

How to select the proper electrode

1. Base Metal strength Properties

Know and match Mechanical properties. For mild steel – generally E 60XX or E70XX electrodes will match base metal.

Low alloy steel:- Select electrodes that match base metal properties.

2. Base Metal Composition

Know and Match the composition. For Mild Steel- generally E 60XX or E70XX electrodes will match base metal composition.

Low alloy steel:- Select electrodes that closely matches base metal composition.

3. Welding Position

Match electrode to welding position as required.

4. Welding Current

Match the power supply available. Some electrodes are designed for direct current (DC) only .Some are designed for both alternating Current (AC) & DC.

5. Joint Design and Fit Up

Select for penetration characteristics- Digging, Medium, Light. No beveling or tight fit up – Use digging. Thin Material or wide root opening- light, soft etc.

6. Thickness and shape of base metal

To avoid weld cracking on thick and heavy material of complicated design. Select electrode of maximum ductility.Low hydrogen processes of electrodes are recommended.

7. Service condition and / or specification

Determine service condition – Low temperature, High temperature, shock loading- match the base metal composition, ductility and impact resistance. Use low Hydrogen process. Also check welding procedure or specification of electrode type.

Calculation of electrode qty

1. Calculate the weld seam area and weight
2. Calculate the requirement of electrode.

Weld bead weight in V groove in Horizontal and Flat Position. V angle 60 degree

Plate thickness (mm)	Root Gap (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
3	1	2.5	8.5	0.07
4	1	2.5/3.25	13.5	0.11
5	1	3.25	19.5	0.16
6	1	R3.25 +F 4	27	0.10+0.12
7	1.5	R3.25 +F 4/F5	39	0.10+0.21
8	1.5	R3.25 +F 4/F5	49	0.10+0.29
9	1.5	R3.25 +F 4/F5	60.5	0.10+0.38
10	2	R3.25 +F 4/F5	77.5	0.10+0.51
11	2	R3.25 +F 4/F5	92	0.10+0.62
12	2	R3.25 +F 4/F5	108	0.10+0.75
13	2	R3.25 +F 4/F5	123	0.10+0.87
14	2	R3.25 +F 4/F5	142	0.10+1.02
15	2	R4+F 4/F5	161	0.12+1.14
16	2	R4+F 4/F5	180	0.12+1.30
17	2	R4+F 4/F5	201	0.12+1.46
18	2	R4+F 4/F5	223	0.12+1.72
19	2	R4+F 4/F5	246	0.12+1.81
20	2	R4+F 4/F5	271	0.12+2.10

Weld bead weight in V groove in vertical Flat Position. V angle 60 degree

Plate thickness (mm)	Root Gap (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
3	1	2.5	8.5	0.09
4	1	3.25	13.5	0.14
5	1	3.25	19.5	0.2
6	1	3.25	27	0.26
7	1.5	3.25	39	0.36
8	1.5	3.25	49	0.45
9	1.5	R3.25 +F 4	60.5	0.20+0.34

10	2	R3.25 +F 4	77.5	0.20+0.47
11	2	R3.25 +F 4	92	0.20+0.59
12	2	R3.25 +F 4	108	0.20+0.73
13	2	R3.25 +F 4	123	0.20+0.85
14	2	R3.25 +F 4	142	0.20+1.0
15	2	R3.25 +F 4	161	0.20+1.14
16	2	R3.25 +F 4	180	0.20+1.30
17	2	R3.25 +F 4	201	0.20+1.47
18	2	R3.25 +F 4	223	0.20+1.73
19	2	R3.25 +F 4	246	0.20+1.83
20	2	R4+F 4	271	0.20+2.01

**Weld bead weight in V groove in over head ,vertical& horizontal
Vertical Position V angle 70 degree)**

Plate thickness (mm)	Root Gap (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
3	1	2.5	9.5	0.1
4	1	2.5 /3.25	16	0.16
5	1	3.25	22.5	0.22
6	1	3.25	31	0.29
7	1.5	3.25	45	0.41
8	1.5	3.25	57	0.51
9	1.5	R3.25 +F 4	70.5	0.20+0.42
10	2	R3.25 +F 4	90.5	0.20+0.57
11	2	R3.25 +F 4	107	0.20+0.71
12	2	R3.25 +F 4	125.5	0.20+0.87
13	2	R3.25 +F 4	138	0.20+0.97
14	2	R3.25 +F 4	165	0.20+1.18
15	2	R3.25 +F 4	188	0.20+1.36
16	2	R3.25 +F 4	211	0.20+1.54
17	2	R3.25 +F 4	236	0.20+1.74
18	2	R3.25 +F 4	263	0.20+1.95
19	2	R3.25 +F 4	291	0.20+2.18
20	2	R4+F 4	320	0.20+2.41



Weld bead weight in Fillet welding in Horizontal and Flat Position.

Plate thickness (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
2	2.5	4	0.038
2.5	2.5/3.25	6.5	0.058
3	3.25/ 4	9	0.082
3.5	3.25/ 4	12.5	0.115
4	3.25/ 4	16	0.15
4.5	3.25/ 4	20.5	0.18
5	3.25/ 4	25	0.23
5.5	3.25/ 4	30.5	0.28
6	3.25/ 4	36	0.33
6.5	3.25/ 4	42.5	0.39
7	3.25/ 4	49	0.45
7.5	3.25/ 4	56.5	0.52
8	R4+F5	64	0.18+0.41
8.5	R4+F5	72.5	0.18+0.48
9	R4+F5	81	0.18+0.56
9.5	R4+F5	90.5	0.18+0.65
10	R4+F 5/F6	100	0.18+0.73
11	R4+F 5/F6	121	0.18+0.92
12	R4+F 5/F6	144	0.18+1.14
13	R4+F 5/F6	169	0.18+1.37
14	R4+F 5/F6	196	0.18+1.60
15	R4+F 5/F6	225	0.18+1.89
16	R4+F 5/F6	256	0.18+2.14

Weld bead weight in Fillet welding in vertical Position.

Plate thickness (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
2	2/ 2.5	4	0.04
2.5	2/ 2.5	6.5	0.061

3	2/ 2.5	9	0.086
3.5	3.25	12.5	0.12
4	3.25	16	0.15
4.5	3.25	20.5	0.19
5	3.25/ 4	25	0.10+0.14
5.5	3.25/ 4	30.5	0.10+0.19
6	3.25/ 4	36	0.10+0.25
6.5	3.25/ 4	42.5	0.10+0.31
7	3.25/ 4	49	0.10+0.37
7.5	4	56.5	0.55
8	4	64	0.62
8.5	4	72.5	0.69
9	4	81	0.78
9.5	4	90.5	0.87
10	4	100	0.96
11	4	121	1.16
12	4	144	1.39
13	4	169	1.63
14	4	196	1.87
15	4	225	2.17
16	4	256	2.44

Weld bead weight in Fillet welding in over head Position.

Plate thickness (mm)	Electrode Dia (mm)	Approximate Seam Cross sectional area (mm ²)	Seam weight (Kg/Mtr)
2	2.5	4	0.04
2.5	2.5	6.5	0.061
3	2.5	9	0.086
3.5	2.5	12.5	0.12
4	2.5	16	0.15
4.5	2.5	20.5	0.19
5	3.25	25	0.24
5.5	3.25	30.5	0.29
6	3.25	36	0.35
6.5	3.25	42.5	0.41
7	3.25	49	0.47
7.5	3.25	56.5	0.55

8	R3.25+F4	64	0.10+0.52
8.5	R3.25+F4	72.5	0.10+0.59
9	R3.25+F4	81	0.10+0.68
9.5	R3.25+F4	90.5	0.10+0.77
10	R3.25+F4	100	0.10+0.86
11	R3.25+F4	121	0.10+1.06
12	R3.25+F4	144	0.10+1.29
13	R3.25+F4	169	0.10+1.53
14	R3.25+F4	196	0.10+1.77
15	R3.25+F4	225	0.10+2.07
16	R3.25+F4	256	0.10+2.34

Weld bead weight in I groove in Horizontal and Flat Position.

Plate thickness (mm)	Root Gap (mm)	Electrode Dia (mm)	Seam weight (Kg/Mtr)
1.5	0.5	2	0.015
2	1	2	0.03
2.5	1.2	2.5	0.06
3	1.5	2.5/3.25	0.075
3.5	1.5	3.25	0.09

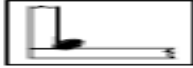
No of electrodes for each Kg/mtr bead weight

Seam weight (Kg/Mtr)	Electrode dia and length (mm)									
	1.5x250	2x250	2.5x250	2.5x350	3.25x350	3.25x450	4x350	4x450	5x450	6x450
0.01	3.6	2.0	1.3	0.9	0.5	0.4	0.4	0.3	0.20	0.14
0.02	7.3	4.1	2.6	1.9	1.1	0.9	0.7	0.5	0.35	0.24
0.03	10.9	6.1	3.9	2.8	1.7	1.3	1.1	0.9	0.55	0.38
0.04	14.5	8.2	5.2	3.7	2.2	1.7	1.4	1.1	0.70	0.48
0.05	18.2	10.2	6.6	4.7	2.8	2.2	1.8	1.4	0.90	0.62
0.06	21.8	12.3	7.8	5.6	3.3	2.6	2.1	1.6	1.05	0.73
0.07	25.4	14.3	9.1	6.5	3.9	3.0	2.5	1.9	1.24	0.86
0.08	29.1	16.4	10.5	7.5	4.4	3.4	2.8	2.2	1.39	0.97
0.09	32.7	18.4	11.8	8.4	5.0	3.9	3.2	2.5	1.59	1.11
0.1	36.4	20.5	13.1	9.4	5.5	4.3	3.5	2.7	1.74	1.21

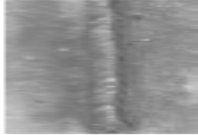
0.15	54.5	30.7	19.6	14.0	8.3	6.5	5.3	4.1	2.64	1.83
0.2	72.8	41.0	26.2	18.7	11.1	8.6	7	5.4	3.48	2.42
0.25	91	51.2	32.8	23.4	13.8	10.8	8.8	6.8	4.38	3.04
0.3	109	61.3	39.2	28.0	16.6	12.9	10.6	8.2	5.28	3.66
0.35	127	71.4	45.7	32.7	19.3	15.0	12.3	9.6	6.12	4.25
0.4	145	81.6	52.2	37.3	22.1	17.2	14.1	11.0	7.02	4.87
0.45	164	92.3	59.0	42.2	25.0	19.4	15.8	12.3	7.86	5.46
0.5	182	102	65.5	46.8	27.7	21.5	17.6	13.7	8.76	6.08
0.55	200	113	72.0	51.4	30.4	23.7	19.4	15.1	9.66	6.71
0.6	218	123	78.5	56.1	33.2	25.8	21.1	16.4	10.50	7.29
0.65	236	133	85.0	60.7	35.9	27.9	22.9	17.8	11.40	7.92
0.7	254	143	91.4	65.3	38.6	30.1	24.6	19.1	12.25	8.50
0.75	273	154	98.3	70.2	41.5	32.3	26.4	20.5	13.14	9.13
0.8	291	164	104.8	74.8	44.3	34.4	28.2	21.9	14.04	9.75
0.85	309	174	111.2	79.5	47.0	36.6	30	23.3	14.93	10.37
0.9	327	184	117.7	84.1	49.8	38.7	31.7	24.7	15.78	10.96
0.95	346	195	124.6	89.0	52.6	40.9	33.5	26.1	16.68	11.58
1	364	205	131.0	93.6	55.4	43.1	35.2	27.4	17.52	12.17
2	728	410	262.1	187.2	110.8	86.2	70.4	54.8	35.04	24.34
3	1090	613	392.4	280.3	165.9	129.0	106	82.4	52.76	36.64
4	1450	816	522.0	372.9	220.6	171.6	141	109.7	70.19	48.74
5	1820	1024	655.2	468.0	276.9	215.4	176	136.9	87.61	60.84
6	2180	1226	784.8	560.6	331.7	258.0	211	164.1	105.03	72.94
7	2540	1429	914.4	653.1	386.5	300.6	246	191.3	122.45	85.04
8	2910	1637	1047.6	748.3	442.8	344.4	288	224.0	143.36	99.56
9	3270	1839	1177.2	840.9	497.6	387.0	317	246.6	157.80	109.58
10	3640	2048	1310.4	936.0	553.9	430.8	352	273.8	175.22	121.68

Examples of Good and Bad stick welding

BAD WELD
Travel speed
too fast



CROSS-SECTION



Weld Face

Narrow and
convex
Irregular contour
Poor
penetration
and fusion

BAD WELD
Travel speed
too slow



CROSS-SECTION



Weld Face

Excessively wide
and flat, porous
Irregular contour
Excessive
penetration
along edges