



Plate

LQ-130 and LQ-140: Very High Strength Steels

LQ-130 and LQ-140 are quenched and tempered, 130 or 140 ksi minimum yield strength, general structural plate product currently available to 5 in. and 2 in. thick respectively. (Refer thicker plates to ArcelorMittal USA Plate offices).

Chemical Composition Requirements (maximums unless a range is shown)

Element	Composition %
Carbon (C)	0.12 – 0.18
Manganese (Mn)	1.55
Phosphorus (P)	0.015
Sulfur (S)*	0.003*
Silicon (Si)	0.15 – 0.55
Molybdenum (Mo)	0.70
Chromium (Cr)	0.70
Nickel (Ni)	1.50
Vanadium (V)	0.08
Niobium (Nb, Cb)	0.04
Boron (B)	0.005

* Includes Finline® calcium treated for sulfide shape control

Tensile Requirements

	LQ-130	LQ-140
Yield strength (minimum)	130 ksi	140 ksi
Ultimate tensile strength (minimum)	For information only	
Elongation (minimum)	12%	12%

Charpy V-Notch Impact Properties

Longitudinal @ -40°F	25 ft.-lbs.
Minimum average	

Size Availability +

	Width	Length
3/16 to 1/2 in. incl.	To 96 in.	To 500 in.
LQ-130: Over 1/2 to 5 in. incl.	To 130 in.	To 540 in.
LQ-140: Over 1/2 to 2 in. incl.	To 130 in.	To 540 in.

+ Refer other sizes to ArcelorMittal USA Plate offices.

Flatness

This product will be supplied to 1/2 the permissible variation in the ASTM A6 Table A1.14 for high strength steels.

Formability

Cold forming should be performed at shop temperatures over +60°F using practices that include grinding of plate edges, conditioning of dies, use of adequate lubrication and applying the load in a smooth, steady manner. Bend punch radius to plate thickness ratio should be greater than 3 for bending perpendicular to the direction of rolling and 4 for bending parallel to the rolling direction for plates up to 0.5 in. thick. Check with ArcelorMittal USA Plate offices for guidelines on thicker plate.

Welding Guidelines for LQ-130 and LQ-140

LQ-130 and LQ-140 may be welded using any conventional welding process provided low hydrogen welding practice is followed (weld metal diffusible hydrogen level ≤ 5 ml/100g, ≤ 3 ml/100g preferred). All weld edges should be clean and free from rust, oil, grease, etc. with proper joint fit-up. Specific recommendations are as follows:

Thermal Limitations

Suggested maximum heat input

Section Thickness Range		Welding Process	
(in)	(mm)	SMAW	GMAW/FCAW
3/8 – 5/8	9.5 – 15.9	40 kJ/in	35 kJ/in
5/8 – 7/8	15.9 – 22.2	45 kJ/in	40 kJ/in
7/8 – 1-3/8	22.2 – 34.9	45 kJ/in	45 kJ/in
1-3/8 – 3	34.9 – 101	50 kJ/in	50 kJ/in

Suggested minimum preheat/interpass temperature

Section Thickness Range		Minimum Preheat/Interpass Temperature *	
(in)	(mm)	(°F)	(°C)
$\leq 5/8$	≤ 15.9	75 – 150	25 – 65
5/8 – 7/8	15.9 – 22.2	125 – 200	50 – 95
7/8 – 1-3/8	22.2 – 34.9	200 – 275	95 – 135
$> 1-3/8$	> 34.9	225 – 300	105 – 150

* Measure preheat/interpass temperature approximately 3" from the joint face.

The information given above is based on general welding metallurgy principles, AWS D1.1:2004 (Annex XI, Tables XI-1 and XI-2), and available data on similar steels. It is subject to revision without notice and is intended *only as a starting guideline*.

Consumables

Conservative approach – Use undermatching consumables with the lowest strength electrode permitted by design. Use softer electrodes for the root pass and higher strength electrodes for filler passes.

Weld matched to plate strength – Employ matching consumables although availability of suitable electrodes is limited. This approach carries increased risk of problems with cracking, distortion, and higher residual stresses. Fabricator should be aware that weld metal strength and toughness would vary with consumable supplier and product. Qualification of the joint and process is strongly recommended.

Process/Governing Standard

	SMAW/ AWS 5.5	SAW/ AWS 5.23	GMAW/ AWS 5.28	FCAW/ AWS 5.29
Consumable	(140 ksi)*	(140 ksi)*	(140 ksi)*	(140 ksi)*
	(130 ksi)*	(130 ksi)*	(130 ksi)*	(130 ksi)*
	E 12018	F12A4-EX	E110S-X	E 12XT-X
	E 11018	F11A4-EX	E100S-X	E 11XT-X
		F10A4-EX		E 10XT-X

* Note: Although consumables delivering tensile strengths exceeding 120 ksi are not generally included in these AWS specifications, some are available. Contact your welding supplier or ArcelorMittal USA Plate offices for further details.

It is important to note this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Therefore, ArcelorMittal USA Plate metallurgists recommend careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade. Also, it is not recommended for service at temperatures lower than -50°F or higher than 800°F .

Information

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All information in this brochure is for the purpose of information only. ArcelorMittal USA reserves the right to change its product range at any time without prior notice.

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