



TANZANIA DRAFT STANDARD

MEDC 2 (5187) P3, Sheet roof and wall covering – Aluminium alloy corrugated and troughed sheet (Revision TZS 1475:2012)

DRAFT FOR PUBLIC COMMENTS

TANZANIA BUREAU OF STANDARDS

0 Foreword

Aluminium alloy roofing sheets have been used on commercial, industrial and domestic buildings for many years due to natural property of corrosion resistant. The sheets are lighter, attractive, tough and durable. Aluminium alloy roofing sheets are available in the country at a different profile and quality. This Tanzania Standard is set to address issues which might affect the quality of the product. The standard specifies materials, profile and dimensions of a straight corrugated and types of straight troughed aluminium alloy sheets.

During the preparation of this Tanzania Standard, assistance was derived from the following publications;

SANS 903: 2010, *Aluminium alloy corrugated and troughed sheets*, published by South African Bureau of Standards.

SANS 51676: 2010, *Aluminium and aluminium alloys – Alloyed ingots for remelting – Specification*, published by South African Bureau of Standards.

1. Scope

This Tanzania Standard covers four types of straight corrugated, and six types of straight troughed aluminium alloy sheets.

NOTE – Recommendations for the use of aluminium alloy corrugated and troughed sheets are given in annex B.

2. References

For the purpose of this Tanzania Standard the following reference shall apply:

ASTM B 209, *Standard specification for aluminium and aluminium-alloy sheet and plate*

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

3. Definitions

For the purposes of this Tanzania Standard, the following definitions apply.

3.1 Defective

Sheet that fails in one or more respects to comply with the relevant requirements of the standard

3.2 Lot

Not more than 600 linear metres of sheet of the same profile, batch identification, and (when relevant) type, size, and thickness, from one manufacturer, submitted at any one time for inspection and test

3.3 Purchaser

Person or entity that is a recipient of a good provided by a seller under a purchase order or contract of sale.

4. Requirements

4.1 Chemical composition

When tested in accordance with 7.2.2, the chemical composition of the sheets shall comply with the requirements given in table 1 or the requirements for 3004 alloy of ASTM B 209 or as specified by the purchaser (see annex A).

Table 1 — Chemical composition

| 1 | 2 |
|---|------------------------|
| Mineral content | % |
| Copper, max. | 0.2 |
| Magnesium, max | 3.0 |
| Zinc, max. | 0.25 |
| Silicon, max. | 0.6 |
| Iron, max | 0.7 |
| Manganese, max. | 0.15 |
| Aluminium | Remainder ^a |
| a Except that titanium and other grain refining elements may be present in quantities that do not aggregate more than 0.20 %. | |

4.2 Tensile strength

The tensile strength, determined in accordance with 7.2.3, shall be at least 175 N/mm².

4.3 Resistance to bending

When tested in accordance with 7.2.4, the test specimen shall not crack.

4.4 Thickness

The nominal thickness of the sheets shall be one of those given in table 2, as specified by the purchaser (see annex A), and, when measured in accordance with 7.2.1.1, the actual thickness shall conform to the appropriate values given in table 2.

Table 2 – Thickness

| Dimension in millimeters | | |
|--------------------------|------------------|------|
| 1 | 2 | 3 |
| Nominal Thickness | Actual thickness | |
| | Max. | Min. |
| 1.2 | 1.28 | 1.12 |
| 0.9 | 0.98 | 0.82 |
| 0.8 | 0.87 | 0.73 |
| 0.7 | 0.77 | 0.63 |
| 0.6 | 0.66 | 0.54 |
| 0.5 | 0.55 | 0.45 |
| 0.4 | 0.45 | 0.35 |

4.5 Number of corrugations or pitches**4.5.1 Corrugated sheets**

Corrugated sheets shall have 8, 10, 12, or 14 corrugations, as specified by the purchaser (see annex A).

4.5.2 Troughed sheets

- a) Type A sheets shall have 4, 5, or 7 pitches, as specified by the purchaser (see annex A).
- b) Type B sheets shall have 4 or 6 pitches, as specified by the purchaser (see annex A).
- c) Type C sheets shall have 4 pitches.

4.6 Width

The width of the sheets, measured in accordance with 7.2.1.3, shall be one of the following values, as relevant:

- a) **Corrugated sheets.** The distance between the crowns of the outermost corrugations shall be as given in table 3.

Table 3 – Distance between crowns of corrugated sheets

| Dimension in millimeters | |
|--------------------------|-------------------------|
| 1 | 2 |
| Number of corrugations | Distance between crowns |
| 8 | 610 ± 5 |
| 10 | 760 ± 5 |
| 12 | 910 ± 7 |
| 14 | 1 060 ± 7 |

- b) **Troughed sheets.** The distance between the centres of the tops of the outermost ridges shall be as given in table 4.

Table 4 – Distance between centre of the tops of the outermost ridges of troughed sheets

| 1 Type | 2 Pitches | 3 Distance between centre of outermost ridges |
|-----------|--------------|--|
| A | 4 | 508 ± 5 |
| | 5 | 635 ± 5 |
| | 7 | 889 ± 7 |
| B | 4 | 610 ± 5 |
| | 5 | 915 ± 7 |
| C | - | |

4.7 Profile, depth of corrugations and troughs, and lip

- 4.7.1 The profile of the corrugations or troughs shall conform to that shown in figure 1, 2, 3, or 4 (as relevant) and, when measured in accordance with 7.2.1.5, the depth of the corrugations or troughs shall be as given in table 5.

Table 5 – Depth of corrugations and troughs, and lip

| Dimension in millimeters | |
|--------------------------------|---|
| 1 Sheet | 2 Depth of the corrugations Or troughs |
| Corrugated sheets | 19 ± 2 |
| Troughed sheets, types A and B | 38 ± 2 |
| Troughed sheets, type C | 40 ± 2 |

- 4.7.2 In the case of troughed sheets, the lip (see figures 2, 3, and 4) shall measure at least 14 mm, and on any one side of a sheet the difference between the maximum and minimum of the lip shall not exceed 7 mm.

4.8 Length

When measured in accordance with 7.2.1.2, the length of corrugated or troughed sheets shall be as specified by the purchaser (see annex A), subject to a tolerance of ± 15 mm for any length of sheet.

4.9 Squareness

When measured in accordance with 7.2.1.4, the distances between diagonally opposite corners of the sheet shall not differ by more than 10 mm in the case of sheets of nominal length not exceeding 6 m and more than 15 mm in the case of longer sheets.

4.10 Freedom from defects

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

4.11 Finish

Unless otherwise specified by the purchaser (see annex A), the finish shall be 'mill finish'.

5. Marking

Each sheet shall bear the following information in legible and durable marking:

- a) the manufacturer's name or trademark (or both);
- b) the thickness of the sheet, in millimetres; and
- c) the batch identification.

6. Sampling and compliance with the standard

6.1 Sampling

NOTE 1 – This clause applies to the sampling for inspection and testing before acceptance or rejection of single lots (consignments) in cases where no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of the lot. It is also used as the procedure for adjudicating in cases of dispute.

NOTE 2 – The sampling procedure given in 6.1.1 can be applied in determining whether a lot complies with the relevant requirements of the standard.

6.1.1 *Sample for inspection and dimensional tests*

From the lot take at random the number of sheets shown in column 2 of table 6 relative to the appropriate lot size shown in column 1.

Table 6 – Number of sheets per lot

| 1 | 2 |
|----------------------------------|--------------------|
| Lot size number of sheets | Sample size |
| 1 – 20 | 1 |
| 21 – 60 | 2 |
| 61 – 200 | 3 |
| > 200 | 4 |

6.1.2 *Sample for other tests*

From the sample taken in accordance with 6.1.1, take at random one sheet.

6.2 Compliance with the standard

The lot shall be deemed to comply with the requirements of the standard if, after inspection and testing of the samples taken in accordance with 6.1.1, no defective is found.

7. Inspections and testing

7.1 Inspection

Inspect the sample taken in accordance with 6.1.1 for compliance with 4.10, 4.11, and clause 5.

7.2 Testing

7.2.1 Dimensions

7.2.1.1 Thickness

Using a micrometer calliper, measure to the nearest 0.01 mm the thickness of each sheet in the sample (see 6.1.1) at any point at least 10 mm from an edge and end of the sheet. Check for compliance with 4.4.

7.2.1.2 Length

Measure to the nearest 1 mm the length of each sheet in the sample (see 6.1.1) along the centre line of the sheet. Check for compliance with 4.8.

7.2.1.3 Width

- a) Place each of the sheets in the sample (see 6.1.1) in turn on a flat rigid surface.
- b) Choose at random a cross section of the sheet and if, because of the spring of the sheet, the undersides 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 these lower surfaces 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 or troughs into contact with the rigid surface.

- c) Place the width gauge appropriate to the type of sheet being tested (see figure 5 or 6, or 7, as relevant) across the sheet at the chosen cross section and at right angles to the sides of the sheet and adjust the gauge to fit firmly over the outermost corrugations or troughs. Clamp the gauge by tightening the butterfly nuts on the welded-in bolts and, by checking the position of the index mark, determine whether the width of the sheet complies with the requirements of 4.6.
- d) Retain the width gauge in position until the depths of the corrugations and troughs have been measured (see 7.2.1.5).

7.2.1.4 Squareness

Measure to the nearest 1 mm the distances between the diagonally opposite corners of each sheet in the sample (see 6.1.1) and record to the nearest 1 mm any difference between the two measurements on a sheet.

7.2.1.5 Depth of corrugations and troughs and lip

- a) With the sheet in contact with a flat surface, and the width gauge in position as described in 7.2.1.3, place a straight-edge on edge across the sheet so that it rests on the crests of two adjoining corrugations or ridges, as relevant, in a position near the width gauge, but far enough from the points at which pressure is applied to the sheet to ensure that the means of applying pressure does not obstruct the measurement of the depth of the corrugation or trough.
- b) Using a graduated rule with its lower end rounded to a curve of radius not exceeding 10 mm, measure to the nearest 1 mm the greatest distance between the lower edge of the straightedge and the bottom of the trough or corrugation, as relevant, bridged by the straight-edge.

NOTE – Alternatively, a square-ended graduated rule may be used, provided that it is held with its width parallel to the length of the corrugations or troughs and its thickness is such that the measurement of the depth of the corrugation or trough is not affected by the curved surface of the corrugation or trough.

- c) Measure, as in b), the depth of each of the remaining troughs or corrugations in the sheet.
- d) Using a graduated rule, measure the lip. Check for compliance with 4.7.

7.2.2 Chemical composition

Cut one suitably sized specimen from the sample (see 6.1.2), ensuring that the cutting instrument does not contaminate the specimen in any way. Use the methods described in SANS 51676 to determine the copper, silicon, magnesium, iron, zinc, manganese, and aluminium contents of the specimen. Check for compliance with 4.1.

7.2.3 Tensile strength

7.2.3.1 From the sample (see 6.1.2) prepare a tensile test specimen that complies with the requirements for specimens from sheet or strip of SANS 6892 so that the length of the

test specimen is cut transversely to the direction of rolling of the sheet. The portion of sheet from which the test piece is cut shall be carefully flattened and, in the case of a troughed sheet, the gauge length of the test specimen shall lie wholly within the originally flat portion of the trough.

7.2.3.2 Determine the tensile strength of the test specimen in accordance with the relevant method given in SANS 6892.

7.2.3.3 If the tensile strength of the test specimen fails to comply with the specified tensile strength (see 4.2), prepare two further test specimens, and determine their tensile strengths.

7.2.3.4 If the tensile strengths of both these test specimens comply with the requirements, discard the result of the test on the first test specimen, but if the tensile strength of either of the additional test specimens fails to meet the requirements, deem the sheet to be defective.

7.2.4 Bend test

7.2.4.1 From the sample (see 6.1.2) prepare a test specimen 10 mm wide, of convenient length, and cut with its length transverse to the direction of rolling of the sheet.

7.2.4.2 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.

7.2.4.3 Examine the specimen (at the bend) for cracks. If the test specimen shows cracks, prepare and test two further test specimens in the same way.

7.2.4.4 If both these test specimens comply with the requirements of 4.3, discard the results obtained on the rust test specimen, but if either of the specimens shows cracks at the bend, deem the sheet to be defective.

8. Non complying sheets

For non-complying sheets with regards to this standards shall be punched four holes of not less than 12 mm. Two holes at a distance of 210 mm from the diagonal centre to the nearest/next ridge and two holes on the valley at a distance of 300 mm from the diagonal centre.

Dimensions in millimetres

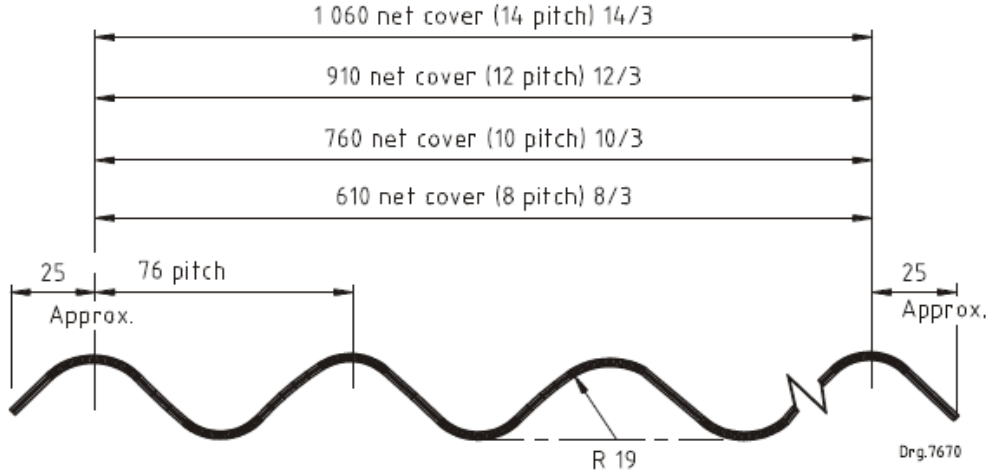


Figure 1 — Profile for corrugated sheet



Dimensions in millimetres

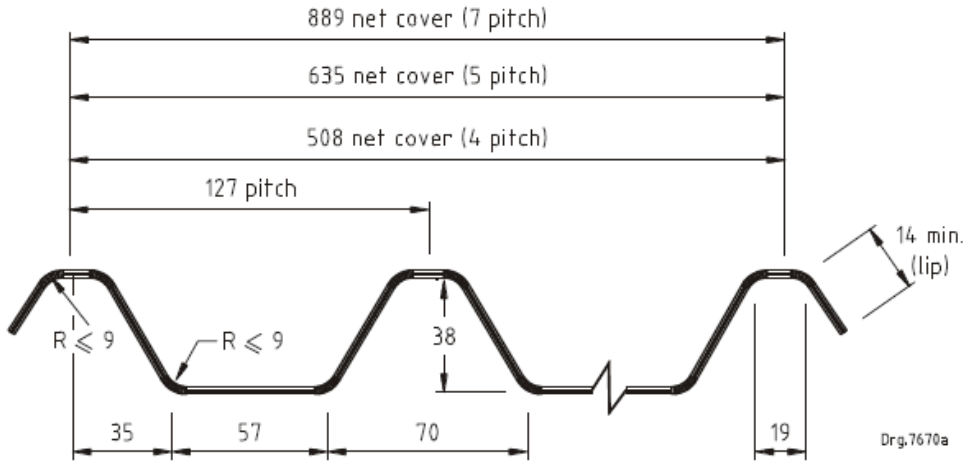


Figure 2 — Profile for troughed sheet — Type A

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Dimensions in millimetres

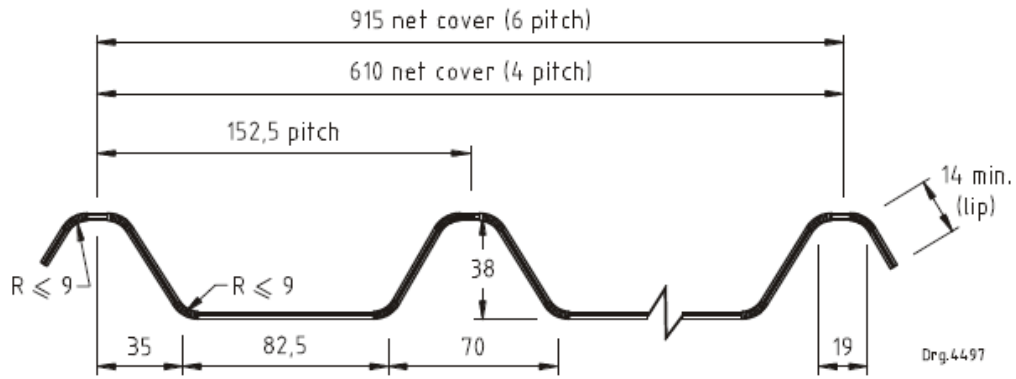


Figure 3 — Profile for troughed sheet — Type B

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Dimensions in millimetres

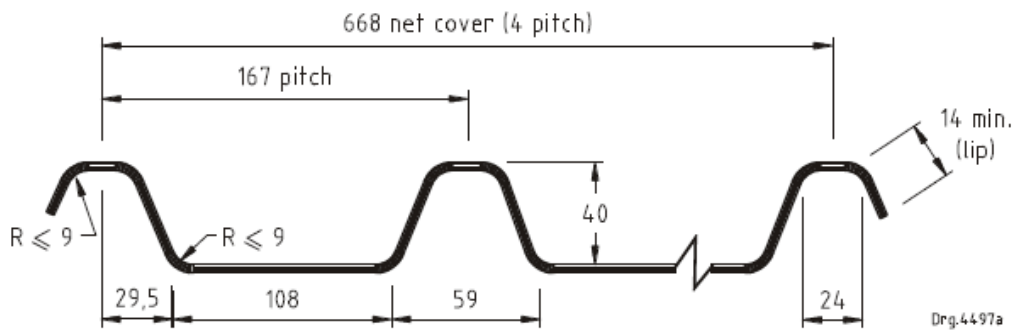
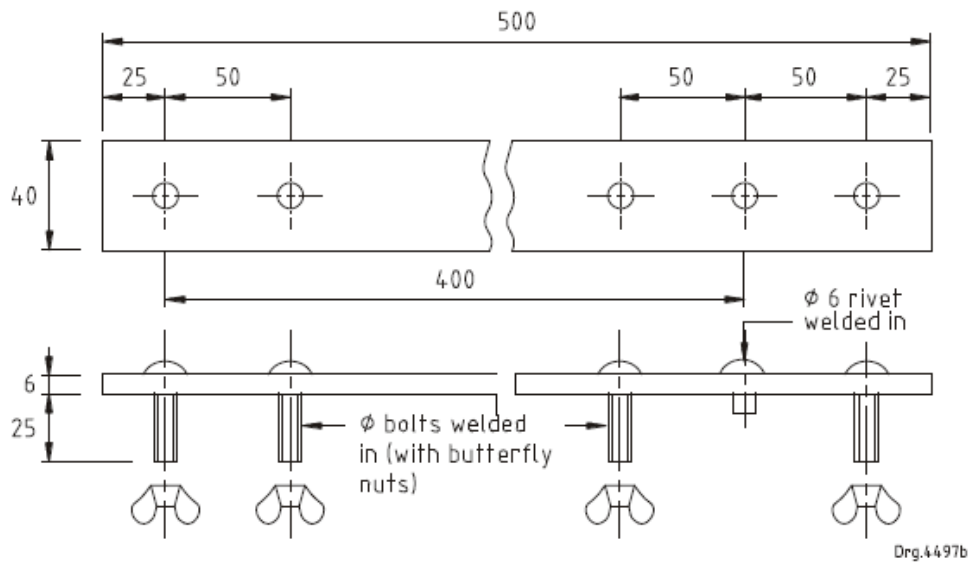


Figure 4 — Profile for troughed sheet — Type C

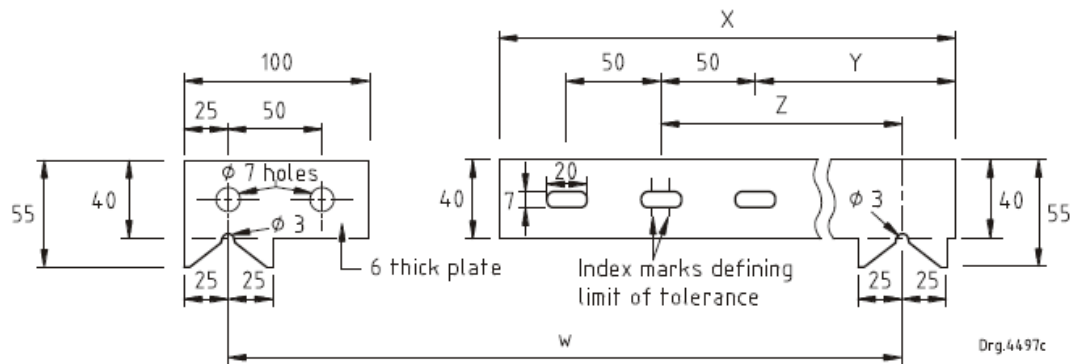
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Dimensions in millimetres



Part A

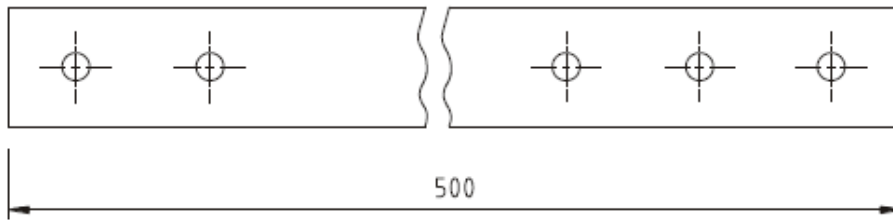
Dimensions in millimetres



| 1 | 2 | 3 | 4 | 5 |
|------------|------------|-----|-----|-----|
| Sheet type | Dimensions | | | |
| | W | X | Y | Z |
| 8/3 | 610 | 320 | 185 | 210 |
| 10/3 | 760 | 470 | 335 | 360 |
| 12/3 | 910 | 620 | 620 | 510 |
| 14/3 | 1 050 | 770 | 770 | 660 |

Figure 5 — Width gauge for corrugated sheets

Dimensions in millimetres

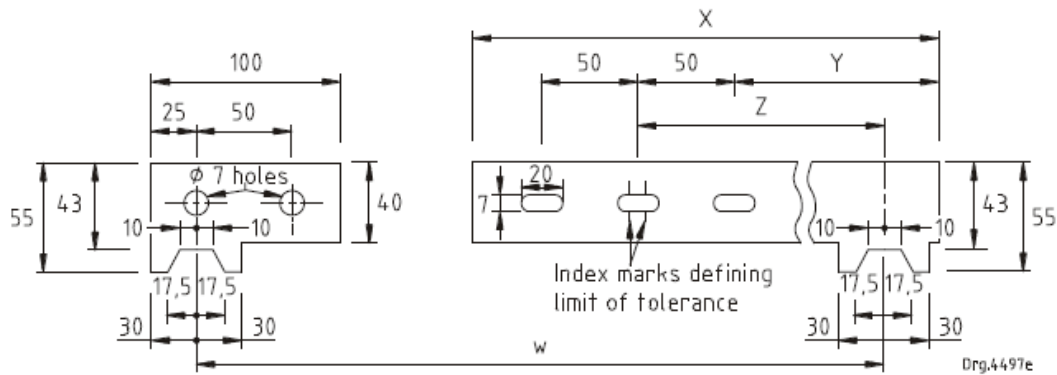


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Part A



Dimensions in millimetres



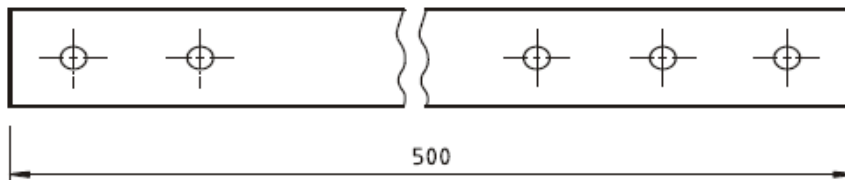
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| Sheet type | Pitch | Dimensions | | | |
|------------|-------|------------|-----|-----|-----|
| | | W | X | Y | Z |
| | | A | 4 | 508 | 225 |
| | 5 | 635 | 350 | 220 | 240 |
| | 7 | 889 | 604 | 474 | 494 |

Figure 6 — Width gauge for troughed sheets

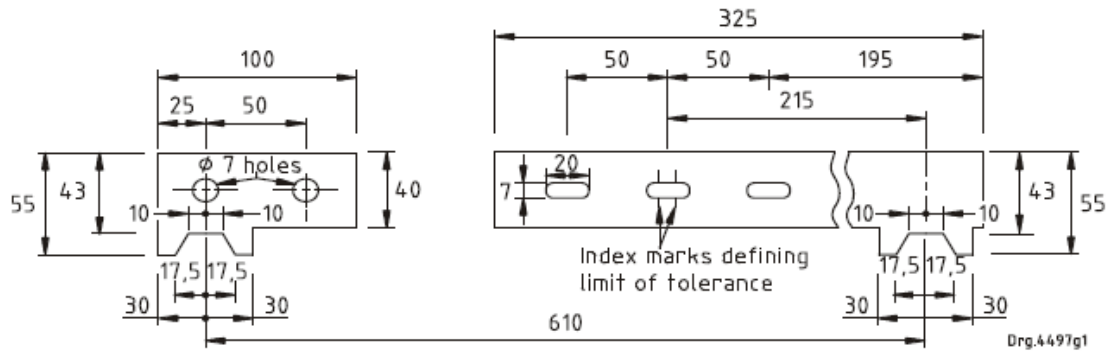


Dimensions in millimetres

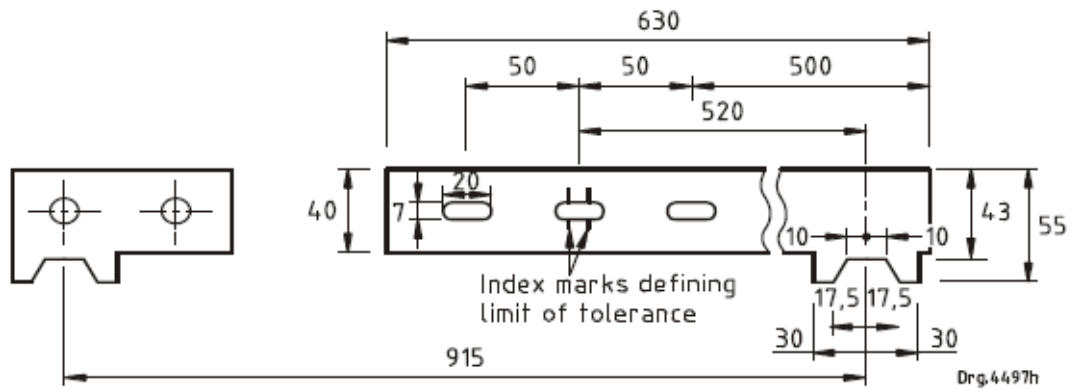


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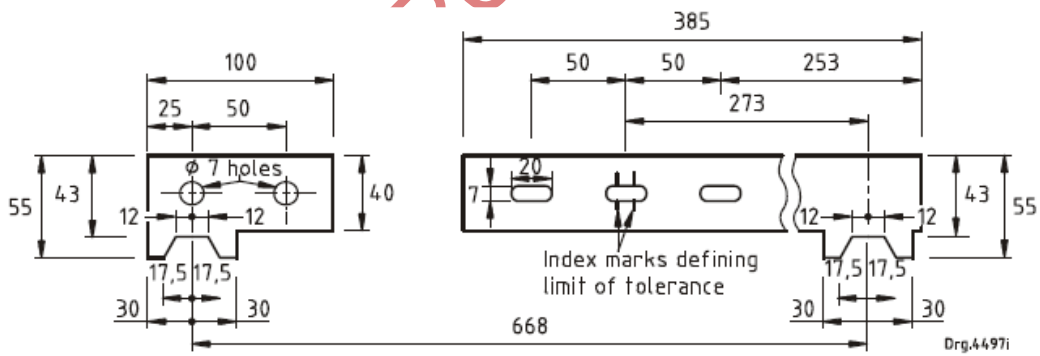
Part A



Type B (4 pitch)



Type B (6th pitch)



Type C (4 pitch)

Figure 7 — Width gauge for troughed sheets

Annex A

(Normative)

Notes to purchasers

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

- a) the chemical composition (see 4.1);
- b) the nominal thickness (see 4.4);
- c) when relevant, the number of corrugations or pitches (see 4.5);
- d) whether corrugated sheets or troughed sheets are required and, in the case of troughed sheets, the type (see 4.5, 4.6 and 4.7);
- e) the length (see 4.8); and
- f) the finish, if other than 'mill finish' (see 4.11).

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Annex B

(Informative)

Recommendations for the use of aluminium alloy corrugated and troughed sheets

B.1 Thickness of sheets, purlin spacing, laps, and fasteners

The thickness of sheets, purlin spacing, the lengths of edge and end laps, and the details of fasteners to be used for a specific project should be in accordance with the recommendations of the manufacturer of the sheets and with local building by-laws.

B.2 Precautions to be taken at points of contact between aluminium alloy sheets and other building materials

B.2.1 Cement concrete, mortars, and plasters

Sheets should be insulated from contact with these materials by painting the contact surfaces with two coats of bituminous aluminium paint, or zinc chromate or barium chromate primer.

B.2.2 Masonry

Where practicable, sheets should not be in contact with masonry because of the danger that corrosion might occur, particularly if the masonry contains chlorides or acid or alkaline compounds. If contact with masonry is unavoidable, the contact surfaces should be painted with two coats of bituminous aluminium paint or zinc chromate or barium chromate primer.

B.2.3 Timber

The use of timber that has been preservative-treated with a copper or mercury compound, in contact with aluminium alloy sheets, fasteners, etc., is not recommended. Timber preservatives which are more compatible with aluminium (e.g. creosote or pentachlorophenol) should be used in preference and the timber surfaces in contact with the sheeting should, in any case, be sealed with a bituminous aluminium or zinc chromate or barium chromate coating.

B.2.4 Steelwork

All steel surfaces in contact with the aluminium alloy sheets should be painted with a bituminous aluminium, zinc chromate, or other paint that does not contain lead. In severe atmospheric conditions (e.g. in marine or industrial environments) it is advisable to provide additional insulation in the form of chromate-impregnated or plastic tape or sheeting applied to the painted surface of the steelwork before the aluminium alloy sheets are fixed.

B.2.5 Lead

The use of lead washers, flashings, etc. in contact with aluminium alloy sheets is not recommended. The contact surfaces should be separated by a coating of bituminous aluminium paint or other insulating material. The use of lead-based paints on the sheeting or on materials in contact with it should be avoided.

B.2.6 Zinc

Aluminium is not corroded by contact with zinc, but in severe atmospheric conditions the zinc might suffer attack. Contact surfaces between the sheets and zinc should be separated by a coating of bituminous aluminium or of a zinc chromate or barium chromate primer.

B.2.7 Copper and copper alloys

Copper fastenings should under no circumstances be used to fix aluminium alloy sheets. Contact between copper and aluminium results, in the presence of moisture, in very rapid corrosion of the aluminium. Even water running off copper should not be allowed to fall on or run over aluminium. Bare copper wire should not be suspended over aluminium roofing, and copper lightning conductors should not be erected on or over aluminium alloy roofs.

Both finials and conductors should be of aluminium or an aluminium alloy. When they are clear of aluminium alloy sheeting, the aluminium conductors may be connected to the final part of the earthing conductor which may be of copper, provided that the joint is completely sealed against the entry of moisture by suitable means.

B.3 Earthing

Earthing of aluminium roofs is best achieved by bolting a flat aluminium conductor to the underside of the eaves, the final earth connection being made as described in B.2.7.

B.4 Storage

Aluminium alloy sheeting in storage should be kept under cover and protected from the ingress of water between sheets because contact with water might result in water staining of the surfaces of the sheeting and this detracts from the appearance of the sheets. The sheets should preferably be stacked on end or on edge.

Water staining is not regarded as detracting from the structural or corrosion performance of the sheet in service.

B.5 Holing of sheets during fixing

All holes in sheets should be drilled and not punched. The diameter of holes for other than selftapping fasteners should be 2 mm larger than the diameter of the fasteners.

B.6 Support for workmen on roofs during construction

Access to roofs should be restricted to authorized persons. To prevent damage to roofing during construction or inspection, crawlboards, walkways, or roofing ladders should be provided. If it is necessary to walk on the sheets, the feet should be placed in the troughs of the corrugations.

Permanent walkways should preferably be constructed of aluminium but if of wood or steel they should be adequately painted and kept in good repair. Roof boards should be of sound clean timber and free from projecting nails and bolts.

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