
**Continuous hot-dip metallic-coated steel
sheet for corrugated steel pipe**

*Tôles en acier revêtues en continu par immersion à chaud pour tuyaux
d'acier strié*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16172 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

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Continuous hot-dip metallic-coated steel sheet for corrugated steel pipe

1 Scope

This International Standard specifies the requirements for steel sheet used in the manufacture of corrugated steel pipe for storm sewers, culverts, drains, and similar uses.

The sheet is metallic coated by the continuous hot-dip process.

Many metallic coated materials are covered in this International Standard. Users must determine which product best serves their needs. Four different metallic coatings are included:

- zinc coated;
- zinc-5 % aluminum-mischmetal alloy coating;
- 55 % aluminum-zinc alloy coated;
- Al-Si alloy coated.

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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.

ISO 1460, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

ISO 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*

ISO 6892:1998, *Metallic materials — Tensile testing at ambient temperature*

ISO 16163, *Continuously hot-dipped coated steel sheet products — Dimensional and shape tolerances*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

fabricator

(for corrugated metal pipe) the organization that produces the finished pipe

3.1.2

fabricator

(for structural plate pipe) the organization that processes flat sheets and other items necessary for the field assembly of finished products

3.1.3

manufacturer

(for corrugated metal pipe) the organization that produces the metal sheet from which pipe is made

3.1.4

purchaser

(for corrugated metal pipe) the person or agency that purchases the finished pipe

NOTE With regard to this International Standard for sheet for corrugated steel pipe, the fabricator may also be considered as the purchaser of the sheet, where that term is used in this International Standard. Such an interpretation will not restrict the purchaser of finished pipe from enforcing any provisions of this specification.

3.1.5

normal spangle coating

coating formed as a result of the unrestricted growth of aluminium alloy crystals during normal solidification of the Zn-5Al-MM coating type <https://standards.iteh.ai/catalog/standards/sist/a0175e85-8fd4-41da-b927-99634f7957df/iso-16172-2006>

3.1.6

minimized spangle coating

a finer metallurgical coating formed as a result of treatment to restrict the formation of the normal coarse-grain coating structure of the Zn-5Al-MM coating type

3.2 Abbreviations

Al-Si: aluminium-silicon alloy

55Al-Zn: 55 % aluminium-zinc alloy

Zn: zinc

Zn-5Al-MM: zinc-5 % aluminium-mischmetal alloy

4 Requirements

4.1 Chemical composition

The chemical composition (heat analysis) of the base metal shall conform to the requirements of Table 1.

4.2 Mechanical properties

The metallic-coated sheet shall conform to the requirements listed in Table 2.

Table 1 — Chemical composition

| Element | Heat analysis | Product analysis |
|---|---------------|------------------|
| Sulfur, max., % | 0,05 | 0,06 |
| Sum of carbon, manganese, phosphorus, sulfur and silicon, max., % | 0,70 | 0,74 |

Table 2 — Mechanical requirements (properties of flat sheet prior to fabrication) ^a

| | |
|--|-----|
| Tensile strength ^b , min., N/mm ² | 310 |
| Yield strength ^b , min. N/mm ² | 230 |
| Elongation, in 50 mm ^c , min., % | 20 |
| <p>^a To determine conformance with this specification, round each value for tensile strength and yield strength to the nearest 1 N/mm² and each value for elongation to the nearest 1 %.</p> <p>^b Yield strength and tensile strength are based on the thickness of the base metal. If tests are made after coating, determine the base metal thickness after stripping the coating from the ends of the specimen contacting the grips of the tension-testing machine prior to tensile testing.</p> <p>^c The elongation requirement does not apply to material tested after corrugating.</p> | |

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5 Coating requirements (standards.iteh.ai)

5.1 Coating mass

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The coating mass shall comply with the requirements listed in Table 3. The coating mass is the total amount of coating on both sides of the sheet, expressed in grams per square metre.

5.2 Coating adhesion

The adhesion of the coating shall be such that no peeling or flaking occurs while the coated sheet is being corrugated and formed into pipe.

5.3 Surface treatment

A chemical treatment may be applied to the metallic-coated sheet to minimize the hazard of wet storage stain during shipment and storage. However, the inhibiting characteristics of the treatment are limited and, if a shipment is received wet, the material shall be used immediately or dried.

Table 3 — Coating mass requirements

| Type | Coating mass | | Equivalent coating thickness | |
|-----------|--|---------------------------------------|----------------------------------|-------------------------|
| | total, both sides | | total, both sides ^a | |
| | Triple spot, average, min. g/m ² | Single spot, min. g/m ² | Triple spot, average, min. µm | Single spot, min. µm |
| Zn | 610 | 550 | 86 | 78 |
| Zn-5Al-MM | 640 | 550 | 93 | 80 |
| 55Al-Zn | 210 | 180 | 56 | 48 |
| Al-Si | 305 | 275 | 95 | 86 |

^a Coating thicknesses are approximate, for information only. Conversions are based on the following relationships: Zn coating: 1 g/m² = 0,141 5 µm; Zn-5Al-MM: 1 g/m² = 0,146 0 µm; 55Al-Zn coating: 1 g/m² = 0,266 36 µm; Al-Si coating: 1 g/m² = 0,331 28 µm.

6 Dimension and tolerances

6.1 Thickness

Sheet thickness shall conform to the dimensions specified in Table 4. The thickness of the sheet includes both the base metal and the coating.

6.2 Length

Permissible variations in the length of cut-length sheets, both flat and corrugated, shall be in accordance with ISO 16163.

6.3 Flat sheet

Permissible variations in the width and camber of flat material shall be in accordance with ISO 16163. The flatness tolerances are given in Table 5.

6.4 Corrugated sheet

6.4.1 Corrugations shall form smooth continuous curves and tangents. The dimensions of the corrugated sheet shall be in accordance with Table 6.

6.4.2 The covering width of corrugated sheet shall be in accordance with Table 7. The covering width is the distance between the crests of the extreme corrugations. The lip dimension of corrugated sheet shall be in accordance with Table 8 and is measured along the radial curvature from the crest of the corrugation to the edge of the sheet. There is no established tolerance for overall width, since the covering width and lip dimensions are the governing factors for the formed product.

Table 4 — Coated-steel-sheet thickness requirements

| Specified thickness mm | Minimum thickness mm |
|---------------------------|-------------------------|
| 1,0 | 0,9 |
| 1,3 | 1,2 |
| 1,6 | 1,5 |
| 2,0 | 1,8 |
| 2,8 | 2,6 |
| 3,5 | 3,3 |
| 4,3 ^a | 4,0 |

^a Aluminium-silicon-alloy-coated sheet is not available in these thicknesses.

NOTE Thickness is measured not less than 10 mm from an edge. On corrugated sheet, thickness is measured on the tangents of corrugations.

7 Sampling

7.1 Chemical composition

A heat analysis of each heat shall be made by the manufacturer to determine compliance with the requirements of Table 1.

7.2 Mechanical properties

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One representative sample is used for the tensile test to determine conformance with the requirements of Table 2. Mechanical property tests shall be conducted on the sheet prior to corrugating or other fabrication, whenever possible. If the tests are made after corrugating, the specimens shall be taken on the tangents of corrugations and used for the determination of tensile and yield strength only.

7.3 Coating properties

7.3.1 Coating mass

Test specimens for coils shall be taken from a sample piece approximately 300 mm in length on the as-coated width. Three specimens are cut from the sample, one from the mid-width position and one from each side, not closer than 25 mm from the side edge. The minimum specimen area shall be 2 000 mm².

7.3.2 Triple-spot test

The triple-spot test result shall be the average coating mass found on the three specimens taken according to 7.3.1.

7.3.3 Single-spot test

The single-spot test result shall be the minimum coating mass found on any one of the three specimens used for the triple-spot test.