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LAMPIRAN



ALLOY

10s.



2:19pm



MILKA AL

C-4130



POSSIBLE MATCH (1/3)

ELEMENT	% ↑	+/-	LIMIT
Fe	89.70	0.141	90.00 - 100.00
Zn	10.06	0.056	
Mn	0.16	0.015	0.40 - 0.60
Cr	0.08	0.006	0.80 - 1.10
As	0.00	0.000	
Se	0.00	0.000	
Nb	0.00	0.000	
Y	0.00	0.000	
	0.00	0.000	



1.3 Hukum Hooke

Berbunyi, “Jika benda dibebani dalam batas elastisnya, maka tegangan berbanding lurus dengan regangannya”. Secara matematis ditulis:

$$\frac{\text{Tegangan}}{\text{Regangan}} = E = \text{konstan}$$

1.4 Modulus Elastisitas (Modulus Young)

Tegangan berbanding lurus dengan regangan, dalam daerah elastisnya, atau:

$$\begin{aligned}\sigma &\propto \varepsilon \\ &= E \times \varepsilon\end{aligned}$$

atau

$$E = \frac{\sigma}{\varepsilon}$$

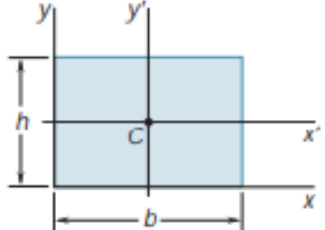
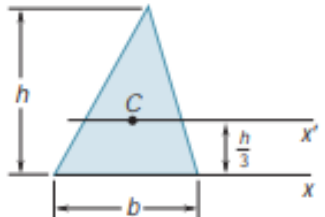
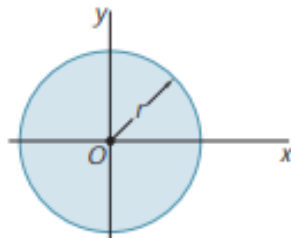
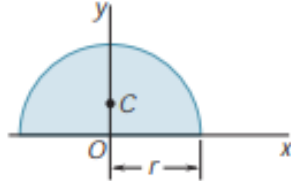
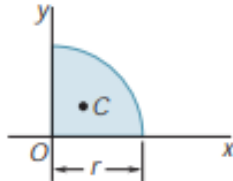
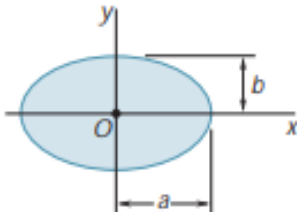
dimana σ = tegangan
 ε = regangan, dan
 E = konstanta proporsionalitas atau disebut juga modulus elastisitas atau modulus Young.

Tabel 1.1: Harga E (modulus elastisitas) dari berbagai material.

No.	Material	Modulus Elastisitas (E) dalam GPa
1.	Baja	200 – 220
2.	Besi tempa	190 – 200
3.	Besi cor	100 – 160
4.	Tembaga	90 – 110
5.	Perunggu	80 – 90
6.	Aluminium	60 – 80
7.	Timbal	10

1.5 Deformasi Benda Karena Gaya Yang Bekerja

Misalkan sebuah benda mendapat tegangan tarik.

Rectangle		$\bar{I}_x = \frac{1}{12} bh^3$ $\bar{I}_y = \frac{1}{12} b^3 h$ $I_x = \frac{1}{3} bh^3$ $I_y = \frac{1}{3} b^3 h$ $J_C = \frac{1}{12} bh(b^2 + h^2)$
Triangle		$\bar{I}_x = \frac{1}{36} bh^3$ $I_x = \frac{1}{12} bh^3$
Circle		$\bar{I}_x = \bar{I}_y = \frac{1}{4} \pi r^4$ $J_O = \frac{1}{2} \pi r^4$
Semicircle		$I_x = I_y = \frac{1}{8} \pi r^4$ $J_O = \frac{1}{4} \pi r^4$
Quarter circle		$I_x = I_y = \frac{1}{16} \pi r^4$ $J_O = \frac{1}{8} \pi r^4$
Ellipse		$\bar{I}_x = \frac{1}{4} \pi ab^3$ $\bar{I}_y = \frac{1}{4} \pi a^3 b$ $J_O = \frac{1}{4} \pi ab(a^2 + b^2)$

TABEL DATA PENGUJIAN BENDING HOLLOW 4X4

time (s)	Load (N)	Displacement (mm)	Stress	Strain
0	0	0	0	0
7	7	0	0	0
14	14	0	0,123	0
21	21	0	0,123	0,322
28	28	0	0,123	0,587
35	35	0,00213	0,134	0,725
42	42	0,00256	0,139	0,863
49	49	0,00256	0,146	1,001
56	56	0,00318	0,152	1,139
63	63	0,00475	0,159	1,139
70	70	0,00521	0,161	1,192
77	77	0,00421	0,161	1,245
84	84	0,00576	0,252	1,298
91	91	0,00624	0,273	1,351
98	98	0,00579	0,363	1,404
105	105	0,00579	0,363	1,457
112	112	0,00579	0,363	1,51
119	119	0,00645	0,363	1,563
126	126	0,00537	0,421	1,616
133	133	0,00623	0,428	1,693
140	140	0,00623	0,428	1,772
147	147	0,00623	0,428	1,892
154	154	0,00623	0,512	2,012
161	161	0,00721	0,592	2,132
168	168	0,00734	0,623	2,252
175	175	0,00721	0,731	2,372
182	182	0,00721	0,731	2,492
189	189	0,00721	0,731	2,612
196	196	0,00793	0,749	2,732
203	203	0,00814	0,825	2,852
210	210	0,00834	0,839	2,972
217	217	0,00912	0,852	3,092
224	224	0,00972	0,871	3,212
231	231	0,00972	0,921	3,332
238	238	0,0113	0,934	3,452
245	245	0,0113	0,934	3,512

252	252	0,0113	0,934	3,572
259	259	0,0113	1,123	3,632
266	266	0,0134	1,259	3,692
273	273	0,0121	1,276	3,752
280	280	0,012	1,318	3,812
287	287	0,012	1,332	3,872
294	294	0,012	1,332	3,932
301	301	0,012	1,332	3,992
308	308	0,0124	1,393	4,052
315	315	0,0129	1,395	4,112
322	322	0,0135	1,425	4,172
329	329	0,0147	1,478	4,232
336	336	0,0147	1,569	4,292
343	343	0,0147	1,597	4,352
350	350	0,0152	1,632	4,412
357	357	0,0147	1,667	4,472
364	364	0,0147	1,695	4,532
371	371	0,0156	1,745	4,592
378	378	0,0148	1,821	4,652
385	385	0,0148	1,882	4,712
392	392	0,0148	1,917	4,772
399	399	0,0148	1,978	4,832
406	406	0,0148	2,012	4,892
413	413	0,0148	2,125	4,952
420	420	0,0148	2,134	5,012
427	427	0,0164	2,156	5,072
434	434	0,0169	2,231	5,132
441	441	0,0174	2,254	5,192
448	448	0,0185	2,315	5,252
455	455	0,0185	2,315	5,312
462	462	0,0185	2,412	5,372
469	469	0,0193	2,515	5,432
476	476	0,0195	2,584	5,492
483	483	0,0213	2,589	5,552
490	490	0,0213	2,621	5,612
497	497	0,0213	2,621	5,672
504	504	0,0213	2,621	5,732
511	511	0,0213	2,637	5,792
518	518	0,0214	2,675	5,852

525	525	0,0197	2,772	5,912
532	532	0,0199	2,832	5,972
539	539	0,0212	2,895	6,231
546	546	0,0225	2,942	6,49
553	553	0,0225	2,951	6,521
560	560	0,0225	3,019	6,552
567	567	0,0225	3,019	6,583
574	574	0,0276	3,116	6,614
581	581	0,0293	3,245	6,645
588	588	0,0291	3,289	6,676
595	595	0,0291	3,356	6,707
602	602	0,0294	3,472	6,738
609	609	0,0312	3,492	6,769
616	616	0,0319	3,569	6,8
623	623	0,0323	3,597	6,831
630	630	0,0323	3,621	6,862
637	637	0,0325	3,645	6,893
644	644	0,0329	3,692	6,924
651	651	0,0356	3,732	6,955
658	658	0,0362	3,792	6,986
665	665	0,0367	3,825	7,017
672	672	0,0369	3,872	7,048
679	679	0,0375	3,912	7,079
686	686	0,0382	3,979	7,11
693	693	0,0382	3,999	7,141
700	700	0,0382	4,215	7,172
693	693	0,0321	4,034	7,138
686	686	0,0312	3,974	7,09
679	679	0,0292	3,921	7,056

TABEL DATA PENGUJIAN BENDING HOLLOW 2X4

time (s)	Load (N)	Displacement (mm)	Stress	Strain
0	0	0	0	0
2	2	0	0	0
4	4	0	0	0,223
6	6	0	0,122	0,311
8	8	0,0243	0,122	0,399
10	10	0,0246	0,122	0,487
12	12	0,0246	0,139	0,499
14	14	0,0246	0,156	0,511
16	16	0,0249	0,173	0,523
18	18	0,0251	0,199	0,535
20	20	0,0251	0,207	0,547
22	22	0,0251	0,207	0,559
24	24	0,0255	0,207	0,571
26	26	0,0256	0,207	0,583
28	28	0,0259	0,207	0,595
30	30	0,0262	0,211	0,641
32	32	0,0265	0,215	0,687
34	34	0,0265	0,219	0,733
36	36	0,0265	0,223	0,779
38	38	0,0267	0,227	0,825
40	40	0,0271	0,312	0,871
42	42	0,0269	0,341	0,917
44	44	0,0272	0,37	0,963
46	46	0,0274	0,399	1,009
48	48	0,0276	0,428	1,055
50	50	0,0278	0,428	1,167
52	52	0,0281	0,428	1,279
54	54	0,0281	0,433	1,391
56	56	0,0281	0,438	1,503
58	58	0,0287	0,443	1,615
60	60	0,0285	0,448	1,727
62	62	0,0285	0,453	1,839
64	64	0,0289	0,458	1,951
66	66	0,0292	0,463	2,063
68	68	0,0293	0,468	2,175
70	70	0,0293	0,473	2,287

72	72	0,0293	0,478	2,399
74	74	0,0297	0,478	2,511
76	76	0,0311	0,478	2,623
78	78	0,0311	0,478	2,735
80	80	0,0311	0,487	2,847
82	82	0,0405	0,496	2,959
84	84	0,0407	0,505	3,071
86	86	0,0407	0,514	3,111
88	88	0,0407	0,523	3,151
90	90	0,0407	0,532	3,191
92	92	0,0439	0,539	3,243
94	94	0,0451	0,546	3,295
96	96	0,0413	0,553	3,347
98	98	0,0415	0,561	3,399
100	100	0,0417	0,567	3,451
102	102	0,0419	0,574	3,503
104	104	0,0421	0,581	3,555
106	106	0,0421	0,588	3,607
108	108	0,0471	0,595	3,659
110	110	0,0400	0,602	3,711
112	112	0,0521	0,609	3,763
114	114	0,0519	0,616	3,815
116	116	0,0522	0,623	3,867
118	118	0,0525	0,632	3,919
120	120	0,0528	0,637	3,971
122	122	0,0531	0,644	4,023
124	124	0,0564	0,652	4,075
126	126	0,0584	0,66	4,127
128	128	0,0599	0,668	4,179
130	130	0,0634	0,676	4,231
132	132	0,0634	0,684	4,283
134	134	0,0632	0,692	4,325
136	136	0,0652	0,699	4,367
138	138	0,0684	0,708	4,409
140	140	0,0698	0,716	4,451
142	142	0,0704	0,724	4,493
144	144	0,0741	0,732	4,535
146	146	0,0742	0,732	4,577
148	148	0,0742	0,736	4,619

150	150	0,0742	0,74	4,661
152	152	0,0772	0,744	4,703
154	154	0,0796	0,748	4,745
156	156	0,0841	0,752	4,787
158	158	0,0842	0,756	4,829
160	160	0,0843	0,762	4,871
162	162	0,0891	0,768	4,913
164	164	0,0945	0,774	4,955
166	166	0,0946	0,783	4,997
168	168	0,0947	0,786	5,039
170	170	0,0948	0,792	5,081
172	172	0,0949	0,798	5,123
174	174	0,0952	0,804	5,165
176	176	0,0952	0,811	5,207
178	178	0,0952	0,818	5,298
180	180	0,0912	0,825	5,389
182	182	0,0952	0,832	5,481
184	184	0,0931	0,839	5,571
186	186	0,0955	0,846	5,662
188	188	0,0956	0,853	5,753
190	190	0,0957	0,86	5,844
192	192	0,0958	0,867	5,935
194	194	0,0959	0,874	6,026
196	196	0,0941	0,881	6,117
198	198	0,0961	0,888	6,208
200	200	0,0959	0,895	6,299
202	202	0,0959	0,902	6,39
204	204	0,0959	0,909	6,481
206	206	0,0963	0,916	6,572
208	208	0,1017	0,923	6,663
210	210	0,1041	0,932	6,754
212	212	0,1075	0,937	6,845
214	214	0,1079	0,944	6,936
216	216	0,1083	0,951	7,027
218	218	0,1087	0,951	7,111
220	220	0,1091	0,951	7,195
222	222	0,1071	0,956	7,279
224	224	0,1091	0,961	7,363
226	226	0,1091	0,966	7,447

228	228	0,1131	0,971	7,531
230	230	0,1137	0,976	7,615
232	232	0,1181	0,981	7,699
234	234	0,1104	0,986	7,783
236	236	0,1149	0,991	7,867
238	238	0,1158	0,996	7,951
240	240	0,1167	1,001	8,035
242	242	0,1146	1,006	8,119
244	244	0,1135	1,011	8,203
246	246	0,1194	1,016	8,287
248	248	0,1164	1,021	8,371
250	250	0,1194	1,026	8,455
252	252	0,1101	1,033	8,539
254	254	0,1111	1,032	8,623
256	256	0,1109	1,042	8,707
258	258	0,1131	1,046	8,791
260	260	0,1184	1,051	8,875
262	262	0,1211	1,056	8,959
264	264	0,1219	1,063	9,043
266	266	0,1227	1,066	9,127
268	268	0,1235	1,071	9,211
270	270	0,1243	1,076	9,232
272	272	0,1251	1,076	9,253
274	274	0,1259	1,076	9,274
276	276	0,1267	1,076	9,295
278	278	0,1255	1,083	9,316
280	280	0,1275	1,091	9,337
282	282	0,1275	1,097	9,358
284	284	0,1275	1,104	9,379
286	286	0,1269	1,111	9,4
288	288	0,1271	1,118	9,421
290	290	0,1273	1,125	9,442
292	292	0,1275	1,132	9,463
294	294	0,1290	1,139	9,484
296	296	0,1319	1,146	9,505
298	298	0,1331	1,146	9,526
300	300	0,1353	1,151	9,547
302	302	0,1355	1,156	9,568
304	304	0,1387	1,161	9,589

306	306	0,1389	1,166	9,61
308	308	0,1391	1,171	9,631
310	310	0,1391	1,176	9,722
312	312	0,1421	1,181	9,813
314	314	0,1442	1,186	9,904
316	316	0,1492	1,191	9,995
318	318	0,1454	1,196	10,086
320	320	0,1475	1,201	10,177
322	322	0,1495	1,209	10,268
324	324	0,1498	1,214	10,359
326	326	0,1497	1,219	10,45
328	328	0,1504	1,224	10,541
330	330	0,1507	1,228	10,632
332	332	0,1519	1,228	10,723
334	334	0,1543	1,228	10,814
336	336	0,1526	1,232	10,905
338	338	0,1559	1,236	10,996
340	340	0,1569	1,241	11,087
342	342	0,1569	1,244	11,178
344	344	0,1597	1,248	11,269
346	346	0,1612	1,252	11,36
348	348	0,1632	1,256	11,451
350	350	0,1641	1,261	11,542
352	352	0,1521	1,264	11,633
354	354	0,1529	1,268	11,724
356	356	0,1529	1,271	11,815
358	358	0,1529	1,274	11,906
360	360	0,1528	1,277	11,997
362	362	0,1531	1,28	12,088
364	364	0,1534	1,283	12,179
366	366	0,1537	1,286	12,27
368	368	0,1541	1,289	12,361
370	370	0,1543	1,292	12,452
372	372	0,1546	1,295	12,528
374	374	0,1549	1,298	12,604
376	376	0,1552	1,301	12,68
378	378	0,1555	1,303	12,756
380	380	0,1558	1,305	12,832
382	382	0,1561	1,307	12,908

384	384	0,1564	1,309	12,984
386	386	0,1567	1,311	13,06
388	388	0,1569	1,313	13,136
390	390	0,1569	1,315	13,212
392	392	0,1569	1,317	13,288
394	394	0,1571	1,319	13,364
396	396	0,1573	1,321	13,44
398	398	0,1575	1,323	13,516
400	400	0,1589	1,327	13,592
402	402	0,1600	1,331	13,668
404	404	0,1621	1,335	13,744
406	406	0,1642	1,339	13,82
408	408	0,1612	1,343	13,896
410	410	0,1643	1,347	13,972
412	412	0,1682	1,351	14,048
414	414	0,1654	1,355	14,124
416	416	0,1682	1,359	14,2
418	418	0,1698	1,363	14,276
420	420	0,1711	1,367	14,352
422	422	0,1723	1,371	14,411
424	424	0,1862	1,375	14,47
426	426	0,1862	1,379	14,529
428	428	0,1862	1,383	14,588
430	430	0,1897	1,387	14,647
428	428	0,1794	1,384	14,706
426	426	0,1791	1,381	14,765