

Quality standard for expanded metal ceilings: abridged version

Association of Industrial Metal Ceiling Manufacturers
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Quality standard - expanded metal

1. Objectives

With the publication of this standard, TAIM pursues the objective of redefining the technological developments and of unifying the quality standard (thus defining the liability of the individual members of TAIM). Where applicable, the regulations of the Technical Manual Metal Ceilings (TMMC) shall apply. EN 13964:2004 and Amendments shall be read in conjunction with this document.

2. Scope

The standard applies to industrially manufactured visible expanded-metal ceiling components, from different materials. They are designed for use in standard interior applications. In case of special demands on performance or other applications, e.g. application in swimming pools, sport halls and exterior usage, additional relevant standards should be taken into account.

3. Terminology

Expanded Metal

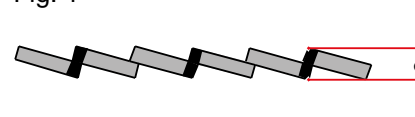
Expanded metal is a sheet shaped, semi-finished product with apertures through the surface.

These are formed by staggered shearing and simultaneous stretching without any material loss. A wide variety of different meshes can be used as ceiling panels depending on application, purpose and design.

Expanded metal thickness a

Total thickness of the stretched metal

Fig. 1



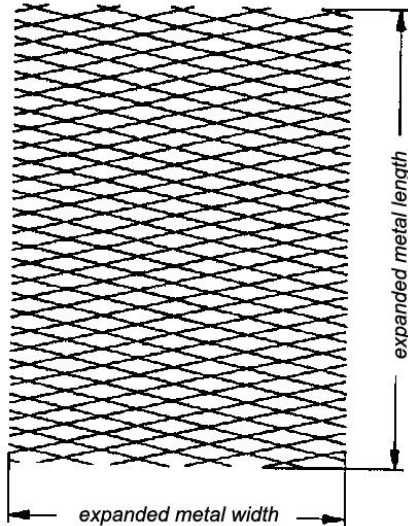
Expanded metal width

Equal to panel width, always measured in the mesh length direction

Expanded metal length

Equal to panel length, always measured in the mesh width direction

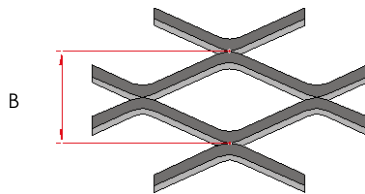
Fig. 2



Mesh width B

Distance from strand node centre to strand node centre in the short diagonal direction.

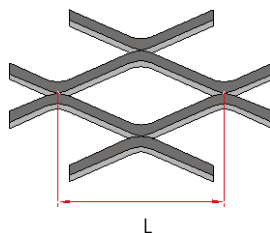
Fig. 3



Mesh length L

Distance from strand node centre to strand node centre in the long diagonal direction.

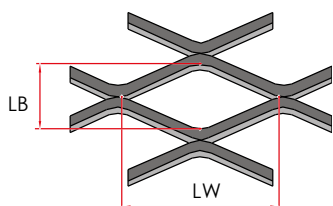
Fig. 4



Aperture dimension LB and LW

Opening between the four strands, perpendicular to the expanded metal level.

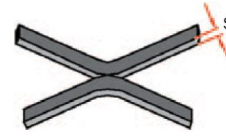
Fig. 5



Strand thickness s

Thickness of the strand material

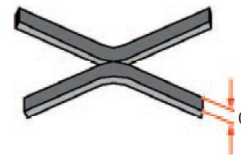
Fig. 6



Strand width c

Width of the strand

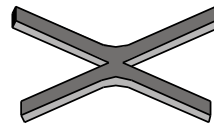
Fig. 7



Strand node

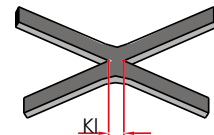
Crossing point between four adjoining strands

Fig. 8



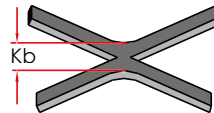
Node length KI

Fig. 9



Node width Kb

Fig. 10



4. Materials

Steel, up to 3 mm

- EN 10327; DX51D + Z
EN 10327; DX54D + Z
- EN 10130; DC01
EN 10130; DC04
- EN 10152; DC 01 + ZE
EN 10152; DC 04 + ZE
- EN 10111; DD11
EN 10025; S 235JR

Aluminium, up to 3 mm

- EN 485 and EN 573, EN AW 1050 A H24
- EN 485 and EN 573; EN AW 5005 H24
- EN 485 and EN 573; EN AW 5754 H22
- EN 485 and EN 573, EN AW 5754 O/H111

Stainless steel, max. 1 mm

- Stainless steel according to EN 10088-2 material No. 1.4301

5. Corrosion resistance

According to EN 13964.

The quality of corrosion resistance is suitable for environmental conditions according to EN 13964 table 7 Class A, when used in enclosed spaces e.g. apartments (incl. kitchens and bathrooms), offices, schools, hospitals and retail facilities.

When using uncoated steel sheets or steel sheets that have been galvanised prior to being expanded, a minimum level of corrosion protection needs to be applied for use in internal areas to ensure compliance with EN 12944-6: Class C2.

6. Mesh Types [examples]

Diamond mesh

Fig. 11



Round mesh

Fig. 12



Square mesh

Fig. 13



Hexagonal mesh

Fig. 14



Long strand mesh

Fig. 15



Expanded metals are designated as follows:

Example: 40 x 20 x 2 x 1.5 means:

mesh length L= 40 mm

mesh width B = 20 mm

strand width c = 2 mm

material thickness s = 1.5 mm

7. Surface finishes

Coloured surface finish coatings of expanded metal are produced with individual coatings, for example wet painted or powder coated.

The following specific requirements apply regardless of the chosen manufacturing process for the listed surface finishes and as long as no other stipulations are agreed upon.

Custom-fit tiles and connecting tiles are to be coated together with the standard elements to avoid colour variations.

The guidelines stated in this quality standard refer to instances where elements are directly abutting. In spatially independent areas/rooms, larger variations are permitted.

Spot variations are not taken into account if they are locally confined and not visible to the human eye over a distance of greater than 1.5m.

If the direction of installation influences the optical quality of the ceiling, the designer should specify the direction and the manufacturer adequately mark the product which is to be observed during installation.

The following regulations apply to the face side of panels. Where necessary, the face side should be indicated.

The face side includes all surfaces visible from beneath the ceiling but excludes the upstands. Any deviations from this shall be communicated to the manufacturer.

The coating thickness is dependent upon the finishing process used. A minimum coating thickness is not defined. A uniform coverage of the base material and compliance with the surface finish tolerances is to be ensured regardless of the coating thickness.

Requirements concerning light reflectance are not regulated here. If there is a special requirement for light reflectance, attention should be given to the type of mesh, size, direction and any inlays which could affect the reflection coefficient.

When colour matching between two different manufacturers, e.g. fixtures and fittings, colour samples of minimum DIN A5 size (unperforated) are required. Colour range specifications such as RAL, NCS etc. alone are insufficient.

Deviations from these sampled colours are to be treated as outlined below.

If an obligatory colour sample is agreed, it is recommended, at least for the main colour, to keep colour samples of each batch until the final building inspection.

Subsequent deliveries made after prolonged periods of time must accept larger deviations than those stated below.

This equally applies, if due to technical conditions (e.g. new environmental protection laws) a subsequent delivery of the exact same colour is not possible.

Requirements of the surface coating with powder-coated or wet painted surfaces

Gloss factor deviations

The stated tolerances are valid for measurements according to ISO 2813 and are defined as follows:

- matt finish
(0 < 30 E) ± 4 E deviation
- medium gloss
(30 < 70 E) ± 5 E deviation
- high gloss
(70 ≤ 100 E) ± 6 E deviation

For further information about the measurement procedure, see TMMC.

Colour / Colour deviation

Differs between white and coloured finishes.

White

For the most widely used white colours, the ΔE value according to the CIE-Lab method defined by ISO 7724-2 and ISO 7724-3 may not exceed 1.0 for each production batch. A tolerance greater than $\Delta E = 1.0$ is possible when combining different deliveries.

Coloured

For coloured finishes, the ΔE value according to the CIE-Lab method defined by ISO 7724-2 and ISO 7724-3 may also be above 1.0; colour differences are visually harder to detect. If nothing else is specified then $\Delta E = 1.5$

Mechanical properties / resistance /galvanising

The painted surface finishes meet the exposure conditions according to EN 13964 table 7 class A. Any other special requirements must be separately agreed. The ceiling panel may be loaded with up to 400g /m².

Higher loading capacities are determined on a case by case basis.

Subsequent hot dip galvanising of expanded metal ceiling panels can result in "drip formations". These are technically unavoidable.

Aluminium

When using aluminium, a coating or anodising is recommended for optical reasons.

8. Tolerances

8.1 Ceiling panels [length and width]

Customary cut expanded metal meshes are not suitable for expanded metal ceiling panels without additional treatment due to production related tolerances (e.g. dimensional accuracy, material tension caused by the expanding process).






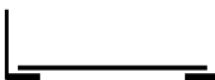

The following design types are exclusively related to finished ceiling panels.

Cut edges:

It is also recommended to declare that cut edges should be finished with a protective cap or fusion cut to reduce the risk of injury.

Design types

Tolerances of expanded metal ceiling panels – form tolerances

	dimensions: length/width	< 600	600 up to < 1 000 mm	1 000 up to < 2 000 mm	2 000 up to < 3 000 mm
Ceiling panel, flat with/without reinforced edges, mesh length up to L=40 mm/ mesh width up to B=20 mm/ strand thickness c up to 2 mm/ material thickness s ≤ 2 mm	Fig. 16 	+0/-1.0 mm	+0/-1.5 mm	+0/-2.0 mm	+0/-3.0 mm
Ceiling panel, flat with/without reinforced edges, mesh length L greater than 40 to 80 mm/ mesh width B 20 up to 40 mm/ strand thickness c up to 4 mm/ material thickness s ≤ 3 mm		+0/-2.0 mm	+0/-3.0 mm	+0/-5.0 mm	+0/-6.0 mm
Ceiling panel with folded edges and with/without frame on the inside mesh length up to L=40 mm/ mesh width up to B=20 mm/ strand thickness c up to 2 mm/ material thickness s ≤ 2 mm	Fig. 17 without frame on the inside 	+0/-1.5 mm	+0/-2.5 mm	+0/-5.0 mm	+0/-5.0 mm
Ceiling panel with folded edges and with/without frame on the inside mesh length L greater than 40 to 80 mm/ mesh width B 20 up to 40 mm strand thickness c up to 4 mm/ material thickness s ≤ 3 mm	Fig. 18 With frame on the inside 	—	+0/-4.0 mm	+0/-6.0 mm	+0/-6.0 mm
Ceiling panels with attached frame (welded), ceiling panels with enclosing frame mesh length up to L=40 mm/ mesh width up to B=20 mm/ strand thickness c up to 2 mm/ material thickness s up to 1.5 mm	Fig. 19 	+0/-1.0 mm	+0/-1.5 mm	+0/-2.5 mm	+0/-3.5 mm
Ceiling panels with attached frame (welded), ceiling panels with enclosing frame mesh length L greater than 40 to 80 mm/ mesh width B 20 up to 40 mm strand thickness c up to 4 mm/ material thickness s greater than 1.5 mm	Fig. 20 	+0/-1.5 mm	+0/-2.0 mm	+0/-3.0 mm	+0/-4.0 mm
Ceiling panels with reduced dimension tolerances Dimension ceiling panels	Fig. 20 	+0/-0.5 mm	+0/-0.7 mm	+0/-1.5 mm	+0/-1.5 mm

8.2 Deflections and necking

The deflection of expanded metal ceiling panels is strongly dependent on the mesh type, strand thickness, material strength and inlays.

Deflection is determined in individual cases dependent on the dimensions and span. Table 4 of EN 13964 is not applicable to expanded metal ceiling panels. Limits for deflection are determined on a case by case basis due to the wide variety of mesh types and methods of installation.

Ceiling panels with folded edges are especially susceptible to necking along the long edge as a result of tile deflection.

8.3 Angularity of the upstands and stop edges

The tolerances of the upstands are dependent on the production and system used.

8.4 Angular dependence

The outer, longer edge relative to the shorter

- widths up to 625 mm: ± 1.5 mm
- widths greater than 625 up to 1250 mm: ± 2 mm

8.5 Mesh tolerances

Mesh length L ± 5 %

Mesh width B ± 5 %

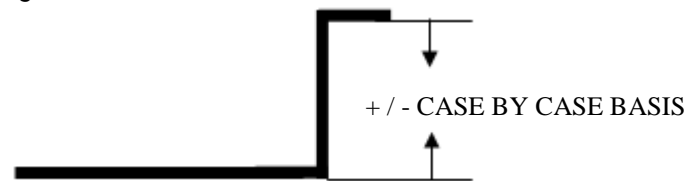
strand thickness s ± 10 %

8.6 Height of the upstands and stop edges

The tolerances of the functional edges vary on a case by case basis due to the large variety of meshes and design types. As a rule, they are greater than ± 3 mm.

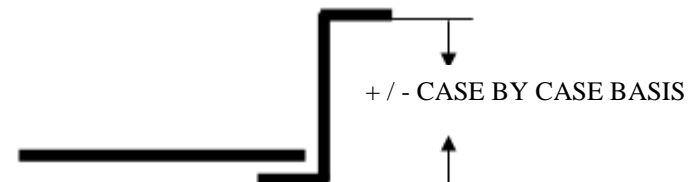
Upstand with edged expanded metal

Fig. 21



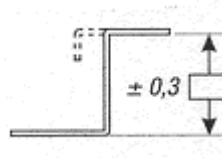
Upstand with edged profile

Fig. 22



Ceiling panel with enclosing frame

Fig. 23



Note: only in conjunction with design type Fig. 20

9. Substructure

The details are in accordance with TAIM's Technical Manual on Metal Ceilings.

10. Acoustics

Expanded metal ceiling panels can provide sound absorption when used in conjunction with suitable inlays.

11. Installation and user instructions

See TAIM and EN 13964.

The installation and maintenance instructions set out by TAIM and by the manufacturers are to be respected.

During installation, attention should be given to the mesh layout with the positioning of the ceiling panels. A completely different appearance will be created, if the mesh is installed in the wrong direction.

In addition it should be ensured that the face side and the back side of the panels are not confused.