



TANZANIA DRAFT STANDARD

MEDC2 (5189) P3, Specification for steel sheet, metallic coated by the hot-dip process and pre painted by the coil-coating process for exterior exposed building products (Revision TZS 1477:2012)

DRAFT FOR PUBLIC COMMENTS

TANZANIA BUREAU OF STANDARDS

Specification for steel sheet, metallic coated by the hot-dip process and pre painted by the coil-coating process for exterior exposed building products

0. Foreword

Metallic and colour-coated metal roofing sheets are the products used for roofing and wall cladding construction. It has been observed that, the usage of metallic and colour coating on metal roofing sheets is becoming important especially in coastal regions. This importance is due to long life expectancy, corrosion resistance and highly resistance to hail damage. In order to meet performance and quality requirements for ensuring public safety, health and welfare in private, commercial and industrial buildings the Tanzania Standard for metallic and colour coated metal roofing sheet (coil) has been prepared.

For the purpose of deciding whether a particular requirement of this Tanzania Standard is complied with, the final value observed or calculated expressing the result of a measurement or test shall be rounded off in accordance with TZS 4 (see clause 2).

During preparation of this Tanzania Standard, reference was made from the following publication:

ASTM A 755/ A 755M: 2008, *Specification for steel sheet, metallic coated by the hot-dip process and pre painted by the coil-coating process for exterior exposed building products*, published by the American Society for Testing and Materials.

1. Scope

This specification covers sheet metallic coated by the hot-dip and coil-coated with organic films for exterior exposed building products of various qualities. Sheet of this designation is furnished in coils, cut lengths and formed cut lengths such as industrial troughs, corrugated and tile profiled sheets.

Coating systems supplied under this specification shall consist generally of a primer coat covered by various types and thicknesses of top coats. The combination between the primer and top coat is usually classed as either a two-coat thin-film system or as a two-coat (or more) thick-film system. Typical top coats are; polyester, silicone polyester, acrylic, fluoropolymer, plastisol, or polyurethane.

2. References

For the purpose of this Tanzania Standard, the following references shall apply;

TZS 4: 2009, *Rounding off numerical values*

TZS 1476: 2011, *Hot-dip aluminium – Zinc coated plain, corrugated and troughed steel sheets – Specification*

TZS 1475: 2011, *Sheet roof and wall covering – Aluminium alloy corrugated and troughed sheet*

TZS 1059: 2008, *Continuous hot-dip zinc coated carbon steel sheet of commercial and drawing qualities (ISO 3575)*

TZS 1061: 2008, *Continuous hot-dip zinc coated steel sheet of structural quality (ISO 4998)*

TZS 1060: 2008, *Continuous hot-dip aluminum/zinc-coated steel sheet of Commercial, Lock-forming and drawing qualities (ISO 9364)*

TZS 956: 2007, *Paints and varnishes – Bend test (cylindrical mandrel)*

TZS 967: 2007, *Metal roofing tiles – Test method – Resistance to laboratory artificial weathering of paint films*

TZS 948: 2007, *Metal roofing tiles – Specification*

TZS 969: 2007, *Paints and varnishes – Resistance to impact of paint films*

TZS 353: 2001, *Galvanized corrugated sheets – Specification*

3. Definitions

3.1 Substrate

3.1.1 Commercial quality (CQ)

Steel sheet intended for applications where the product is subjected to bending or moderate forming.

3.1.2 Lock-forming quality (LFQ)

Steel sheet intended for applications where the product is subjected to machine lock-forming. The higher speed forming by the machines imposes requirements on both the base metal and the coating which are in excess of the formability requirements of commercial quality.

3.1.3 Drawing quality (DQ)

Steel sheet intended for fabrication of parts where drawing or severe forming may be involved.

3.1.4 drawing quality (DQ) – Special killed (DQSK)

Steel sheet intended for fabrication of an identified part where particularly severe drawing or forming may be involved or essential freedom from aging is required.

3.1.5 Structural quality (SQ)

Steel sheet intended for applications where mechanical properties are specified. Such properties or values include those indicated by tensile, hardness, or other commonly accepted mechanical tests.

3.2 Coatings

3.2.1 Acrylic

A polymer based on resins prepared from a combination of acrylic and methacrylic esters, acrylic and methacrylic acids, and styrene. They contain one or more functional groups such as amide, hydroxy, or carboxy and form thermosetting systems on baking by cross-linking with themselves, or amino or epoxy resins.

3.2.2 Conversion coating

A chemical treatment, normally applied to a metal surface prior to final finishing, which is designed to react with and modify the metal to provide a surface suitable for painting.

3.2.3 Epoxy polymers based on epoxy resins

Usually the reaction product of epichlorohydrin and biphenol-A and are generally cross-linked with amino or urea-formaldehyde resins to form thermosetting systems on baking.

3.2.4 Fluorocarbon

Polymers based on fluorocarbon resins made by the polymerization of vinyl fluoride monomer (PVF) or vinylidene fluoride monomer (PVF₂). These resins are usually formulated into coatings by dispersion of finely divided particles in dispersants and diluents and form thermosetting systems on baking.

3.2.5 Plastisol

A dispersion of finely divided vinyl resin in plasticizers. During the baking process, the resin particles are solvated by the plasticizer and fuse into continuous film.

3.2.6 Polyester

A polymer based on condensation products of polybasic acids and diols (dihydric alcohols), sometimes called oil-alkyds. They may be modified by the addition reaction of other monomers such as styrene or acrylic esters. Polyester resins are generally cross-linked with amino resins to form thermosetting systems on baking.

3.2.7 Polyurethane

A polymer produced by the addition reaction of an acrylic polyol or polyester polyol with an isocyanate-containing compound to produce thermosetting systems on banking.

3.2.8 Primer

The first complete layer of paint of a coating system applied to an uncoated surface. The type of primer varies with the type of surface and its condition, the intended purposes and the coating system being used.

3.2.9 Silicone polyester

A polymer which is the reaction product between an organo-siloxane intermediate and an alkyd resin, or a cold blend of a silicone resin and a compatible alkyd resin. These resins are generally cross-linked with amino resins to form thermosetting systems on baking.

3.3 Coating Characteristics

3.3.1 Chalking

The formation on a pigmented coating of a friable powder evolved from the film itself at or just beneath the surface.

3.3.2 Fade

A loss in colour intensity experienced by pigmented organic coatings over time, generally due to the effect of ultraviolet radiation.

3.3.3 Gloss

The luster, shininess or reflecting ability of a surface.

3.4 Descriptions of terms specific to this Tanzania Standard

3.4.1 Bottom side

The side of prepainted sheet opposite the exposed weathering side, generally coated with a washcoat (see 3.2.6) but sometimes coated with the same system as top side.

3.4.2 Coil coating

A continuous process by which paint and other coatings are applied and baked onto a moving strip of steel sheet. Generally, rolls are used to pick-up, meter, and deposit the liquid coating onto a moving strip and are also used to support the strip through the line. The product of this process is called prepainted steel sheet.

3.4.3 Mil

A unit for measuring thickness. One mil =0.025 mm [0.001 inch]. This term is generally applied only to paint films.

3.4.4 Paint

In terms of coating, an organic liquid, generally pigmented, which is converted to a solid film by baking.

3.4.5 Roll former

An apparatus that forms a continuous strip of painted metal into various shapes by a series of contoured steel rolls.

3.4.6 Top side

The side of the prepainted sheet which is exposed to weathering. The organic coating on the top side typically consists of a primer and a topcoat.

3.4.7 Washcoat

A thin organic coating, usually polyester, applied to the back or unexposed side of prepainted sheet (also known as a backcoat). This coating may or may not be pigmented and is applied for such reasons as protection of the topcoat while in coil form, interior appearance, and lubrication during roll forming.

4. Classification

4.1 The substrate shall conform to one of the requirements of the appropriate standards specification depending on the application as follows:

4.1.1 zinc-coated (galvanized)

4.1.1.1 CDQ specifications [TZS 1059 (see clause 2)]

4.1.1.2 SQ specification [TZS 1061 (see clause 2)]

4.1.2 Aluminium-zinc alloy coated.

4.1.2.1 Continuous hot-dip aluminium/zinc-coated steel sheet of commercial drawing and structural qualities [TZS 1059 (see clause 2)] and [TZS 1061 (see clause 2)]

4.2 The organic coating shall typically consist of a primer and a topcoat on the top (exposed) side and washcoat on bottom (unexposed) side. Typical primers are epoxy, acrylic, and polyurethane. The topcoats are polyester, silicone acrylic, aolyester, fluoropolymer, plastisol, and polyurethane and the washcoat or backercoats are polyester and acrylic

4.3 Other coatings may be specified if agreed upon between producer and purchaser.

5. Ordering information

5.1 The coated flat sheet covered by this specification is produced on continuous lines to decimal thickness only. The thickness of the sheet includes the base metal and the metallic coating. The thickness of the organic system is in addition to the substrate (base steel and metallic coating).

5.2 Orders for material and under this specification should include the following information, as applicable, to describe the required product adequately:

5.2.1 Product name (prepainted steel sheet),

5.2.2 The number of this Tanzania Standard,

5.2.3 Metal coating designation of substrate (see 4.1),

5.2.4 Metallic coating type (see 4.1).

5.2.5 Metallic coating weight [mass] designation.

5.2.6 Metallic coating finish (such as regular, minimized, spangle, extra smooth, or minimized spangle-extra smooth).

5.2.7 Organic coating system designation (see 4.2 or 4.3).

5.2.8 Dry organic film thickness top side and bottom side (the top side typically consists of a primer and topcoat and the bottom side a primer and a washcoat; however the bottom side may be ordered to the same quality as the topside) (see 7.4.2).

5.2.9 Protection required (waxed or strippable coating).

5.2.10 Dimensions (thickness, width, either flat or formed (overall or cover) and length (if cut length)) and, if applicable, type of formed configuration.

5.2.11 Coil size requirement; maximum outside diameter, acceptable inside diameter, and maximum mass.

5.2.12 Cut length requirement: maximum lift weight [mass].

5.2.13 Special requirements if any, and

5.2.14 Application (part identification and description).

NOTE 1 – Typical ordering description is as follows:

Pre-painted steel sheet, TZS 1475 (see clause 2), Zinc coated (galvanized), G90, Extra smooth, Top side primer, 0.00625 mm (0.25 mil) thickness plus gold silicone-polyester, 0.02mm (0.8 mil) thickness, bottom side primer, 0.00625 mm (0.25 mil) thickness plus washcoat, 0.0075 mm (0.3 mil) thickness, 0.4826 mm min. thickness by 1066.8 mm width by coil, 609.6 mm inside diameter, 1320.8 mm max outside diameter, 9072 kg max weight coil for roll-formed exterior building siding.

NOTE 2 – When specifying organic coating system designation, instead of using generic terms listed in 4.2, it is permissible to use trade name terminology as published by various coating and pre-painted sheet suppliers. These trade name coatings are generally brand name versions of the generic coatings listed in 4.2 and usually include a primer and film thickness values.

6. Substrate requirement

For the purpose of this Tanzania Standard, substrate refers to the steel sheet and metallic coating. The specific requirements for the substrate contained in the list referenced specifications shall apply. When the metal is coated by zinc, the coating shall be determined and comply with the requirement set in TZS 353 (see clause 2), and when metal is coated by the Alu-zinc, the coating shall be determined and comply with the requirement set in TZS 1476 (see clause 2).

7. Profiles for the formed sheets

7.1 The pre – coated steel sheets intended for roofing shall have the profiles as described in TZS 1476 and TZS 1475 (see clause 2).

7.2 Sampling procedure shall be performed as described in TZS 353 (see clause 2). The sample shall be applied in determining whether a lot complies with the relevant requirements of the specification. The sample so taken shall be deemed to represent the lot.

8. Organic coating requirements

8.1 Coating shall be of an acceptable colour and shall have an acceptable degree of resistance to weathering.

The application of organic coatings on a continuous coil coating line shall involve three major steps.

These are:

- a) Application of Conversion coating
- b) The application of a Primer and
- c) The application of one or more topcoats.

8.2 Conversional coating

Conversional coating is a chemical treatment applied to metal prior to application of the primer. It is designed to react with and modify the metal surface to enable chemical bonding to occur between the metal and the primer thus optimizing adhesion and corrosion resistance.

8.3 Primer

8.3.1 The purpose of primer coating is to serve as the bond between the substrate and the topcoat and to offer added corrosion protection for the entire system. For building products, primer thickness is typically 0.005 mm [0.2 mil] (tolerance \pm 0.001 mm [0.05 mil]). Higher performance primer with films as thick as 0.075 mm [3 mils] (tolerance \pm 0.008 mm [0.30 mil]) may be specified

8.3.2 When a primer is used it must be compatible with both the conversion coating and the topcoat in order to ensure optimum properties of the coating system. For this reason the primer is specified by the coating supplier or pre painted sheet producer.

8.4 Topcoat

8.4.1 The topcoat provides colour and durability and also acts as protection against atmospheric corrosion. Different coats are selected based on the performance or appearance requirements desired. For building products, topcoat thickness is typically 0.020 mm [0.8 mil] [tolerance \pm 0.005 [0.2 mil]]. High performance topcoats with film as thick as 0.30 mm [12 mils] (tolerance \pm 0.03 mm [1.2 mil]) may be specified. Other upgrade system may specify the application of two or more layers of topcoats.

8.4.2 The topcoat is normally applied only to the top (exposed) side of the sheet; however the bottom (unexposed) side may be ordered with the same coating as the top side. Usually the coating that is applied only to the bottom side is a washcoat or backcoat (refer to 8.5).

8.4.3 The selection of topcoat depends on the performance parameters required such as chalk and fade, plus the corrosion resistance needed, which must take into account the severity of the service environment.

8.5 Washcoat or backcoat

The washcoat or backcoat is applied to the bottom (unexposed) side of the sheet and may be pigmented or clear. Its purpose is to provide protection against damage to the top side coating during shipment and storage and also provide some addition durability to the exposed side during the service life of the product. For building products, washcoat thickness is typically 0.008 mm [0.3 mil] (tolerance \pm 0.001 mm [0.05 mil]).

8.6 Testing requirements

The properties of the substrate and the organic coating system, combined with the method of forming, determine the life expectancy and general appearance of the final product. Each coating system shall have different qualities in regard to gloss, flexibility, fading, chalking, and resistance to cracking at bends, abrasion resistance, dirt retention, and resistance to varying atmospheric conditions. All of these factors should be considered in any end application. The test methods used to measure some of these parameters shall be as specified in the list standards, TZX 353, TZX 948 TZX 956, TZX 967, TZX 968, TZX 969 and TZX 1476 (see all in clause 2).

9. Packaging, marking, and loading

9.1. Packaging and loading

Coil should be shipped eye vertical to minimize transition abrasion. Coil coated steel is finished material and should be treated as such in handling and storage. Pallets should be placed between the ground and the coil. Plastic bags should not be used to protect the coil. However the purchasers may specify packaging methods in accordance with their requirements. After a product has been delivered, purchasers are faced with problems of disposal of the packaging materials. For this reason the simplest effective packaging is the most desirable.

9.2 Marking

Each coil shall be identified with a tag containing the following information

- a. Producer's name, brand, or trade mark,
- b. Thickness and width,
- c. Metal coating designation,
- d. Heat number,
- e. Weight,
- f. Customer's name, and
- g. Customer's order number.

9.3 Shipment condition

When specified in the contract or order, and for direct shipments to the government, preservation, packaging, and packing shall be in accordance with the manufacturer requirements. Marking for shipment shall be in accordance with purchaser requirements.

9.4 Storage Condition

Proper on-site storage of building panels prior to election has been found to be important in maintaining the integrity of the coat system. Corrosion failure can result when building panels are not properly protected from water being trapped during storage prior to installation. Pallets should be placed off the ground and at a slight angle for effective drainage. In addition, the use of metal covers or the equivalent is an effective way of keeping pallets dry. Plastic bags should not be used to protect the coils or pallets.

10 Inspection

The producer shall afford the purchaser's inspector reasonable facilities to ensure that the product is being produced in conformance with the specification. Unless otherwise specified, all inspection and tests, except product analysis, shall be made at the producer's works prior to shipment. Such inspection or sampling shall be made concurrently with the producer's regular inspection and test operations unless in cause interference with normal operations or is otherwise specified.

10.1 Responsibility for inspection

Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the producer may use any facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the purchaser. The purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

11 Rejection and rehearing

11.1 Unless otherwise specified, any rejection should be reported to the producer within an agreed time after receipt of the product by the purchaser.

11.2 Product that is reported to be defective subsequent to the acceptance at the purchaser's premises should be set aside, adequately protected, and correctly identified. The producer should be notified as soon as possible as that an investigation may be initiated.

11.3 Samples that are representative of the rejected product shall be made available to the producer. In the event that the producer is dissatisfied with the rejection, a rehearing may be requested.

11.4 Rejection of non-conforming sheets made from this coil, will be done as per T2S 1476.

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