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Edition 2

SOUTH AFRICAN NATIONAL STANDARD

Steel tubes for non-pressure purposes

Part 3: Steel tubes for rolls for conveyor belt idlers

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Table of changes

Change No.	Date	Scope

Abstract

Covers welded steel tubes intended for use in the manufacture of steel rolls for conveyor belt idlers. Requirements are laid down for material and physical properties, dimensions, straightness, ovality, scarfing and freedom from defects, also includes the marking of tubes.

Keywords

conveyor belts, idler rolls, marking, mechanical testing, roller conveyors, steels, tensile properties, tubes, wall thickness.

Foreword

This South African standard was approved by National Committee, StanSA TC 5120.49, *Continuous mechanical handling equipment*, in accordance with procedures of Standards South Africa, in compliance with annex 3 of the WTO/TBT agreement.

This edition cancels and replaces the first edition (SABS 657-3:1980).

Annexes A and B form an integral part of this standard.

SANS 657 consists of the following parts, under the general title *Steel tubes for non-pressure purposes*:

Part 1: Sections for scaffolding, general engineering and structural applications.

Part 2: Steel tubes for cycles.

Part 3: Steel tubes for rolls for conveyor belt idlers.

Part 4: Steel tubes of round, oval, square and rectangular section for furniture.

The requirements in 5.2.1 (a) and (b), and likewise 5.2.2 (a) constitute, in terms of section 21(2) of the Standards Act (Act no. 29 of 1993), a self-declaration of conformity by the manufacturer, notwithstanding the implications of any third-party certification mark that might also be displayed.

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Steel tubes for non-pressure purposes

Part 3:

Steel tubes for rolls for conveyor belt idlers

1 Scope

This part of SANS 657 covers the requirements for welded steel tubes for use in the manufacture of rolls for conveyor belt idlers.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of SANS 657. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this part of SANS 657 are encouraged to take steps to ensure the use of the most recent edition of the standard indicated below. Information on currently valid national and international standards can be obtained from Standards South Africa.

SANS 6892/ISO 6892 *Metallic materials – Tensile testing at ambient temperature.*

3 Definitions

For the purposes of this part of SANS 657, the following definitions apply:

3.1

acceptable

acceptable to the authority administering this standard or to the parties concluding the purchase contract, as relevant

3.2

defective

steel tube that fails in one or more respects to comply with the relevant requirements of this part of SANS 657

3.3

lot

not less than 25 and not more than 3 200 tubes of the same nominal outside diameter, nominal wall thickness and length, made by one manufacturer, and submitted at any one time for inspection and testing

4 Requirements

4.1 Type and grade

4.1.1 Type

Tubes for rolls shall be of electrically (induction/resistance) welded mild steel.

4.1.2 Grade

The grade of the tube shall comply with the properties given in table 1.

4.2 Material

Tubes shall be of steel whose ladle chemical composition complies with the following:

Carbon content: 0,25 %, max, (by mass).

Sulfur and phosphorus content: each 0,06 %, max, (by mass).

4.3 Physical properties

4.3.1 When required by the purchaser (see annex A), the tensile strength, yield stress, and elongation of a tube shall be determined in accordance with 6.3, and shall be at least the appropriate values given in table 1.

4.3.2 When tested in accordance with 6.7 and 6.8, a tube shall show no sign of cracking.

Table 1 — Tensile properties of tubes^a

1	2	3
Yield stress MPa, min.	Tensile strength MPa, min.	Elongation %, min.
230	320	10
^a When verification of the physical properties of tubes are required, the manufacturer shall furnish a certificate in which it is stated that the tubes supplied against each order or contract conform with those requirements (see annex A).		

4.4 Dimensions

4.4.1 Outside diameter and wall thickness

4.4.1.1 The nominal outside diameter of a tube shall be as specified by the purchaser (see annex A), and shall be one of the values given in column 1 of table 2.

4.4.1.2 The actual outside diameter shall be within the appropriate range given in column 2 of table 2.

4.4.1.3 The wall thickness shall be as specified by the purchaser (see annex A), and shall be at least equal to the appropriate nominal value given in column 6 or 7 of table 2.

Table 2 — Dimensions of tubes

Dimensions in millimetres

1	2	3	4	5	6	7
Nominal outside diameter	Actual outside diameter	Outside diameter		Ovality Max.	Nominal preferred wall thickness	Nominal alternative wall thickness
		Max.	Min.			
101	101,6	101,8	101,4	0,4	3	3,5
108	108	108,2	107,8	0,4	3,8	4,5
127	127	127,2	126,8	0,4	3,8	4,5 or 6
133	133,1	133,3	132,9	0,4	4	6
152	152,4	152,6	152,2	0,4	4	6
159	158,8	159,1	158,6	0,5	4	6
165	165,1	165,3	164,8	0,5	4,5	6
178	177,8	178,1	177,5	0,6	4,5	6
219	219,1	219,4	218,8	0,6	6	6

NOTE Tubes up to and including 4,5 mm wall thickness are subject to a mill rolling tolerance of $\pm 0,2$ mm. Tubing above 4,5 mm wall thickness is subject to a mill rolling tolerance of $\pm 0,28$ mm. All measurements to be taken 150 mm from the end of the tube.

4.4.2 Length

Except when tubes of specified "mill cut" length (subject to a tolerance of ± 50 mm) are specified by the purchaser (see annex A), tubes shall be supplied in random lengths of 5,5 m to 8 m.

4.4.3 Straightness

In any length of tube, any deviation from straightness shall not exceed 1 in 1 000, measured at the midpoint of the tube.

4.4.4 Ovality

Ovality of a tube (A) is given by

$$A = a - b$$

where

a is the greater diameter;

b is the lesser diameter.

The maximum ovality is specified in table 2.

4.5 Scarfing

4.5.1 The inner and outer weld protrusion shall be removed by scarfing. The outer scarfing shall blend smoothly with the outer diameter of the tube and shall not protrude above the tube by more than 0,1 mm or indent within the wall of the tube by more than 0,1 mm. Similarly, the inner scarfing shall not stand proud of the tube wall by more than 0,1 mm or indent within the wall of the tube by more than 0,35 mm.

4.5.2 When tested in accordance with 6.5, the depth or height of the scarfed section over an area of 15 mm either side of the centre line of the scarfed section shall not exceed 0,1 mm.

4.5.3 The longitudinal variation of the scarfing shall not exceed the values indicated in table 3.

Table 3 — Longitudinal weld variation

Dimensions in millimetres	
1	2
Outside diameter (OD) of tube	Tolerance
OD < 127	± 0,15
127 ≤ OD ≤ 152,4	± 0,175
OD > 152,4	± 0,2

4.5.4 When tested in accordance with 6.6, the protrusion or indent of chatter shall not exceed 0,1 mm.

4.6 Freedom from defects

4.6.1 Tubes shall have an acceptable finish and shall be free from defects that affect their serviceability, for example, dents and score marks that are outside the tolerance.

4.6.2 The presence of superficial "powder" rusting on the surface of uncoated tubes shall not be regarded as prejudicial to the serviceability of the tubes.

4.6.3 Unless otherwise specified by the purchaser (see annex A), tubes shall be supplied with "mill cut" ends and any deformation shall not extend more than 100 mm from the cut.

4.7 Cross-welds

Tubes for rolls shall have no cross-welds.

4.8 Coatings

Unless otherwise specified by the purchaser (see annex A), tubes shall be supplied uncoated.

5 Packing and marking

5.1 Packing

Tubes shall be supplied loose or bundled, as required. When supplied in bundles, only tubes of the same nominal outside diameter and wall thickness shall be packed together.

5.2 Marking

5.2.1 The following information shall be indelibly marked on each tube:

- a) the manufacturer's name or trade mark (logo) (see foreword);
- b) the standard number SANS 657-3 (see foreword); and
- c) the batch code (if required).

5.2.2 The following information shall appear in legible and indelible marking on a label securely attached to each bundle:

- a) the manufacturer's name or trade mark (logo) (see foreword);
- b) the batch code or order number;
- c) the grade and type; and
- d) the nominal outside diameter and wall thickness.

6 Inspection and methods of test

6.1 General

Normal production release shall be in accordance with the manufacturer's quality procedures. Where there is no evidence of a manufacturer having internal quality procedures to assure compliance to this standard, the requirements in annex B shall apply.

6.2 Inspection

Visually examine and measure each tube in the sample for compliance with the requirements of 4.4 to 4.8. If required (see annex A), sampling shall be done in accordance with annex B.

6.3 Tensile test

Carry out the test in accordance with the relevant test method given in SANS 6892, and check for compliance with the requirements of 4.3.1. For the determination of elongation, use a gauge length of $5,65 \sqrt{S_0}$, (where S_0 is the original cross-sectional area).

6.4 Ovality Test

6.4.1 Apparatus

V-rollers.
Dial gauge with probe.

6.4.2 Test pieces

From the pipe(s) selected for testing, cut a piece of 1m in length. Deburr the test piece.

6.4.3 Procedure

6.4.3.1 Place a test piece on the v-rollers and position the dial gauge probe in such a way that it touches the outside of the tube at a point diametrically opposite a support roller (see figure 1).

6.4.3.2 Rotate the tube about its longitudinal axis (centreline) and complete a full revolution of the tube. Set the zero point of the dial indicator at the lowest point on the tube circumference and then read the ovality as the maximum deflection of the dial indicator needle. The ovality shall not exceed the values given in table 2.

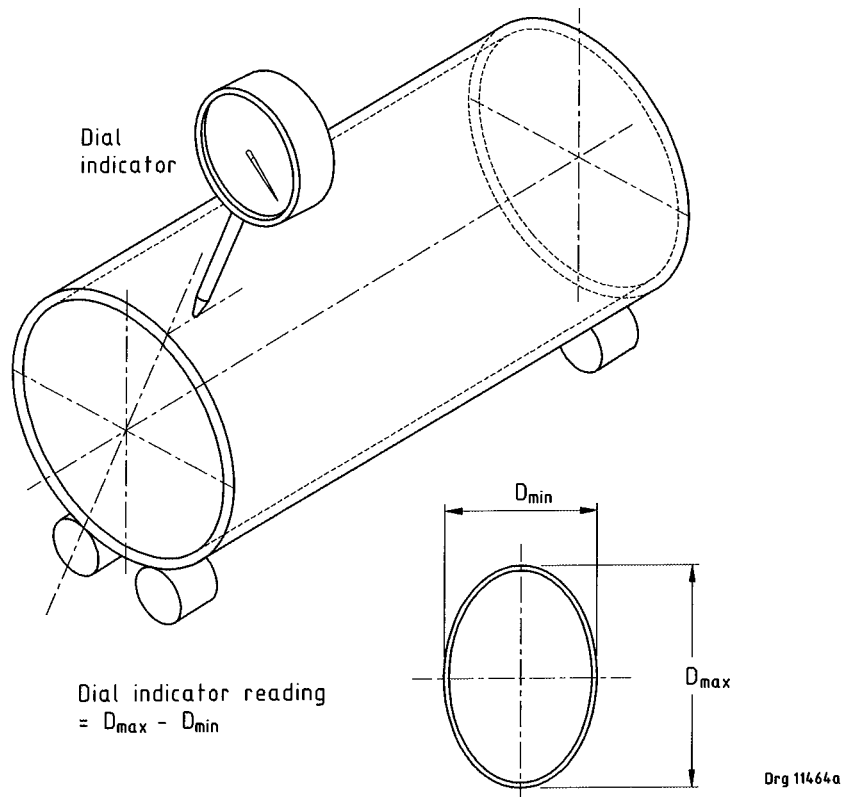


Figure 1
Test for Ovality

6.5 Visual test for scarfing

6.5.1 Apparatus

V-rollers.
Dial gauge with probe for measuring ovality

6.5.2 Test pieces

From the pipe(s) selected for testing, cut a piece of 1 m in length. Deburr the test piece.

6.5.3 Procedure

6.5.3.1 Place a test piece on the v-rollers and position the dial gauge probe in such a way that it touches the outside of the tube initially away from the scarfed section.

6.5.3.2 Rotate and slide the tube along its longitudinal and horizontal axis as appropriate. Measure the depth or height of the external scarf over the length of the tube covering an area 15 mm either side of the scarfed section of the tube. The depth or height of the scarfed section over this area shall not exceed the values indicated in 4.5.2.

6.6 Visual test for chatter

6.6.1 Apparatus

V-rollers.
Dial gauge with probe.

6.6.2 Test pieces

From the pipe(s) selected for testing, cut a piece of 1 m in length. Deburr the test piece.

6.6.3 Procedure

6.6.3.1 Place a test piece on the v-rollers and position the dial gauge probe as appropriate.

6.6.3.2 Whilst moving the tube along its longitudinal axis (along the weld seam), measure the height by which the scarfing protrudes above the outer diameter of the tube and the depth of indentation which the scarfing presents beneath the diameter of the tube outer wall. The readings obtained shall not exceed the values indicated in 4.5.4.

6.7 Flattening test

6.7.1 Apparatus

Compressive testing machine, with parallel platens of width at least equal to 1,5 times the diameter of the pipe under test.

6.7.2 Test pieces

From the pipe selected for testing, cut two pieces of pipe (at least 40 mm each in length). Deburr the test pieces.

6.7.3 Procedure

6.7.3.1 Place one test piece in the testing machine with the weld positioned as shown in figure 2(a).

6.7.3.2 Apply a steadily increasing force until the distance between the two platens is 60 % \pm 1 % of the actual outside diameter of the pipe (see figure 2(b)).

6.7.3.3 Remove the test piece and examine it for signs of cracking. Check for compliance with 4.3.2.

6.7.3.4 Place one test piece in the testing machine with the weld positioned as shown in figure 2(c).

6.7.3.5 Apply a steadily increasing force until the distance between the two platens is 15 % \pm 1 % of the actual outside diameter of the pipe (see figure 2(d)).

6.7.3.6 Remove the test piece and examine it for signs of cracking. Check for compliance with 4.3.2.

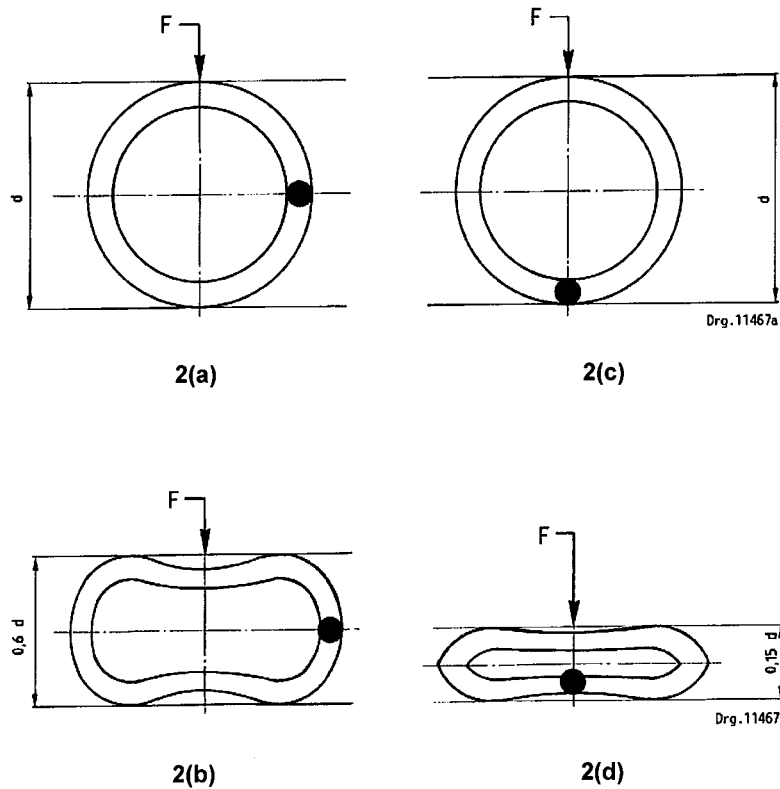


Figure 2 — Flattening test

6.8 Flare test

6.8.1 Apparatus

6.8.1.1 Compressive testing machine as in 6.7.1.

6.8.1.2 Steel cone of included angle 60° , and of base diameter at least 1,1 times the outside diameter of the pipe.

6.8.2 Test piece

Cut a piece of suitable length, but of length equal to at least the outside diameter of the pipe. Deburr the ends of the test piece.

6.8.3 Procedure

Place the cone and the test piece in the testing machine as shown in figure 3.

Apply a steadily increasing force until the end of the test piece flares to a diameter $10\% \pm 1\%$ larger than the outside diameter of the pipe.

Examine the flared end of the test piece and check for compliance with 4.3.2.

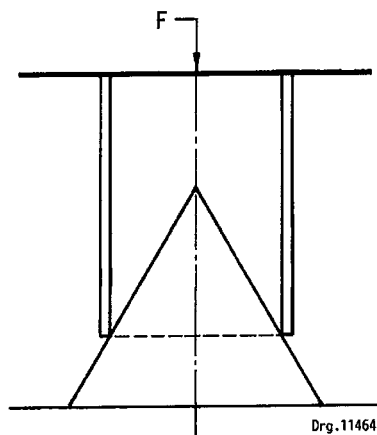


Figure 3 — Flare test

Annex A
(normative)

Notes to purchasers

The following requirements shall be specified in tender invitations and in each order or contract:

- a) the nominal outside diameter and nominal wall thickness (see 4.4.1);
- b) should the purchaser require tubing manufactured to tighter tolerances than indicated in this standard (see table 2), these tolerances shall be agreed between the purchaser and the supplier at the time of placing the order;
- c) when tubes of specific length are required, the length (see 4.4.2);
- d) the finish of ends, if other than as specified (see 4.6.3);
- e) when relevant, the type of coating (see 4.8);
- f) if required, that a certificate be furnished (see table 1 and 4.3.1) verifying the tube properties; and
- g) if required, sampling shall be done in accordance with 6.1.

Annex B
(normative)

Sampling and compliance

B.1 Sampling

The following sampling procedure shall be applied in determining whether a lot complies with the relevant requirements of this part of the standard. The sample(s) so taken shall be deemed to represent the lot.

After checking the lot for compliance with the requirements of clause 4, not covered by the tests in clause 6, take from it at random the number of tubes shown in column 2 of table B1 relative to the appropriate lot size shown in column 1.

Table B.1 — Sampling

1	2	3	4
Lot size, number of tubes	Sample size, number of tubes	Number of defectives allowed	
		Inspection	Testing
25 – 90	13	0	0
91 – 150	20	1	1
151 – 280	32	2	1
281 – 500	50	3	1
510 – 1 200	80	4	2
1 201 – 3 200	125	5	2

B.2 Compliance

The lot shall be deemed to comply with the requirements of this part of the standard if

- a) on inspection of the sample taken in accordance with B.1, the number of defectives found does not exceed the appropriate acceptance number given in column 3 of table B.1; and
- b) on testing of the sample taken in accordance with B.1, the number of defectives found does not exceed the appropriate acceptance number given in column 4 of table B.1.