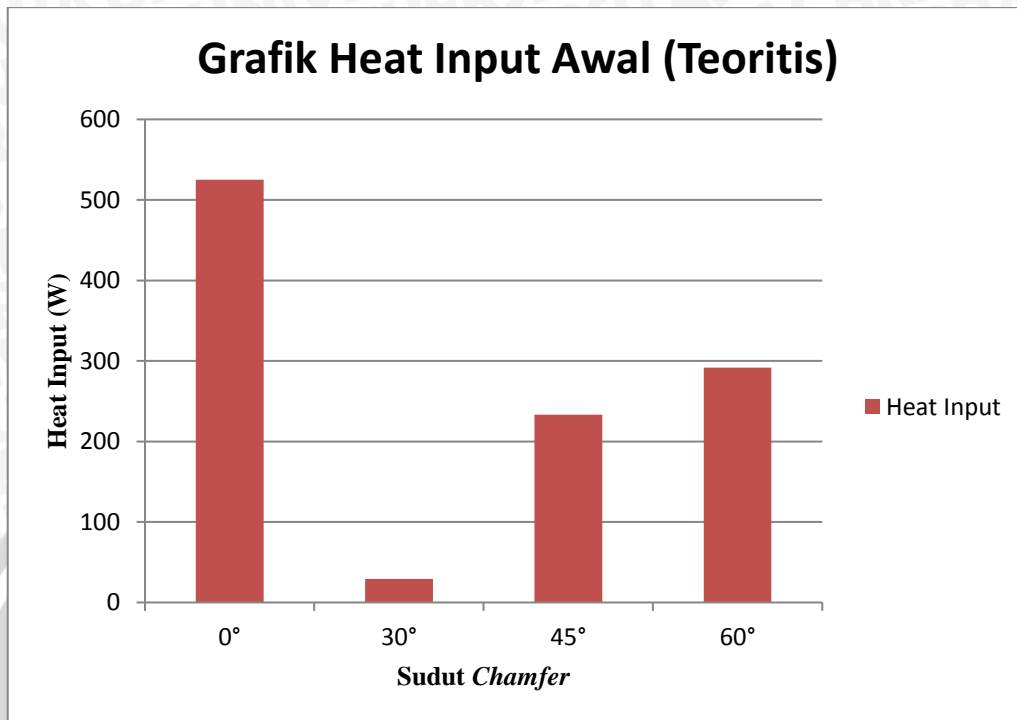


Grafik Tegangan Regangan Kekuatan Tarik Tertinggi



Grafik Tegangan Regangan Kekuatan Tarik Terendah

Lampiran 5 : Grafik Heat Input



Lampiran 6 : Tabel Hasil Pengujian Komposisi

SPECTRO

Method: AI-SS
Comment: AI-Base SS
Element Concentration

Sample ID: 6061

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
	%	%	%	%	%	%	%	%
1	0.566	0.275	0.246	0.0234	0.667	0.0618	0.0495	0.0144
2	0.587	0.289	0.254	0.0236	0.609	0.0610	0.0504	0.0134
3	0.570	0.275	0.246	0.0234	0.663	0.0617	0.0485	0.0142

	Na	Ca	Ni	Pb	P	Sn	Sb	Sr
	%	%	%	%	%	%	%	%
1	0.00088	0.00019	0.0078	0.0020	< 0.00050	0.00070	< 0.00040	0.00016
2	0.00090	0.00019	0.0081	0.0020	< 0.00050	0.00071	< 0.00040	0.00016
3	0.00090	0.00021	0.0078	0.0020	< 0.00050	0.00070	< 0.00040	0.00015

	Ba	Zr	Bi	Cd	Al
	%	%	%	%	%
1	0.00006	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 GROWTH SUMATRA INDUSTRY
Head Office / factory : Medan.

MILL TEST CERTIFICATE

COMMODITY : COLD DRAWN STEEL ROUND BARS CERTIFICATE NO : 1304/D/XII/081/2014
SPECIFICATION : S30 400 - D - SS 41. No. PO : -
(Equivalent to JIS G. 3133). DATE OF ISSUE : 08/12/2014
No. Contract : -

DIMENSION		HEAT NUMBER	QUANTITY	CHEMICAL COMPOSITION (%)					TENSILE STRENGTH (N/mm ²)	HARDNESS	
DIAMETER (in, mm)	LENGTH (mtr)			C	SI	Mn	P	S		(HRB)	(HB)
1 1/2 in	6	12450	150	0.1706	0.1919	0.5991	0.0275	0.0410	636	-	174
1 1/4 in	6	32227	2040	0.1472	0.1456	0.5059	0.0072	0.0351	625	-	170
1 1/8 in	6	32213	198	0.1668	0.2119	0.5973	0.0190	0.0362	624	-	168
1 3/4 in	6	32225	236	0.1690	0.1960	0.5310	0.0280	0.0440	633	-	177
1 in	6	12444	1100	0.1726	0.1978	0.5345	0.0304	0.0362	630	-	169
2 1/2 in	6	12491	32	0.1680	0.2050	0.5990	0.0280	0.0360	640	-	178
2 1/4 in	6	12485	20	0.1679	0.2091	0.5961	0.0246	0.0368	624	-	170
2 in	6	12475	75	0.1369	0.1706	0.5477	0.0104	0.0357	631	-	168
20 mm	6	12430	365	0.1342	0.1503	0.4261	0.0197	0.0379	621	-	160
26 mm	6	12436	1940	0.1305	0.1921	0.4783	0.0196	0.0404	622	-	166
3 in	6	12453	24	0.1501	0.1985	0.5459	0.0200	0.0421	630	-	169
30 mm	6	12443	292	0.1945	0.2193	0.4402	0.0405	0.0441	640	-	176
35 mm	6	12480	245	0.1528	0.1371	0.5948	0.0241	0.0415	633	-	164
40 mm	6	12446	40	0.1452	0.2369	0.4312	0.0214	0.0372	628	-	169
7/8 in	6	32189	910	0.1408	0.1669	0.5989	0.0148	0.0335	624	79	-

1 / 2



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

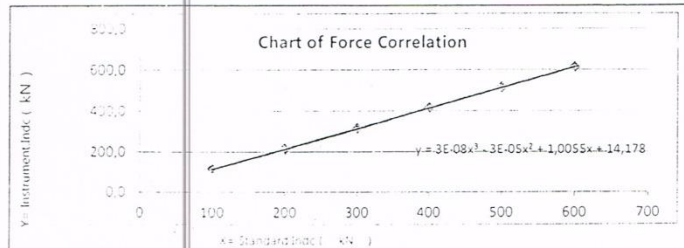
Equipment Name : Universal testing Machine
Manufacture : Kai Wei
Type / Model : -
Serial Number : 068
Capacity : 1000 kN
Resolution : 0,1 kN

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	Treaceable 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





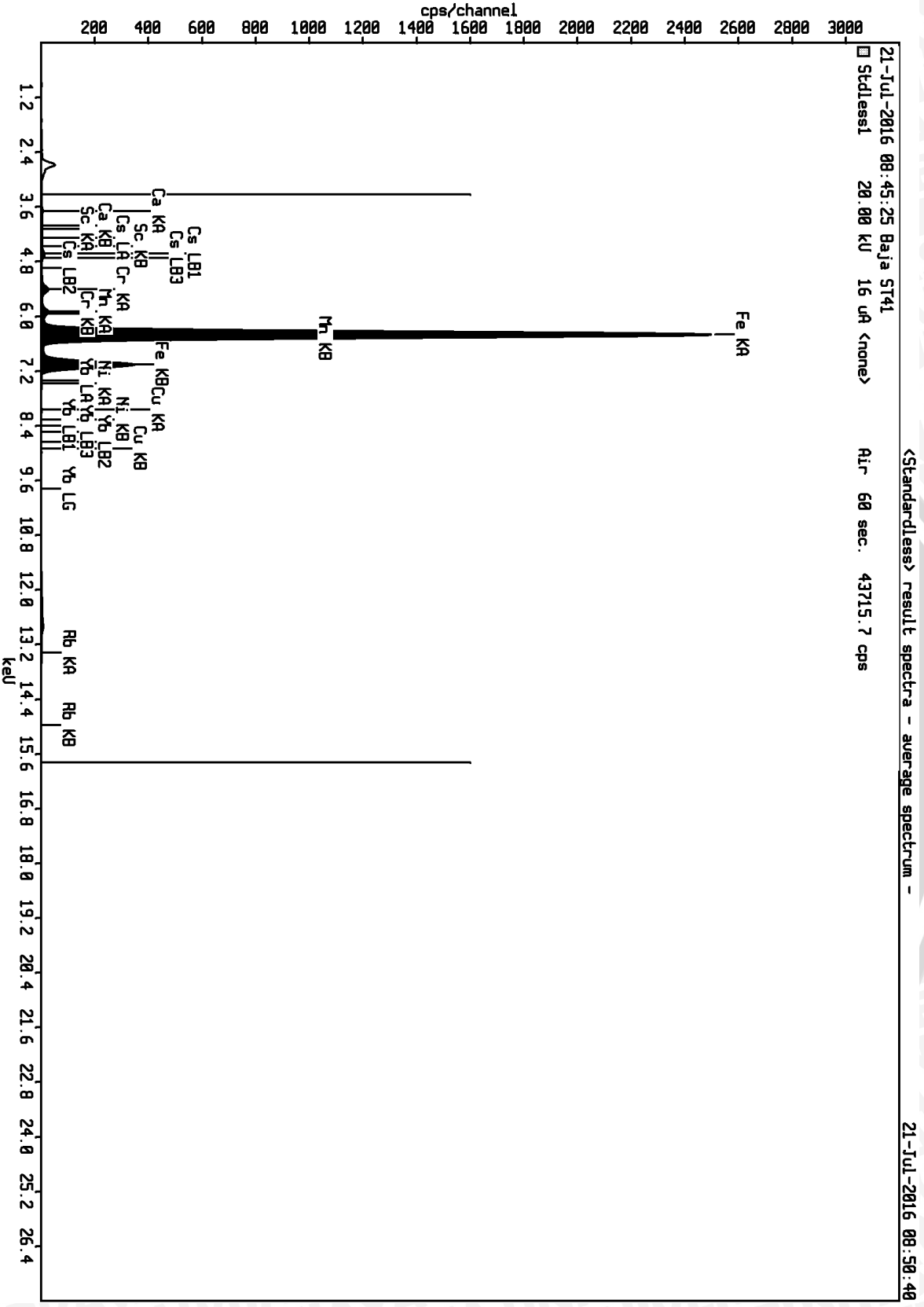
LABORATORIUM STRUKTUR
JURUSAN TEKNIK SIPIL
FAKULTAS TEKNIK UNIVERSITAS NEGERI MALANG
 Gedung D9 Lt 2 Kampus UM Jl. Semarang No. 5 Malang Telp/Fax: (0341) 587 082 Ext. 2051

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	K.T rata-rata	Standar Deviasi	%
10	0	1	29895	13	16695	132.665	125.8433	139.4766	11.81383055	8%
		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	153.2582	5.779843137	4%
		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	146.429	20.0182021	14%
		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	148.8838	24.00889401	16%
		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	154.4718	17.96128931	12%
		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	197.9598	17.22627762	9%
		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	147.0169	4.608286464	3%
		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	143.3938	3.362867994	2%
		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	146.5672	12.09628514	8%
		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	190.6004	11.28389016	6%
		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	168.8288	5.209335332	3%
		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	166.4091	7.663113399	5%
		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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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

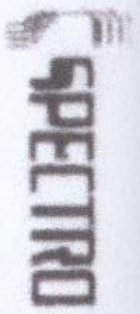


Dr. Karyadi, M.P., M.T
NIP. 19610312 198703 1 001

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

Lusti Mustikasari, Amd
NIP. -





Method:
Comment:

ALSS
Al-Base SS

Element Concentration

Sample ID:
6061

	Si	Pb	Cu	Mn	Mg	Cr	Zn	Ti
1	0.296 %	0.276 %	0.246 %	0.0234 %	0.067 %	0.0616 %	0.0496 %	0.014 %
2	0.547 %	0.269 %	0.254 %	0.0296 %	0.909 %	0.0610 %	0.0504 %	0.0134 %
3	0.510 %	0.275 %	0.246 %	0.0234 %	0.603 %	0.0617 %	0.0496 %	0.0145 %

	Na	Ca V	Ni	Pb	P	Sn	Sb	Bi
1	0.00488 %	0.00019 %	0.0078 %	0.0020 %	< 0.00060 %	0.20070 %	< 0.00040 %	0.00016 %
2	0.00090 %	0.00019 %	0.0081 %	0.0020 %	< 0.00060 %	0.20071 %	< 0.00040 %	0.00016 %
3	0.00090 %	0.00021 %	0.0078 %	0.0020 %	< 0.00060 %	0.20070 %	< 0.00040 %	0.00015 %

	Ba	Zr	Bi	Cd	Al
1	0.000096 %	0.0014 %	< 0.00010 %	< 0.00010 %	97.8 %
2	0.000097 %	0.0014 %	< 0.00010 %	< 0.00010 %	97.8 %
3	0.000097 %	0.0014 %	< 0.00010 %	< 0.00010 %	97.8 %

