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ATM precision tube

GALVATUBE®

TECHNICAL SPECIFICATION – TS30

PREMIUM LOW CARBON ERW PRECISION TUBE GALVATUBE™ STEEL TUBING FOR GENERAL APPLICATIONS

TS30

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1.0 Scope

This specification covers the technical requirements for the production and supply of low carbon ERW (electric resistance welded) galvanised steel tubing supplied in the As Formed condition with the internal weld upset (fin) not removed. This product is intended for use in general applications requiring ductile tubing and is generally denoted GALVATUBE™.

Note:

1. The ERW tube is manufactured from pre-galvanised strip which is zinc coated on both surfaces. In the ERW process the zinc coating is burnt off in the weld area. (The outside area is re-coated after the weld bead has been removed.)
2. The performance of Galvatube™ is influenced by micro-enviroments which vary from site to site. In corrosive environments it is recommended that a suitable barrier coating (eg paint or powder coating) be applied over the galvanised surface and that the application of such coating be fully in accordance with the supplier's recommendations with regard to surface pre-treatment, application, curing, and maintenance of the coating - refer to AS2312 "Guide to the Protection of Structural Steel against Atmospheric Corrosion by the use of Protective Coatings".

Galvatube™ is a registered trademark of OneSteel Trading Pty Limited.

2.0 References

ATM Precision Tube Customer Information Handbook – Standard Terminology

AS2312 "Guide to the Protection of Structural Steel against Atmospheric Corrosion by the use of Protective Coatings".

AS1397 "Steel sheet and strip - Hot-dip zinc-coated or aluminium/zinc coated".

3.0 Definitions

Terms used in this specification are defined in the ATM Precision Tube Customer Information Handbook Standard Terminology.

4.0 Designation

Tubing ordered to this specification shall be designated as TS30 GALVATUBE™.

For tube ordered with special requirements (eg specified end finish on cut lengths) or with additional/supplementary requirements (eg special dimensional tolerances) the suffix S shall be used and the tube designated as TS30S GALVATUBE™.

5.0 Information to be Supplied by the Purchaser:

The purchaser should supply the following information at the time of an enquiry and/or order.

(a) Dimensions of cross section (diameter/non circular size and wall thickness).

(b) Length required (in mm) and type (ML, NSML, CL) - refer to clause 6.7.

(c) Designation eg TS30 GALVATUBE™ - refer to clause 4.0.

(d) Quantity and delivery instructions

(e) Any special requirements or additional/supplementary requirements or exceptions to this specification. In these cases the designation TS30S GALVATUBE™ shall be used.

6.0 Requirements

6.1 Tube Condition

Tubing shall be supplied in the As Formed condition i.e. as produced ex the weldmill.

6.2 Chemical Composition

The cast analysis of the steel used shall conform to the following:

TABLE 1 : TS30 STANDARD CHEMISTRY

	Guaranteed Maximum (%)	Typical (%)
Carbon (C)	0.10	0.04-0.07
Phosphorous (P)	0.030	0.01-0.02
Manganese (Mn)	0.45	0.20-0.30
Sulphur (S)	0.03	0.01-0.02
Silicon (Si)	-	0.01-0.02
Alumium (Al)	-	0.03-0.05
Nitrogen (Ni)	-	0.001-0.004

Note: By arrangement, tubing can sometimes be supplied with alternative chemical compositions. In these cases the tube would be designated TS30S.

6.3 Zinc Coating

The tube shall be produced from G2 Z275 strip, or equivalent, to comply with specification AS1397 "Steel sheet and strip - Hot-dip zinc-coated or aluminium/zinc coated". Coating Class Z275 has a minimum total coating mass of 275g/m^2 measured by the triple spot test as detailed in AS1397. The thickness in the vicinity of the weldline will generally be less due to the recoating process used.

Note: By arrangement, tubing can sometimes be supplied with alternative zinc coatings. In these cases the tube would be designated TS30S.

6.4 Mechanical Properties

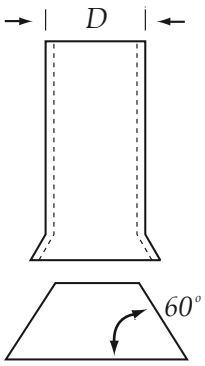
6.4.1 Tensile Test

Tubing in the As-Formed condition shall conform to the following tensile properties:

TABLE 2 : MECHANICAL PROPERTIES	
Yield Strength MPa (min)	300
Tensile Strength MPa (min)	350
Elongation % (min) on a gauge length 5.65 $\sqrt{S_0}$	15

Note: 1. By arrangement, tubing can sometimes be supplied with other tensile properties. In these cases the other mechanical tests applicable (flare and flatten) shall be by agreement and the tube shall be designated TS30S.

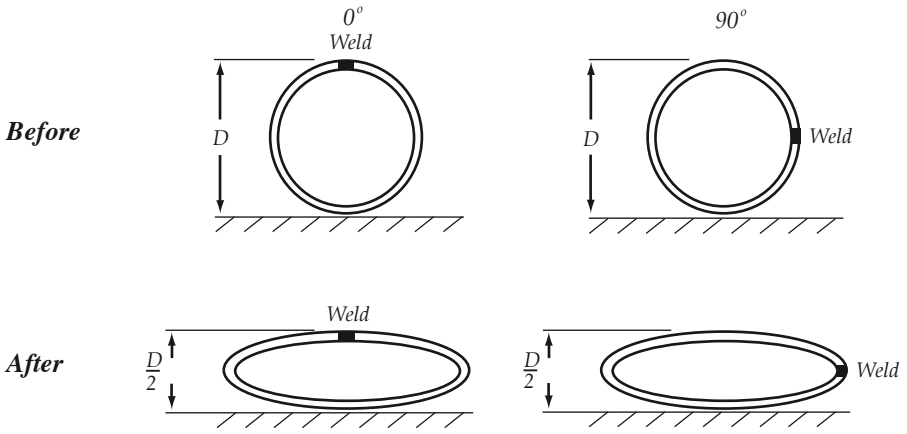
6.4.2 Flare Test



Both circular and non-circular tube shall be capable, with suitable end preparation, of being expanded over a cone or pyramid shaped drift expander until metal failure with no evidence of radial fracture of the weld zone, ie fracture of the weld zone along a radial line from the tube centre to the outside surface is not acceptable. A ductile/shear (45˚) fracture of the weld zone or fracture of the parent metal is acceptable.

6.4.3 Flattening Tests

Circular tube shall be capable of being flattened without cracking between two parallel plane surfaces with the weld located at 90˚ and 0˚ to the direction of flattening until the distance between the surfaces is half the nominal outside diameter of the tube.



Note: These tests are not applicable to non-circular tube

6.4.4 Special Requirements - Other Tests

By arrangement, tubing can be subjected to more severe flare and/or flattening tests or to other forms of mechanical testing such as bending and bulging.

6.5 Surface Finish

TABLE 3 : SURFACE FINISH – GALVATUBE™

Feature	
Coil Break (Creases in Strip)	Coil break up to 0.10mm deep shall not be cause for rejection.
Pitting	Isolated pits not exceeding 0.15mm deep shall not be cause for rejection.
O.D. Scarfing	The external weld flash shall be cleanly removed. Tool chatter marks up to 0.10mm deep shall not be cause for rejection.
Other Surface Marking(1)	Surface marking up to 0.10mm deep shall not be cause for rejection.(2)

Note: 1. Other surface marking includes longitudinal roll marks, chop marks (quarter moon shaped roll marks), indentations due to metal pick up on weldmill tooling, scratches, reeler straightening marks, handling marks and weld burn (low frequency welding only).

2. Notwithstanding the above table of possible defects, the overall appearance of the tube shall be consistent with good workmanship.

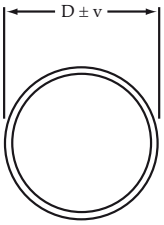
6.6 Tube Dimensions & Wall Thickness

6.6.1 Outside Diameter - Circular Tube

Circular tube shall be supplied to the following dimensional tolerances:

TABLE 4 : OD TOLERANCES

Outside Diameter, D (mm)	Maximum Permissible Variation in Outside Diameter, v (mm)
$D \leq 16$	± 0.10
$16 < D \leq 25$	± 0.15
$25 < D \leq 50$	± 0.20
$50 < D \leq 75$	± 0.25
$75 < D \leq 100$	± 0.30
$100 < D \leq 125$	± 0.35



Note: 1. If the wall thickness is less than 2.5% of the diameter, the above extreme tolerances shall be increased to 1.5 times the values shown.

2. Due to the possible distortion of the tube on cutting, the outside diameter tolerance does not apply for a distance of 25 mm from the end of mill lengths (MLs) or non standard mill lengths (NSMLs) ie. on tube cut to length on the weldmill - refer to clause 6.9.

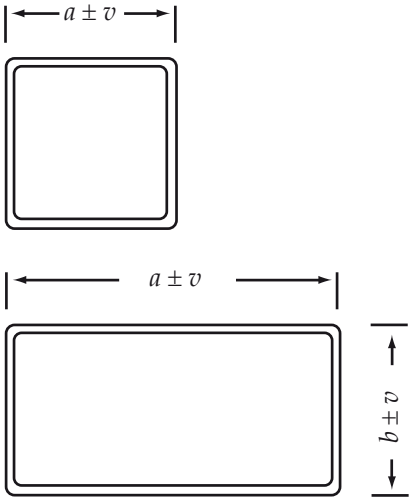
3. For special applications, tighter tolerances can be negotiated in some cases and would be supplied to TS30S.

4. As Formed ERW tube may change shape near the end of the tube due to the effects of welding and cutting when the tube is cut to the final required length.

6.6.2 Outside Dimensions - Non-Circular Tube

TABLE 5 : OUTSIDE DIMENSIONAL TOLERANCES - NON-CIRCULAR TUBE

Dimension, a (mm)	Maximum Permissible Variation in Diameter, v (mm)			
	Squares	Rectangles Long Side	Other Shapes	
			Long Side	Short Side
$a \leq 20$	± 0.15	± 0.15	± 0.15	± 0.30
$20 < a \leq 40$	± 0.20	± 0.20	± 0.20	± 0.40
$40 < a \leq 60$	± 0.25	± 0.25	± 0.25	± 0.50
$60 < a \leq 80$	± 0.30	± 0.30	± 0.30	± 0.60
$80 < a \leq 100$	± 0.35	± 0.35	± 0.35	± 0.70
$100 < a \leq 120$	± 0.40	± 0.40	± 0.40	± 0.80



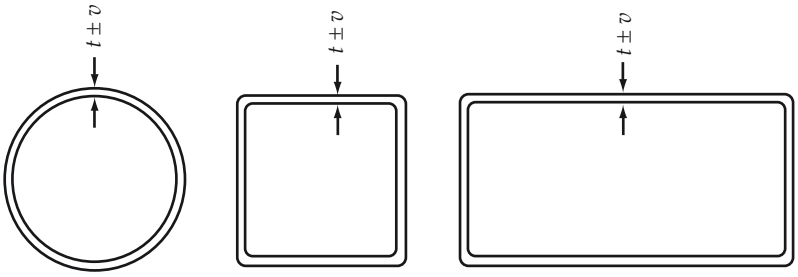
Note:
1. In the case of rectangles the tolerance shown for the long side shall also be applied to the short side (eg. the tolerances for 5025 rectangular tube shall be 50.0 ∔ 0.25mm x 25.0 ∔ 0.25mm).
2. Due to the possible distortion of the tube on cutting, the tolerance shown does not apply for a distance of 25mm from the end of mill lengths (MLs) or non standard mill lengths (NSMLs) ie. on tube cut to length on the weldmill - refer to clause 6.9.
3. For special applications, tighter tolerances can be negotiated in some cases and would be supplied to TS30S.
4. As Formed ERW tube may change shape near the end of the tube due to the effects of welding and cutting when the tube is cut to the final required length.

6.6.3 Wall Thickness

Tubing shall be supplied to the wall thickness tolerances as set out below

TABLE 6 : WALL THICKNESS TOLERANCES

Wall Thickness, t (mm)	Maximum Permissible Variation in Wall Thickness, v (mm)
$t \leq 1.0$	± 0.10
$1.0 < t \leq 1.6$	± 0.15
$1.6 < t \leq 2.0$	± 0.20
$2.0 < t \leq 3.0$	± 0.25
$3.0 < t \leq 4.0$	± 0.30
$4.0 < t \leq 5.0$	± 0.35
$5.0 < t \leq 6.0$	± 0.40



Note: As localised thickening may occur, the above plus variations do not apply to the weld area as indicated by the width of the heat affected zone.

6.6.4 Special Requirements - Tighter Tolerances

By arrangement, tubing can be supplied to tighter dimensional tolerances in some cases and would be supplied as TS30S.

6.7 Length

6.7.1 Mill Lengths

Unless otherwise specified on the order, tubing shall be supplied in mill lengths (ML) of 6100 mm (6.1 metres), or by arrangement, tubing can be supplied ex the weldmill as a non-standard mill length (NSML) within the length range 4000 to 8000 mm eg. 5850 mm NSML. In both cases, a length tolerance of plus 50 mm minus Nil shall apply.

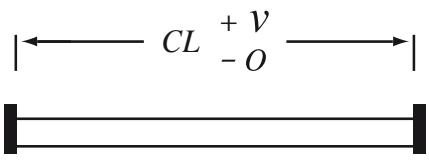
6.7.2 Cut Lengths

By arrangement, tubing can be supplied as cut lengths (CL). The tolerances applicable to length are:

TABLE 7 : CUT LENGTH TOLERANCES

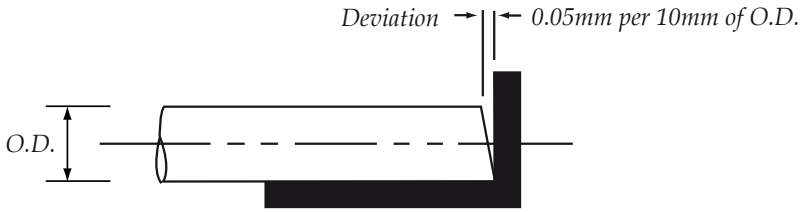
Cut Length, CL (mm)	Max. Permissible Variation in Cut Length, v (mm)
$CL \leq 1000$	+ 1.0, - Nil
$1000 < CL \leq 2000$	+ 1.5, - Nil
$2000 < CL \leq 4000$	+ 3.0, - Nil
$4000 < CL \leq 6000$	+ 4.5, - Nil
$CL > 6000$	+ 6.0, - Nil

Note: The tube length shall be taken to be the measured distance between two parallel plates in contact with each end of the tube. This could vary from the overall length measured along the outside of the tube using a micrometer, vernier or similar device due to the tolerance for end squareness.



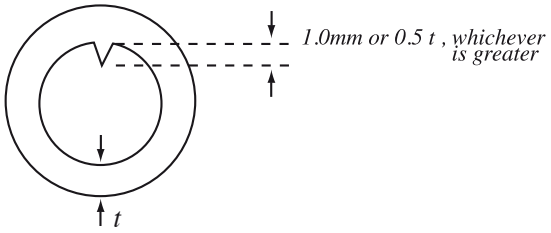
6.7.3 End Squareness

End squareness shall be expressed as the maximum deviation that can be measured between the end of the tube and a straight edge in contact with the end of the tube and at right angles to the tube axis. The maximum allowable out of squareness shall be 0.05 mm per 10 mm of O.D. (equivalent to 0.3˚). End squareness shall apply only to cut lengths up to 1000 mm.



6.8 Height of Weld Upset

The external weld upset shall be removed completely ie. flush with the outside surface of the tube. The internal weld upset or fin is not normally removed and the height may measure up to 1.0 mm or 50% of the nominal wall thickness whichever is the greater. This condition is designated Normal Fin (NF).



Note: By arrangement, tube with other than Normal Fin conditions may be supplied. This tube would be designated as TS30S.

6.9 End Condition

6.9.1 Mill Lengths

Tube shall be supplied with shear or saw cut mill ends that may have a small shear dimple or burrs.

6.9.2 Cut Lengths

Cut lengths can be supplied with the following specific end conditions:

(a) As Cut

Tube ends will be as cut by shear, saw, laser or lathe and some cutting burr could remain.

(b) Deburred

Safe to handle and no dimensional evidence of burr on the outside or inside of the tube. The aim is to completely remove the external and internal burr with minimum stock removal. Unless otherwise specified, there may be evidence of a burr on the end face. Tool chatter is to be avoided but shall not be cause for rejection (workmanship).

(c) Chamfer

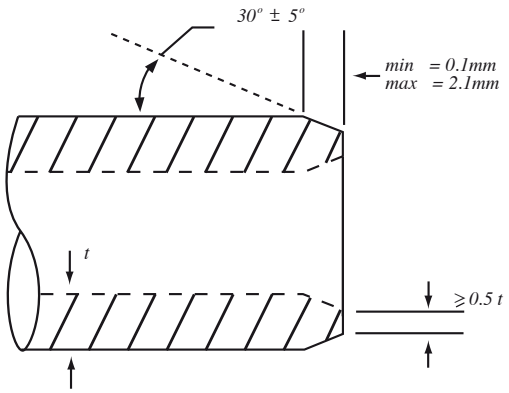
The tube end shall be tool cut on the external and/or internal surface of the tube end to the following dimensions (unless otherwise negotiated and specified on the order).

Angle of Chamfer	=	$30^{\circ} \pm 5^{\circ}$
Min. Length of Chamfer	=	0.10 mm
Max. Length of Chamfer	=	2.10 mm

Stock removal - at least 50% of nominal wall thickness shall remain after internal and/or external chamfering. Tool chatter - shall be avoided but shall not be cause for rejection (workmanship).

Note: 1. Cut lengths specified as Deburred may be supplied in the Chamfered condition.

2. Other specific end finishing requirements can be supplied subject to enquiry.



6.10 End Welds (Cross Welds)

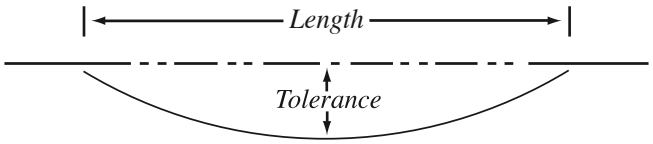
Tubes containing the cross welds used to join the end of one coil of strip to the next coil shall not be included in the consignment.

6.11 Straightness

For lengths greater than or equal to 1000 mm the straightness tolerance shall be as shown in the table below, which assumes the tube to be bent in a constant radius, measured against a straight edge.

For lengths less than 1000 mm the straightness tolerance shall be 1.0mm maximum deviation.

TABLE 8 : STRAIGHTNESS TOLERANCE									
Length (mm)	1,000	2,000	3,000	4,000	5,000	6,000	6,100	7,000	8,000
Tolerance (mm)	1.0	1.1	2.5	4.4	6.9	10.0	10.3	13.6	17.8



Note: By arrangement, tube with other straightness tolerances can be supplied in some cases, and would be supplied to TS30S.

6.12 Non-Circular Tube - Other Features

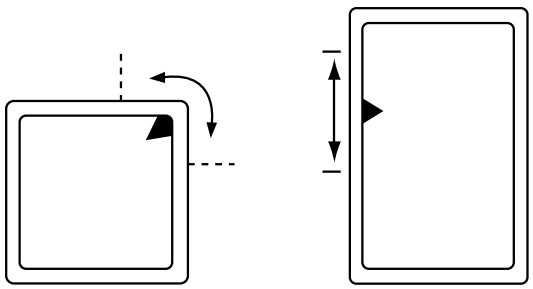
6.12.1 Corner Radii

Corner radii differ for each size and wall thickness combination. Typical corner radii information can be supplied on request.

6.12.2 Weldline Location

Due to the configuration of the weldmill rolls, the weldline will normally be equidistant from the opposite corners ie. the weldline will be on or adjacent to a corner in the case of squares and on the longer face in the case of rectangles, ovals and flat sided ovals.

No action is normally taken to control the exact location of the weldline. However, where weldline location is a critical feature this should be the subject of an enquiry and would be supplied to TS30S.

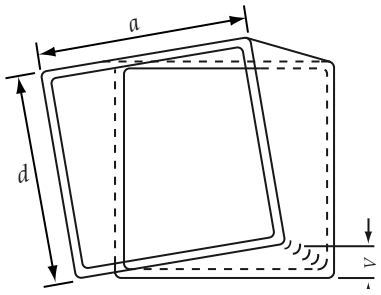


6.12.3 Twist

The tolerances for twist of non-circular tubing are shown in the table below:

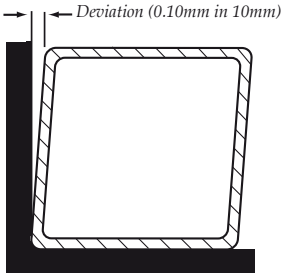
TABLE 9 : TWIST TOLERANCE

Largest Dimension, a (mm)	Twist Tolerance in 1 metre, v (mm)
$a \leq 12.7$	0.9
$12.7 < a \leq 38.1$	1.4
$38.1 < a \leq 63.5$	1.7
$63.5 < a \leq 101.6$	2.1



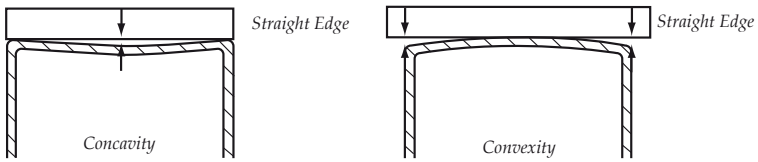
6.12.4 Squareness - Square & Rectangular Tube

Maximum out of square of adjacent sides shall be 0.10 mm in 10 mm face width (equivalent to 0.6˚).



6.12.5 Flatness - Square, Rectangular and Flat Sided Oval Tube

The actual dimensional variation across any face shall not exceed half of the total outside dimensional tolerance as set out in clause 6.6.



6.13 Rust Prevention

6.13.1 Standard Rust Prevention

The tube shall be coated with a light, readily removable, temporary rust preventative, designed to withstand corrosion when stored in normal conditions under cover for at least 3 months from time of delivery.

Note: Care must be taken in transit and in the storage of GALVATUBE™ to keep the tube dry, as water can cause corrosion (white rust) where surfaces of the tubes are in contact. This is particularly important in the case of non-circular tube where the contact area is greater.

6.13.2 Other Rust Prevention

By arrangement, tube may be supplied with greater or lesser amounts of rust preventative.

6.14 Packaging

Standard packaging for mill lengths and some cut lengths is batten-strapped, rectangular or hexagonal packs.

Note:
1. By arrangement, other packaging options may be available. For example, stillages may be used to supply cut lengths, and large diameter tubing may be supplied in crates.
2. Standard rectangular pack sizes for mill lengths are described in the Dimensions and Properties section of the OneSteel ATM Precision Tube Customer Information Handbook. Different pack sizes shall be the subject of agreement between the customer and the supplier.

6.15 Special Requirements

Any other requirements not covered by the above clauses should be the subject of an enquiry prior to placement of an order.

7.0 Control

Technical specifications are also available for the following Precision Tubing products:

TS 11	EzyForm™ - Hot rolled, low carbon ERW steel tubing for general applications
TS 21	EzyForm™ - Low carbon ERW steel tubing for general applications
TS 22	Hi-Lite® - ERW steel tubing with specified mechanical properties
TS 23	VHS - Mild carbon heat treated ultra high strength ERW steel tubing
TS 28	Hi-Form® - Low carbon ERW Aluminised steel tubing for use in automotive exhaust systems
TS 30	GALVATUBE™ - Premium low carbon ERW steel tubing for general applications
TS 31	EzyForm™ - Low carbon ERW steel tubing with special requirements
TS 40	ReadiTube® - Low carbon galvanised ERW steel tubing for general applications
TS 41	EzyForm™ - Low carbon ERW steel tubing for fluid carrying applications
TS 50	Tubecolor® - Premium powder coated ERW steel tubing
TS 60	Painted RT™ - Powder coated ERW steel tubing

OneSteel has a range of other Technical Specifications
for products and/or applications not listed above.
Please contact OneSteel Direct for further Information
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