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Lampiran 1. Hasil Uji Komposisi

Lampiran 2. Hasil Uji Kekerasan

Tempat : Lab Bahan Teknik, JTMI FT UGM
 Material : 12Cr1MoV dengan filler ER80SG
 Suhu : Suhu Kamar
 Beban : 100 gf
 Waktu : 10 detik

No	Jarak	SPECIMEN TANPA PREHEAT					SPECIMEN PREHEAT 150 C				
		d1	d2	d-ok	Daerah	VHN	d1	d2	d-ok	Daerah	VHN
1	0,00	25	27,5	26,25	WM	269,06	26	26	26,00	WM	274,26
2	0,25	26,5	26,5	26,50	WM	264,01	27,2	26	26,60	WM	262,03
3	0,50	26,5	25,5	26,00	WM	274,26	26	27	26,50	WM	264,01
4	0,75	26,5	25,5	26,00	WM	274,26	25,8	27	26,40	WM	266,01
5	1,00	27	25,5	26,25	WM	269,06	25,5	25,7	25,60	WM	282,90
6	1,25	26	27	26,50	WM	264,01	26	24,5	25,25	WM	290,80
7	1,50	26	25	25,50	WM	285,12	25	25,7	25,35	WM	288,51
8	1,75	26,5	25,5	26,00	WM	274,26	25,5	25,5	25,50	WM	285,12
9	2,00	26	27,5	26,75	WM	259,10	25	26	25,50	WM	285,12
10	2,25	27,5	27	27,25	WM	249,68	25,7	26,2	25,95	WM	275,32
11	2,50	26,5	26,5	26,50	WM	264,01	26,5	26,5	26,50	WM	264,01
12	2,75	26,5	27,2	26,85	WM	257,17	26,2	26,2	26,20	WM	270,09
13	3,00	26,7	27,5	27,10	WM	252,45	26,5	27	26,75	HAZ1	259,10
14	3,25	26,6	26,6	26,60	WM	262,03	26,5	27,5	27,00	HAZ1	254,32
15	3,50	25,7	27,2	26,45	WM	265,01	26	27	26,50	HAZ1	264,01
16	3,75	27,5	25,5	26,50	WM	264,01	25,5	26,7	26,10	HAZ1	272,16
17	4,00	27	26,2	26,60	WM	262,03	27,5	26,5	27,00	HAZ1	254,32
18	4,25	27,5	26,5	27,00	WM	254,32	26,5	27	26,75	HAZ1	259,10
19	4,50	25,5	26,7	26,10	WM	272,16	27,5	26,5	27,00	HAZ2	254,32
20	4,75	27,5	26,2	26,85	WM	257,17	27	28	27,50	HAZ2	245,16
21	5,00	26	26	26,00	WM	274,26	27,5	27,5	27,50	HAZ2	245,16
22	5,25	25,5	27	26,25	WM	269,06	26,5	28,2	27,35	HAZ2	247,85
23	5,50	25,5	26,2	25,85	WM	277,45	29	26,5	27,75	HAZ2	240,76
24	5,75	26	26,5	26,25	WM	269,06	27	28	27,50	HAZ2	245,16
25	6,00	26	24,5	25,25	HAZ1	290,80	28	29	28,50	HAZ2	228,25
26	6,25	24,8	25,5	25,15	HAZ1	293,11	30	31	30,50	HAZ2	199,30
27	6,50	27,5	28	27,75	HAZ1	240,76	32	32,2	32,10	HAZ2	179,93
28	6,75	27	27	27,00	HAZ1	254,32	33	31	32,00	BM	181,05
29	7,00	27,7	28	27,85	HAZ1	239,03	31,2	33	32,10	BM	179,93
30	7,25	28	28,5	28,25	HAZ1	232,31	34,5	33	33,75	BM	162,77
31	7,50	28	28,5	28,25	HAZ1	232,31	34,5	33,5	34,00	BM	160,38
32	7,75	27,7	28	27,85	HAZ1	239,03	31,5	31	31,25	BM	189,85
33	8,00	27,5	28	27,75	HAZ2	240,76	32	32	32,00	BM	181,05
34	8,25	27	29,5	28,25	HAZ2	232,31	32	32,7	32,35	BM	177,16
35	8,50	30,5	31	30,75	HAZ2	196,07	35	32,5	33,75	BM	162,77
36	8,75	29,5	31	30,25	HAZ2	202,61	31,5	34	32,75	BM	172,86
37	9,00	31	33	32,00	HAZ2	181,05	33	33,5	33,25	BM	167,70
38	9,25	35,5	33	34,25	HAZ2	158,05	31,5	33	32,25	BM	178,26
39	9,50	34	33	33,50	BM	165,20					
40	9,75	32,2	35	33,60	BM	164,22					
41	10,00	35,5	34	34,75	BM	153,53					
42	10,25	35,5	33,5	34,50	BM	155,77					
43	10,50	36	37	36,50	BM	139,16					
44	10,75	36,5	36	36,25	BM	141,09					
45	11,00	36,5	35,5	36,00	BM	143,06					
46	11,25	36,5	35	35,75	BM	145,06					
47	11,50	35,2	34,2	34,70	BM	153,98					
48	11,75	34,5	35,5	35,00	BM	151,35					
49	12,00	34,5	35,2	34,85	BM	152,65					
50	12,25	34	32,5	33,25	BM	167,70					

Tempat : Lab Bahan Teknik, JTMI FT UGM
Material : 12Cr1MoV dengan filler ER80SG
Suhu : Suhu Kamar
Beban : 100 gf
Waktu : 10 detik

No	Jarak	SPECIMEN PREHEAT 200 C					SPECIMEN PREHEAT 250 C				
		d1	d2	d-ok	Daerah	VHN	d1	d2	d-ok	Daerah	VHN
1	0,00	26,5	25,5	26,00	WM	274,26	26	26,5	26,25	WM	269,06
2	0,25	26	25,7	25,85	WM	277,45	26	25,5	25,75	WM	279,61
3	0,50	27,5	25,5	26,50	WM	264,01	25,5	26,5	26,00	WM	274,26
4	0,75	26,3	25,5	25,90	WM	276,38	27	25,5	26,25	WM	269,06
5	1,00	26	26,2	26,10	WM	272,16	25,5	26,5	26,00	WM	274,26
6	1,25	27	25,5	26,25	WM	269,06	27	27	27,00	WM	254,32
7	1,50	24,5	26	25,25	WM	290,80	27,5	27	27,25	WM	249,68
8	1,75	25,5	24	24,75	WM	302,66	27	26,5	26,75	WM	259,10
9	2,00	25	25,5	25,25	WM	290,80	26	26	26,00	WM	274,26
10	2,25	24,5	25	24,75	WM	302,66	27	27,5	27,25	WM	249,68
11	2,50	25,5	25,5	25,50	WM	285,12	26,5	27,5	27,00	WM	254,32
12	2,75	24,5	25,5	25,00	WM	296,64	26,5	25,5	26,00	WM	274,26
13	3,00	26	25	25,50	WM	285,12	25,5	26	25,75	WM	279,61
14	3,25	24	26,5	25,25	WM	290,80	27,5	25	26,25	WM	269,06
15	3,50	26	25	25,50	WM	285,12	25,5	26	25,75	WM	279,61
16	3,75	24,5	24,5	24,50	WM	308,87	27,5	25,5	26,50	WM	264,01
17	4,00	26	24,5	25,25	WM	290,80	25	27,5	26,25	WM	269,06
18	4,25	24	25,5	24,75	WM	302,66	27,5	26	26,75	WM	259,10
19	4,50	24,5	26	25,25	WM	290,80	25,5	26,5	26,00	HAZ 1	274,26
20	4,75	26	26,5	26,25	WM	269,06	28	27	27,50	HAZ 1	245,16
21	5,00	26,5	24,5	25,50	WM	285,12	26	26,5	26,25	HAZ 1	269,06
22	5,25	26,5	26	26,25	WM	269,06	27	27	27,00	HAZ 1	254,32
23	5,50	27	26	26,50	HAZ 1	264,01	29	29	29,00	HAZ 1	220,45
24	5,75	28,5	29	28,75	HAZ 1	224,30	29	27,5	28,25	HAZ 1	232,31
25	6,00	27,5	28	27,75	HAZ 1	240,76	27,5	28,5	28,00	HAZ 1	236,48
26	6,25	28,5	29	28,75	HAZ 1	224,30	28	27,5	27,75	HAZ 1	240,76
27	6,50	28	28	28,00	HAZ 1	236,48	27	27,5	27,25	HAZ 1	249,68
28	6,75	28,5	28,5	28,50	HAZ 1	228,25	28	27	27,50	HAZ 1	245,16
29	7,00	28	27	27,50	HAZ 1	245,16	27,5	29,5	28,50	HAZ 2	228,25
30	7,25	28,5	28	28,25	HAZ 2	232,31	28	26	27,00	HAZ 2	254,32
31	7,50	31,5	29,5	30,50	HAZ 2	199,30	27	28	27,50	HAZ 2	245,16
32	7,75	30	31,5	30,75	HAZ 2	196,07	30	29,5	29,75	HAZ 2	209,48
33	8,00	32,5	32	32,25	HAZ 2	178,26	29	29	29,00	HAZ 2	220,45
34	8,25	31,5	34	32,75	HAZ 2	172,86	32,5	32,5	32,50	HAZ 2	175,53
35	8,50	32,5	31,5	32,00	HAZ 2	181,05	32	30,5	31,25	HAZ 2	189,85
36	8,75	34,5	32,5	33,50	HAZ 2	165,20	31,5	32	31,75	HAZ 2	183,92
37	9,00	32	32,5	32,25	BM	178,26	32	31	31,50	HAZ 2	186,85
38	9,25	35,5	35	35,25	BM	149,21	31,5	32,5	32,00	HAZ 2	181,05
39	9,50	34,5	33,5	34,00	BM	160,38	34	33,5	33,75	BM	162,77
40	9,75	34	35	34,50	BM	155,77	33	35	34,00	BM	160,38
41	10,00	36,5	34	35,25	BM	149,21	34,5	33,5	34,00	BM	160,38
42	10,25	34,5	35	34,75	BM	153,53	32,5	32,5	32,50	BM	175,53
43	10,50	33	32,5	32,75	BM	172,86	32,5	33,5	33,00	BM	170,25
44	10,75	33,5	33,5	33,50	BM	165,20	35,5	33,5	34,50	BM	155,77
45	11,00	34,5	33	33,75	BM	162,77	33	34	33,50	BM	165,20
46	11,25	32,5	33,5	33,00	BM	170,25	35	33,5	34,25	BM	158,05
47	11,50	33	34,5	33,75	BM	162,77	33,5	34,5	34,00	BM	160,38
48	11,75						34,5	33,5	34,00	BM	160,38
49	12,00						32	33	32,50	BM	175,53
50	12,25						35	34,5	34,75	BM	153,53

Lampiran 3. Hasil Uji Impak


LAPORAN PENGUJIAN IMPACT DAERAH LAS

Tempat : Lab Bahan Teknik, JTMI FT UGM
 Material : 12Cr1MoV dengan filler ER80SG
 Metode : Charpy (takik pada daerah las)
 Suhu : Suhu Kamar
 Beban : 8,5 kg / 150 Joule
 Jari <R> : 83 cm

No Specimen	a	b	Ao	α	β	HI	Rata-rata HI	HK	Rata-rata HK	Hasil Konversi (ASM Vol 8)	
										HI	HK
A2	8,10	7,40	59,94	156	75	82,71	79,87	1,43	1,31	66,29	1,09
A1	8,00	7,45	59,60	156	73	85,08					
A3	8,10	7,45	60,35	156	84	71,83					
B1	8,15	7,40	60,31	156	91	63,22	64,45	1,05	1,07	53,49	0,89
B2	8,10	7,45	60,35	156	99						
B3	8,10	7,45	60,35	156	89	65,68					
C1	7,95	7,45	59,23	156	74	83,90	66,84	1,42	1,21	55,47	1,00
C2	8,00	7,45	59,60	156	97	55,85					
C3	8,20	7,40	60,68	156	93	60,76					
D1	8,10	7,40	59,94	156	53	106,91	88,14	1,78	1,47	73,16	1,22
D2	8,10	7,40	59,94	156	93						
D3	8,20	7,35	60,27	156	86	69,37					

Keterangan

$$HI = W \times g \times R (\cos\beta - \cos\alpha)$$

$$HK = \frac{HI}{A}$$


LAPORAN PENGUJIAN IMPACT DAERAH HAZ

Tempat : Lab Bahan Teknik, JTMI FT UGM
 Material : 12Cr1MoV dengan filler ER80SG
 Metode : Charpy (takik pada daerah las)
 Suhu : Suhu Kamar
 Beban : 8,5 kg / 150 Joule
 Jari <R> : 83 cm

No Specimen	a	b	Ao	α	β	HI	Rata-rata HI	HK	Rata-rata HK	Hasil Konversi (ASM Vol 8)	
										HI	HK
A1	8,20	7,50	61,50	156	15		110,74	0,00	0,92	91,91	0,76
A2	8,10	7,45	60,35	156	49	110,74					
B1	7,70	7,55	58,14	156	45	114,34	113,00	1,97	1,93	93,79	1,60
B2	8,00	7,40	59,20	156	48	111,66					
C1	8,00	7,40	59,20	156	47	112,57	114,31	1,90	1,93	94,87	1,60
C2	8,00	7,40	59,20	156	43	116,05					
D1	8,00	7,00	56,00	156	54	105,92	103,88	1,89	1,84	86,22	1,53
D2	8,00	7,10	56,80	156	58	101,84					
E1	8,00	7,30	58,40	156	37	120,79	120,10	2,07	2,04	99,68	1,69
E2	8,10	7,40	59,94	156	37	120,79					
E3	8,00	7,50	60,00	156	33	123,62					
E4	8,00	7,20	57,60	156	44	115,20					

Keterangan

$$HI = W \times g \times R (\cos\beta - \cos\alpha)$$


$$HK = \frac{HI}{A}$$


Table 1 Conversion table for subsize Charpy impact-test specimens (ASM Handbook Vol 8)

Size of specimens ^(a) , mm	Minimum average impact strength for three specimens		Minimum impact strength for one specimens or for set of three specimens	
	J	ft · lbf	J	ft · lbf
10 × 10 (full size)	20.3	15.0	13.6	10.0
10 × 7.5	16.9	12.5	11.5	8.5
10 × 5	13.6	10.0	9.5	7.0
10 × 2.5	6.8	5.0	4.7	3.5

Lampiran 4. Hasil Uji Tarik

LAPORAN PENGUJIAN TARIK

Tempat : Lab Bahan Teknik, JTM I FT UGM
 Material : 12Cr1MoV dengan filler ER80SG
 Suhu : Suhu Kamar
 Beban : 4 ton

No Specimen	a	b	Ao	Lo	L1	Beban		Tegangan Luluh		Rata-rata YS	Ultimate Stress		Rata-rata UTS	Regangan	Rata-rata
						Luluh	Putus	kg/mm ²	Mpa		kg/mm ²	Mpa			
A1	6.5	6.0	39.00	50	58.5	39.70%	52.70%	40.718	399.443	391	54.051	530.243	524	17.00%	17.67%
A2	6.4	6.0	38.40	50	58.0	37.30%	50.00%	38.854	381.159	391	52.083	510.938	524	16.00%	
A3	6.5	6.0	39.00	50	60.0	38.90%	52.90%	39.897	391.394	391	54.256	532.255	524	20.00%	
B1	6.3	5.9	37.17	50	58.5	35.80%	38.80%	38.526	377.937	382	41.754	409.608	482	17.00%	17.67%
B2	6.4	6.0	38.40	50	59.0	38.00%	51.10%	39.583	388.313	382	53.229	522.178	482	18.00%	
B3	6.4	5.9	37.76	50	59.0	36.60%	49.40%	38.771	380.345	382	52.331	513.362	482	18.00%	
C1	6.3	6.0	37.80	50	58.5	37.70%	51.10%	39.894	391.362	383	54.074	530.467	522	17.00%	16.33%
C2	6.3	5.9	37.17	50	57.5	35.10%	48.50%	37.772	370.547	383	52.193	512.010	522	15.00%	
C3	6.3	5.9	37.17	50	58.5	36.60%	49.50%	39.387	386.383	383	53.269	522.567	522	17.00%	
D1	6.3	5.9	37.17	50	58.5	36.50%	50.00%	39.279	385.327	390	53.807	527.845	531	17.00%	15.67%
D2	6.3	5.8	36.54	50	57.5	36.10%	49.30%	39.518	387.675	390	53.968	529.429	531	15.00%	
D3	6.3	5.9	37.17	50	57.5	37.60%	50.80%	40.463	396.939	390	54.668	536.291	531	15.00%	
E1	3.75	12.5	46.88	54.1	65.4	54.20%	70.40%	46.251	453.719	435	60.075	569.332	590	20.79%	19.28%
E2	3.6	12.5	45.00	57.9	63.4	53.00%	68.70%	47.111	462.160	435	61.067	599.064	590	20.79%	
E3	3.7	12.4	45.70	62.2	73.3	52.20%	67.90%	45.694	448.261	435	59.438	583.083	590	17.77%	