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EAST AFRICAN STANDARD

Galvanized plain and corrugated steel sheets — Specification

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EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Community established an East African Standards Committee mandated to develop and issue East African Standards.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

EAS 11 was prepared by Technical Committee EASC/TC 035, *Steel and steel products*.

This secondedition cancels and replaces the first edition (EAS 11:2008), which has been technically revised.

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Galvanized plain and corrugated steel sheets — Specification

1 Scope

This East African Standard specifies requirements and methods of sampling and test for galvanized plain and corrugated steel sheets for roofing, cladding, fencing, fabrication and general use.

This East African Standard does not cover special purpose profiles.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EAS 196*, High strength low-alloy carbon steel for hot rolled sheet and cold rolled sheet — specification*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.

3.1
galvanized sheets
steel sheets with a uniform coating of zinc applied by the hot-dip process

3.2
corrugated sheets
galvanized steel sheets which are mechanically formed to obtain regular, sinusoidal, profiles, as shown in Figure 1

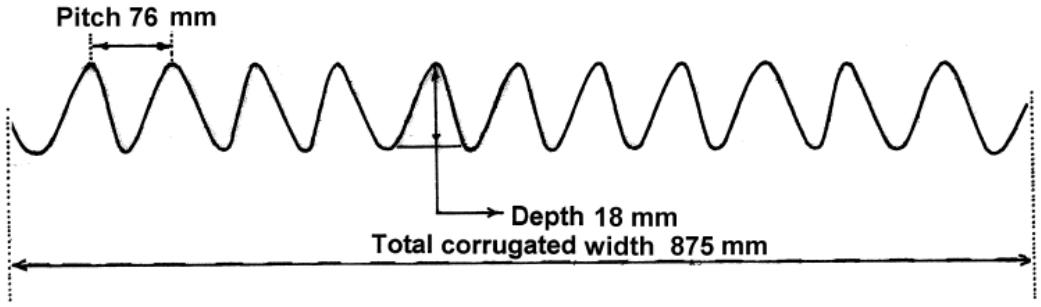

Figure 1 — Profile of corrugated sheets

3.3
thickness
thickness of the base metal

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3.4
plain
flat or even sheets without any relief forms

3.5
pitch
distance between two corresponding and consecutive points on the corrugated steel sheets along its width

4 Requirements

4.1 Dimensions

4.1.1 Length

When measured in accordance with 9.2.2, the length of sheets shall be as specified in Table 1.

Table 1 — Nominal length of plain and corrugated sheets

Dimensions in millimetres

Nominal length, (+0.5%, -0%) mm	
Plain sheets	**Corrugated sheets**
2 000	2 000
2 500	2 500
3 000	3 000

4.1.2 Width

The width of plain and corrugated galvanized sheets when measured in accordance with 9.2.4, shall be as specified in Table 2.

Table 2 — Nominal width of plain and corrugated sheets

Dimensions in millimetres

Width of plain sheets and sheets before corrugation ± 2.5%	**Number of corrugations**	**Total corrugated width ± 2.5 %**
1220	14	1100
1150	13	1025
1070	12	950
1000	11	875
914	10	800

4.1.3 Thickness

The thickness of galvanized plain and corrugated sheets shall be expressed in gauges. The corresponding thickness in millimetres shall be as specified in Table 3.

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Table 3— Base metal thickness of plain and corrugated sheets

Gauge	Thickness, mm	Tolerance (± %)
32	0.20	12
30	0.25	10
28	0.32	10
26	0.40	10
24	0.50	10
22	0.63	10
20	0.80	5
18	1.00	5
16	1.20	5
14	1.50	5
12	2.00	5
10	2.60	5

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4.1.4 Squareness

When measured in accordance with 9.2.3, the distance between diagonally opposite corners of the sheet shall not differ by more than 10 mm.

4.2 Profile

4.2.1 Depth

The depth of corrugations shall be 18 mm ±1.5 mm, when measured in accordance with 9.2.6.

4.2.2 Pitch

The pitch of the corrugations shall be 76 mm ± 2 mm when measured in accordance with 9.2.5.

4.3 Tensile strength

The tensile strength of plain and corrugated galvanized sheets when determined in accordance with 9.2.7 shall be not less than 300N/mm^2. The yield strength shall be not less than 210 N/mm^2.

4.4 Resistance to bending

When tested in accordance with 9.2.8, the sheet shall not crack, flatter or splinter.

4.5 Freedom from defects

The sheets shall be uniform, clean and free from defects that would adversely affect their use.

4.6 Finish

The finish on plain and corrugated galvanized sheets shall be “Mill Finish”.

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5 Galvanized process (criteria of compliance)

5.1 General requirement

The steel sheets shall be manufactured in accordance with accepted current practice and shall be from rolled milled steel made by a suitable process and meeting the requirements of EAS 196. The sheets shall be true to size and homogenous, with no trace of discontinuity of the zinc coating. They shall also be free from holes, tears, twists, cambers and damaged edges and corners. Corrugations shall be parallel to the edges of the sheets.

5.2 Zinc coating

5.2.1 Zinc coating shall be carried out by the hot-dip process with smelter containing not less than 98.5 % pure zinc. The minimum mass of zinc coating on the two sides of sheet and the corresponding thickness of zinc coating on each side shall comply with the classification specified inTable 4.

Table 4 — Classification of galvanized plain and corrugated steel sheet

Coating class	Nominal mass on two sides, g/m^2	Minimum mass on two sides by Weight Method, g/m^2	Minimum mass on two sides by Antimony chloride Method, g/m^2	Nominal corresponding thickness on each side, µm	Minimum corresponding thickness on each side, µm
Z	515	412	360	35	25
Y	450	360	315	31	22
X	387	310	270	26	19
A	305	244	214	21	15
B	244	198	183	17	13
C	214	172	146	15	10
D	183	137	122	13	9

5.2.2 The nominal mass of zinc coating per square metre, when tested according to methods specified in 8.1, shall correspond to the classification specified in Table 4. The minimum values determined by the methods specified in 8.1, shall be as shown in Table 4.

5.2.3 Zinc coating adherence shall be such that there shall be no flaking or splintering in the finished galvanized plain or corrugated sheet, when tested in accordance with8.2.

5.3 Classification of zinc coating

Galvanized plain and corrugated steel sheets shall be classified into seven (7) classes depending on the mass of zinc coating applied to meet different service and environmental conditions. The classes shall be as specified in Table 4.

6 Marking

6.1 Complying sheets

Each galvanized plain or corrugated steel sheet complying with this standard shall be permanently and indelibly marked with the following information:

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a) manufacturer's name and/or trade mark;

b) thickness;

c) coating class of sheet; and

d) batch identification.

6.2 Non-complying sheets

All non-complying sheets shall be identified by cutting off all four corners at least by 75mm along the edges diagonally and shall be marked “Rejected” with indelible ink.

7 Sampling

7.1 General

The sampling proceduresin 7.2 and 7.3 shall be applied in determining whether a lot complies with the relevant requirements of the specification.

The samples so taken shall be deemed to represent thelot.

7.2 Sample for inspection and dimensional test

7.2.1 From the lot, random sampling shall be done in accordance with Table 5.

Table 5 — Sampling plan

Number of sheets	Sample for inspection and dimensional tests, number of sheets
1 -16	1
17 -48	2
49 -100	3
101 -160	4
161 -200	5
>200	5 per 200 sheets

7.2.2 For the manufacturing industry, three sheets shall be taken in every 8 h shift.

7.3 Sample for other tests

From the sample taken in accordance with 7.2.1, take at random one sheet.

8 Testing for zinc coating

8.1 Mass of zinc coating

8.1.1 Weight Method

The steel sheets shall be weighed before galvanizing then passed through the galvanizing process and weighed again at the end of the process.

NOTE The Antimony chloride Method will be used as the criteria for compliance and not the Weight Method.

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8.1.2 Antimony chloride Method

The test piece of minimum area 5 000 mm^2 shall be weighed and then introduced into a zinc-stripping solution of one part antimony chloride and twenty parts hydrochloric acid (specific gravity 1.19), and shall remain therein until the coating has completely dissolved. The test piece shall be taken out of the solution when the violent chemical reaction ceases, rinsed in running water, brushed to remove any loose substance, dried and weighed.

8.1.3 Calculation

The average of the gain or loss in mass (grams) calculated from the results obtained from threetest pieces shall represent the mass of zinc coating on both sides of each test piece (see Annex A).

The results shall be expressed in grams per square metre (g/m^2).

8.2 Coating adherence test

8.2.1 The test shall consist of subjecting the test piece to deformation by bending in one direction. The test piece shall either be bent mechanically or gripped in hand-operated device (mandrels may also be used) and bent until the two legs of the test piece are parallel to each other, that is, through 180°.

8.2.2 A second test piece shall be bent in the opposite direction.

8.2.3 The sheets shall be bent round a diameter of 38 mm.

9 Inspection and physical tests

9.1 Inspection

Inspect the sample taken in accordance with Clause 7for compliance with 4.5 and 6.1.

9.2 Dimensions

9.2.1 Thickness

Measure to the nearest 0.01 mm the thickness of each sheet in the sample of the sheets at any point at least 10 mm from an edge and end of the sheet.

9.2.2 Length

Place each sheet in the sample in turn on a flat rigid surface. Measure to the nearest 1 mm the length of each sheet along the centre line of the sheet.

9.2.3 Squareness

Place each sheet in the sample in turn on a flat rigid surface. Measure to the nearest 1 mm the distance between the diagonally opposite corners of each sheet and record to the nearest millimetre the difference between the two measurements.

9.2.4 Width

9.2.4.1 Plain sheets

Place each sheet in the sample in turn on a rigid surface. Measure to the nearest 1 mm across the width of the sheet.

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9.2.4.2 Corrugated sheets

Place each of the sheets in the sample in turn on a flat rigid surface and measure, to the nearest 1 mm across the width of the sheet. Choose at random a cross-section of the sheet and if, because of the springy nature of the sheet, the underside of the downwards corrugations or troughs are not all in contact with the supporting surface, apply sufficient pressure to the upper surface of the sheet to bring the lower surface into full contact with the supporting surface. Ensure that the application of pressure causes no deformation of the sheet other than that needed to bring the corrugations into contact with the rigid surface.

Place the width gauge appropriate to the type of sheet being tested across the sheet at any chosen cross-section and at right angle to the sides of the sheet and adjust the gauge to fit firmly over the outermost corrugations. Determine whether the width of the sheet complies with the requirements of Table 2. Both edges of the corrugated sheet shall be turned upwards while measuring.

9.2.5 Pitch

With the sheet in contact with a flat surface, place a transparent graduated rule on edge across the sheet so that it rests perpendicularly on the crests of two adjoining corrugations far from the points of contact, and read the distance between them to the nearest 1 mm. Repeat the process to improve your results by taking the average of five readings for the distance between several crests.

NOTE Any other appropriate method may be used to measure the pitch.

9.2.6 Depth of corrugations

With the initial rule lying flat across the corrugations at the edge of the sheet, use another graduated rule or calipers to measure the perpendicular distance between the initial rule and the rigid support.

NOTE Any other appropriate method may be used to measure the pitch.

9.2.7 Tensile strength

From the sample in Clause 7, prepare a tensile test specimen, after stripping off coating, by cutting a strip 30 mm x 80 mm, such that the length of the specimen is transverse to the direction or rolling of the sheet. The portion of sheet from which the test piece is cut shall be carefully flattened. Determine the tensile strength of the specimen.

If the tensile strength of the test specimen fails the requirements of 4.3, prepare two further test specimens and determine their tensile strength. If both specimens comply with the requirements,discard the results of the first specimen, but if either of the additional specimens fails to meet the requirements, deem the sheet and the lot to be defective.

9.2.8 Bend test and coating adherence test

A test specimen shall be selected in accordance with Clause 7and shall be prepared to measure 10 mm in width and 120 mm in length.

It shall be cut with its length transverse to the direction of rolling of the sheet. Carefully bend the strip round a drum of diameter 38 mm (mandrels may also be used) until the edges of the specimen are approximately semi-circular.

If the specimen cracks, prepare and test two further specimens in the same way. If both these test specimens comply with the requirements of 4.4, 4.5 and 5.2.3, discard the results obtained on the first specimen, but if either of the two cracks at the bend, deem the sheet and lot to be defective.

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Annex A
(normative)

Reference method for determination of the zinc coating mass

A.1 Principle

Using a specimen with a surface area of at least 5 000 mm^2, the loss of mass in grams when the coating is dissolved, multiplied by 200, will represent the coating mass in grams per square metreof the product (for both sides).

To verify the mass of coating, three specimens shall be cut and tested, one from the mid-width position and one from each side, no closer than 25 mm from the side edge of a sample piece approximately 300 mm in length on the coated width.

A.2 Reagents

A.2.1 Hydrochloric acid (HCl = 1.19 g/cm^3)

A.2.2 Antimony tri-chloride

A.3 Apparatus

Balance, capable of weighing samples to an accuracy of 0.01 g. For the test, use a take-off device.

A.4 Procedure

A.4.1 If necessary, degrease the sample with an organic solvent, which will not attack the coating, then dry the sample.

A.4.2 Weigh the sample to an accuracy of 0.01 g.

A.4.3 Place the sample in the hydrochloric acid solution with hexamethylenetetramine or antimony chloride inhibitor at an ambient temperature of 20 °C to 25 °C leave the sample immersed in the solution until the release of hydrogen ceases of only a few bubbles are released.

A.4.4 After the attack, wash the sample and brush under running water, dry with a cloth and then by heating to around 100°C and cool or dry by blowing with warm air.

A.4.5 Weigh the sample again to an accuracy of 0.01g.

A.4.6 Determine the difference between the mass of the coated sample and that of the sample without its coating. This difference, calculated in grams, represents the mass of the coating.

NOTE The operations in A.4.1 – A.4.6 are applied to each sample.

A.5 Calculation

The coating weight shall be obtained from the following formulas. Method 1 shall be the reference method in case of a dispute.

Method 1 shall be used for regular pieces of specimen (either square or rectangular). In case where it's difficult to cut regular test pieces, for example, the heavier sheet gauges, method 2 shall be used.

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Method 1

$$C_1 = \frac{W_1 - W_2}{A} \times 10^6 \quad (1)$$

Method 2

$$C_2 = \frac{W_1 - W_2}{W_2} \times t \times 7850 \quad (2)$$

where

C is zinc coating in grams per square metre (g/m^2);

A is area of test specimen (length x width);

W_1 is weight, in grams, of test piece before stripping;

W_2 is weight,in grams, of test piece after stripping (base metal);

t is thickness, in millimetres, of test piece after stripping (base metal);

10^6 is conversion factor;and

7850 is density of steel in kilograms per cubic metre (kg/m^3).

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