Corus Long Products

RQT Fabrication Guide

The RQT range of quench and tempered structural steels combine high strength with excellent forming and welding performance.

Shearing

The RQT range of steels can be cold sheared. The maximum gauge that can be handled will depend on the power available in the shear unit and the material used in the shear blades. For smaller shears the maximum gauge is reduced by 35% relative to mild steel. The quality of the sheared edge can be heavily influenced by machine set up and therefore cutting blades should be well maintained. Any new cut edges should be dressed prior to performing any bending operation.

Flame cutting

The RQT range of steels can be cut satisfactorily using conventional oxy-fuel gas practices, in many cases without the need for preheat, provided cutting procedures are selected with consideration of the plate thickness and the CEV. Other cutting techniques such as abrasive water jet, where no heat is generated, or plasma cutting techniques, which gives a smaller HAZ than oxy-fuel gas, can be used. Care should be taken when cutting underwater as the quenching effect could result in a high hardness edge forming. With all the thermal cutting processes care should be taken that cut edges are free from sharp notches.

Cold bending

The RQT range of steels can be readily cold formed. The power required for forming will be appreciably higher (70%) than that for mild steel of the same thickness.

Bend axis vs. rolling direction	Minimum inside bending radius	Minimum die opening
Perpendicular	3t	8.5t
Parallel	4t	10t

It is recommended that the largest possible bending radius should be used, and generally the inside radius should not be less than 3 times the plate thickness.

Hot forming

It is recommended that the RQT range of steels are NOT hot formed. Where this is absolutely necessary, by design codes, the steels should be heated to a maximum temperature of 550°C, and at least 50°C below the tempering temperature stated on the test certificate. When temperatures approaching 500°C are used the soaking time should be minimised as far as possible to prevent deterioration in mechanical properties.

Stress relief

In cases where stress relief is considered necessary after welding, the stress relieving temperature should be generally within the range 550°C - 600°C and at least 20°C below the tempering temperature stated on the test certificate. Stress relaxation tests have indicated that adequate stress relief can be obtained from a soaking time of 60min at 550°C. Prolonged time at temperature in excess of 550°C is not generally recommended since it can cause some deterioration in mechanical properties.

Machining

The RQT range of steels can be machined and drilled using high-speed steel (HSS) or cemented carbide (CC) tools. The approximate hardness of the RQT range can be obtained from the Ultimate Tensile Strength (UTS) and is within the range 240 – 280 HBN.

Welding

For fabrication with quench and tempered steels a low hydrogen practice should be employed to avoid hydrogen cracking. There are many factors to take into consideration prior to commencement of welding of a fabrication. These could include a degree of restraint or the type of welding consumable used. As a consequence these tables should only be used as guidance in the development of a qualified welding procedure. Welding procedures and welder qualifications to appropriate standards such as EN288 – 3: 1992 and EN287 – 1: 1992 should always be adhered to prior to and during any work. When using high preheats advice should be sought from the consumables manufacturers regarding the suitability of different welding consumables.

To avoid cold cracking during the cooling of welded structures it is advisable to preheat the welded area. The preheating temperature is largely dependant upon factors such as (a) steel composition i.e. CEV, (b) combined plate thickness, (c) the heat input and (d) the hydrogen content of the weld consumable.
The tables below show the minimum recommended pre-heat levels for the RQT series of steels, for a range of combined thickness and 1.5kJ/mm heat input at 5ml H/100g (Table 1) and 10ml H/100g (Table 2).

Guidance on preheat levels for welding at an arc energy of 1.5kJ/mm for hydrogen scales 'D' and 'C', from EN1011: 2

Table 1: Hydrogen scale D < 5ml H/100g

IIW CEV	Combined thickness (mm) $t_1 + t_2 + t_3$											
	20	30	40	50	60	70	80	90	100	110	120	130
0.39%	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
0.49%	50°C	50°C	50°C	50°C	50°C	50°C	75°C	100°C	100°C	100°C	100°C	100°C
0.53%	50°C	50°C	50°C	50°C	75°C	75°C	100°C	125°C	125°C	125°C	125°C	125°C
0.57%	75°C	75°C	75°C	75°C	100°C	125°C	125°C	125°C	125°C	125°C	125°C	125°C

RT = Room Temperature

Table 2: Hydrogen scale C > 5ml < 10ml H/100g

IIW CEV	Combined thickness (mm) $t_1 + t_2 + t_3$									
	20	30	40	50	60	70	80	90	100	110
0.39%	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
0.49%	50°C	50°C	50°C	50°C	75°C	100°C	125°C	125°C	125°C	150°C
0.53%	50°C	50°C	75°C	100°C	125°C	150°C	150°C	150°C	150°C	200°C
0.57%	50°C	50°C	100°C	125°C	150°C	175°C	175°C	175°C	200°C	200°C

RT = Room Temperature

Interpass temperature control

To prevent the possibility of reductions in weld metal and heat-affected zone strength levels, the following maximum interpass temperatures are recommended.

Plate gauge mm	Max interpass temperature °C
$6 < t \leq 16$	125
$16 < t \leq 30$	150
$30 < t \leq 100$	175

The figures in the above table are for guidance only. For more accurate figures we recommend that further testing is undertaken

Further Information

For any queries regarding product application, metallurgy or mechanical properties please contact our Technical Advisory Service +44 (0) 1724 402106 or email:
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All other enquiries may be directed to your account team, or contact us using the details below.

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