

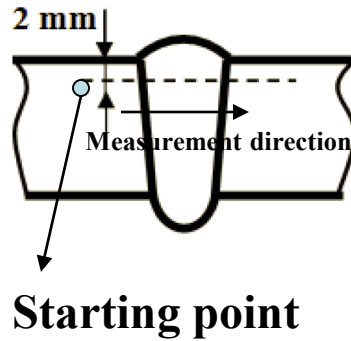
The second lab report format (Due date: 11/9)

1. **Title**
2. **Objective**
3. **Introduction:** background history of classical fusion welding (arc-based joining), applications, recent developments in traditional arc-based welding methods, recent innovations in field of laser application in joining thick materials and the competitive aspects of various fusion joining processes with respect to each other
4. **Experimental procedure:**
 - a. Explain how to operate the Micro-hardness machine, and the steps that should be followed to get the hardness value
 - b. Explain how to operate manual GMAW, and the what parameters should be controlled before start welding
5. **Result and discussion:** plot the graphs of micro-hardness and residual stress with respect to distance from centerline based on the given data in excel file, specify the Fusion zone, heat affected zone and base metal, and discuss possible reasons for the observed trend
6. **Conclusion**
7. **References (Send the lab report to Imad: izahid@smu.edu)**

Microhardness of laser welding at 4000W and 5 mm/s

Distance away from the top surface of the weld is 2 mm.

Test no.	Distance away from the starting point (mm)	Microhardness (HV)
0	0	143.4
1	0.254	160.4
2	0.508	152.7
3	0.762	157.1
4	1.016	165.1
5	1.27	164
6	1.524	162.1
7	1.778	170.1
8	2.032	164
9	2.286	170.5
10	2.54	172.5
11	2.794	170.7
12	3.048	176.3
13	3.302	180
14	3.556	210
15	3.81	223.6
16	4.064	229.5
17	4.318	280.4
18	4.572	273.7
19	4.826	225.9
20	5.08	227.9
21	5.334	216.1
22	5.588	217.9
23	5.842	210.2
24	6.096	217.2
25	6.35	201
26	6.604	216.2
27	6.858	213.8
28	7.112	220.5
29	7.366	218.2
30	7.62	259.9
31	7.874	215.1
32	8.128	205.3
33	8.382	185.3
34	8.636	178.9



Residual Stress of Hot-wire Laser welding of A36 Steel 9.5 mm thick with Wire ER70S-6 with 1 mm diameter

Laser power of 4 kW, scanning speed of 5 mm/s, hot-wire voltage of 7 V, wire feeding rate of 60 mm/s

Test no.	Distance away from the starting point (mm)	Stress MPa
1	0	44.9
2	0.5	65.6
3	1	80.4
4	1.5	70.3
5	2	65.8
6	2.5	52.5
7	3	72.2
8	3.5	53.5
9	4	91.9
10	4.5	105.3
11	5	71.7
12	5.5	26.3
13	6	16
14	6.5	-11
15	7	27.2
16	7.5	160.6
17	8	366.5
18	8.5	302.1
19	9	296
20	9.5	17.2
21	10	-17.8
22	10.5	3.5
23	11	4.4
24	11.5	-37.2
25	12	85.9
26	12.5	124.5
27	13	104
28	13.5	89
29	14	69.5
30	14.5	77.6
31	15	57.6
32	15.5	75.4
33	16	68.4

