



Plate

LQ-690Z: High Strength Steel

LQ-690Z is a low-carbon quenched and tempered steel developed for use where the combination of high strength, toughness and weldability is required for thicknesses to 9.5" (241 mm). LQ-690Z has been designed to meet the stringent requirements for steel plate used in mobile offshore drilling units (MODU) and has been approved by the American Bureau of Shipping as conforming to ABS Part 3 Grades FQ70 through 6.5 in. (165 mm). Approval is also extended to grades AQ, DQ and EQ, depending on required toughness, for both the 100 ksi (690 MPa) and 90 ksi (620 MPa) strength levels. Ultrasonic examination to ASTM A578 Level C when specified.

Chemical Composition

(maximums unless a range is shown)

Element	Composition %
Carbon (C)	0.15
Manganese (Mn)	1.25
Phosphorus (P)	0.015
Sulfur (S)	* 0.005
Silicon (Si)	0.15 – 0.55
Molybdenum (Mo)	0.70
Chromium (Cr)	0.70
Boron (B)	0.005
Nickel (Ni)	1.00 – 3.50
Titanium (Ti)	0.04
Vanadium (V)	0.08
Nitrogen (N)	0.015
Copper (Cu)	0.30
Aluminum (Al)	0.02 Min.

* Includes calcium treatment for inclusion shape control.
Fineline® Double-O-Five.

Tensile Requirements

Yield strength (minimum)	100 ksi (690 MPa)
Tensile strength (minimum)	112-136 ksi (770-940 MPa)
Elongation in $5.65\sqrt{A_0}$ (minimum)	14%

Charpy V-Notch Impact Properties (when specified)

Longitudinal Charpy V-Notch @ -76°F (-60°C), ft-lb. (Joule) min. avg., or	51 (69)
Transverse Charpy V-Notch @ -76°F (-60°C), ft-lb. (Joule), min. avg.	34 (46)

Flatness

Plates to 5" (125 mm) thick can be produced to 1/2 the permissible variation in the ASTM A6 Table 1.14 for high strength steels. Refer to ArcelorMittal USA Plate offices for thicker plates or more restrictive tolerances.

Thermal Cutting

LQ-690Z has been developed to allow thermal cutting at ambient, shop temperatures (+60°F minimum) so that exacting dimensional tolerances can be maintained.

Welding Guidelines

LQ-690Z may be welded using any conventional welding process provided low hydrogen welding practice is followed (extra low hydrogen consumables with 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. Preheat requirements depend on plate thicknesses. See "[Guidelines for Fabricating and Processing Plate Steel](#)" for general welding information. Refer to Mittal Steel USA's Plate mills for specific guidelines.

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 recommends careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade.

Further Information

Technical Contact: Jerry Shick at +1 610 383 2589 or jerry.shick@arcelormittal.com

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.

ArcelorMittal USA

Corporate Office
1 South Dearborn Street
18th Floor
Chicago, IL 60603-9888
USA

T +1 800 422 9422
www.arcelormittal.com

ArcelorMittal USA

Plate
ARC Building
139 Modena Road
Coatesville, PA 19320-0911
USA

T +1 800 966 5352
www.arcelormittal.com

ArcelorMittal USA

Plate
250 West U.S. Highway 12
Burns Harbor, IN 46304-9745
USA

T +1 800 422 9422
www.arcelormittal.com