



**SLOVENSKI STANDARD**  
**SIST EN 13964:2004**  
**01-junij-2004**

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Suspended ceilings - Requirements and test methods

Unterdecken - Anforderungen und Prüfverfahren

Plafonds suspendus - Exigences et méthodes d'essai

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ICS 91.060.30

English version

## Suspended ceilings - Requirements and test methods

Plafonds suspendus - Exigences et méthodes d'essai

Unterdecken - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 3 November 2003.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

## Contents

Page

1	Scope .....	4
2	Normative references .....	5
3	Terms and definitions.....	7
3.1	General.....	7
3.2	Suspended ceiling and substructure components (see Figure 1).....	8
3.3	Ceiling membranes and ceiling membrane components .....	9
3.4	Typical suspended ceiling assemblies using volume or thin gauge materials .....	12
4	Requirements .....	16
4.1	Material and products – General .....	16
4.2	Modular dimensions .....	16
4.3	Mechanical resistance and stability of load bearing components .....	25
4.4	Safety in case of fire .....	28
4.5	Hygiene, health and environment – Toxic gasses and dangerous substances.....	30
4.6	Safety in use .....	30
4.7	Acoustics .....	31
4.8	Durability.....	32
4.9	Colour, light reflectance and gloss factor for suspended ceiling components.....	35
4.10	Thermal insulation .....	35
5	Loading capacity of substructures components – Test methods.....	35
5.1	General.....	35
5.2	Bending test of metal substructure profiles .....	36
5.3	Testing of metal suspension and connecting components.....	38
5.4	Acceptance factor $k_G$ .....	42
6	Evaluation of conformity.....	42
6.1	General.....	42
6.2	Initial type testing .....	43
6.3	Factory production control (FPC) .....	43
7	Marking, labelling and packaging .....	46
7.1	Marking and labelling .....	46
7.2	Packaging .....	46
	Annex A (informative) Guidance for installation .....	47
	Annex B (normative) Selection of top fixing and perimeter trim fixing .....	50
	Annex C (informative) Wind load resistance .....	52
	Annex D (normative) Impact resistance.....	53
	Annex E (normative) Formaldehyde classes and associated test methods.....	57
	Annex F (normative) Membrane components – Flexural tensile strength test.....	59
	Annex G (normative) Suspension component – Functional test .....	67
	Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives .....	69
	Bibliography .....	81

## Foreword

This document (EN 13964:2004) has been prepared by Technical Committee CEN/TC 277 “Suspended Ceilings”, the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2004, and conflicting national standards shall be withdrawn at the latest by December 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 89/106/EEC.

For the relationship with EU Directive 89/106/EEC, see informative Annex ZA, which is an integral part of this document.

Annexes B, D, E, F and G are normative; Annexes A and C are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

The European Standard provides information for the various parties responsible for designing, manufacturing and specifying/selecting suspended ceilings used for interior applications in general building and civil engineering structures. It covers suspended ceilings sold as a complete kit (including, optionally, light fittings and other features), substructures sold as kits, individual components (products) of such substructures, and membrane components. It includes test methods and methods of assessment, as well as provisions for the evaluation of conformity of the products to the requirements of this standard.

In the absence of any other European Standard, this standard specifies dimensions, tolerances and, where relevant, performance requirements, for commonly available ceiling substructures and membrane components.

This standard does not cover the following:

- ceilings in mobile buildings, caravans and other forms of transportation,
- ceilings with heating or cooling properties,
- ceilings subject to water penetration requirements,
- ceilings used externally where requirements other than covered by this scope would apply (tunnels, canopies, petrol stations, arcades, open sports facilities, car parks, etc.),
- heavy duty suspended ceilings or their supporting construction,
- ceilings formed in-situ with no prefabricated membrane (e.g. plastered ceilings).

The standard covers the following essential characteristics:

- reaction to fire,
- resistance to fire (suspended ceiling kits only),
- release of asbestos (content) (suspended ceiling kits and membrane components only),
- release of formaldehyde (suspended ceiling kits and membrane components only),
- shatter properties (for membrane components of brittle materials in suspended ceiling kits only),
- flexural tensile strength,
- load bearing capacity,
- electrical safety,
- direct airborne sound insulation (suspended ceiling kits only),
- sound absorption (suspended ceiling kits and membrane components only),
- thermal conductivity (suspended ceiling kits only),
- durability of flexural tensile strength and load bearing capacity against moisture,
- condensation.

The standard also covers the following non-essential requirements:

- colour and light reflectance,
- installation.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 120, *Wood-based panels – Determination of formaldehyde content – Extraction method called the perforator method.*

EN 312, *Particleboards - Specifications*

EN 335-3, *Durability of wood and wood-based products – Definition of hazard classes of biological attack – Part 3: Application to wood based panels.*

EN 350, *Durability of wood and wood-based products – Natural durability of solid wood.*

EN 351, *Durability of wood and wood-based products – Preservative-treated solid wood.*

EN 460, *Durability of wood and wood-based products – Natural durability of solid wood – Guide to the durability requirements for wood to be used in hazard classes.*

prEN 520, *Gypsum plasterboards – Definitions, requirements and test methods.*

EN 573-3, *Aluminium and aluminium alloys – Chemical composition and form of wrought products – Part 3: Chemical composition.*

EN 599-2, *Durability of wood and wood-based products – Performance of preventive wood preservatives as determined by biological tests – Part 2: Classification and labelling.*

EN 622-1, *Fibreboards – Specifications – Part 1: General requirements.*

ENV 717-1, *Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method.*

EN 717-2, *Wood-based panels – Determination of formaldehyde release – Part 2: Formaldehyde release by the gas analysis method.*

EN 1396: 1996, *Aluminium and aluminium alloys – Coil coated sheet and strip for general applications – Specifications.*

EN 1912, *Structural timber – Strength classes – Assignment of visual grades and species.*

ENV 1991-2-4, *Eurocode 1: Basis of design and actions on structures – Part 2.4: Actions on structures – Wind actions.*

ENV 1993-1-1, *Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings.*

ENV 1995-1-1, *Eurocode 5: Design of timber structures – Part 1-1: General rules and rules for buildings.*

ENV 1998-1-3, *Eurocode 8: Design provisions for earthquake resistance of structures - Part 1-3: General rules - Specific rules for various materials and elements.*

EN 10142, *Continuously hot dip zinc coated low carbon steels strip and sheet for cold forming – Technical delivery conditions.*

EN 10143, *Continuously hot dip metal coated steel sheet and strip – Tolerances on dimensions and shape.*

## EN 13964:2004 (E)

- EN 10152, *Electrolytically zinc coated cold rolled steel flat products for cold forming – Technical delivery conditions.*
- EN 10169-1, *Continuously organic coated (coil-coated) steel flat products – Part 1: General information (definitions, materials, tolerances, test methods).*
- EN 10169-3, *Continuously organic coated (coil-coated) steel flat products – Part 3: Products for building interior applications.*
- EN 10214, *Continuously hot-dip-zinc-aluminium (ZA) coated steel strip and sheet – Technical delivery conditions.*
- EN 10215, *Continuously hot-dip aluminium zinc (AZ) coated steel strip and sheet – Technical delivery conditions.*
- EN 10244-2, *Steel wire and wire products- Non-ferrous metallic coatings on steel wire- Part 2: Zinc or Zinc alloy coatings.*
- prEN 10327, *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming – Technical delivery conditions.*
- EN ISO 11925-2, *Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2002).*
- EN 12524, *Building materials and products – Hygrothermal properties – Tabulated design values.*
- EN 12600, *Glass in building – Pendulum test – Impact test method and classification for flat glass.*
- EN 12664, *Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Dry and moist products of medium and low thermal resistance.*
- EN 12667, *Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance.*
- EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests.*
- EN 13501-2, *Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services.*
- EN 13823, *Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item.*
- prEN 14190, *Gypsum plasterboard products from secondary processing – Definitions, requirements and test methods.*
- prEN 14195, *Metal framing components for gypsum plasterboard partitions, wall and ceiling linings – Definitions, requirements and test methods.*
- EN 20140-9, *Acoustics – Measurement of sound insulation in buildings and of building elements – Part 9: Laboratory measurements of room to room, airborne sound insulation of a suspended ceiling with plenum above it (ISO 140-9:1985).*
- EN ISO 354:, *Acoustics – Measurement of sound absorption in a reverberation room (ISO 354:2003).*
- EN ISO 140-3, *Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements (ISO 140-3:1995).*
- EN ISO 717-1, *Acoustics – Rating of sound insulation in building and of building elements – Part 1: Airborne sound insulation (ISO 717-1:1996).*
- EN ISO 11654, *Acoustics – Sound absorbers for use in buildings – Rating of sound absorption (ISO 11654:1997).*



EN ISO 12944-3, *Paints and varnishes – Corrosion protection of steel structures by protective paint systems - Part 3: Design considerations (ISO 12944-3:1998).*

EN ISO 2813, *Paints and varnishes – Determination of specular gloss of non-metallic paint films at 20°, 60° and 85° (ISO 2813:1994, including Technical Corrigendum 1:1997).*

EN ISO 6946, *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method (ISO 6946:1996).*

EN ISO 9001:2000, *Quality management systems – Requirements (ISO 9001:2000)*

EN ISO 10211-1, *Thermal bridges in building constructions – Heat flows and surface temperatures – Part 1: General calculation methods (ISO 10211-1:1995).*

ISO 1006, *Building construction – Modular co-ordination – Basic module.*

ISO 7724-2, *Paints and varnishes – Colorimetry – Part 2: Colour measurement.*

ISO 7724-3, *Paints and varnishes – Colorimetry – Part 3: Calculation of colour differences.*

CENELEC HD 384, *Electrical installations of buildings.*

ETAG.001-1, *ETAG Metal anchors for use in concrete: Part 1: “General”.*

ETAG.001-2, *ETAG Metal anchors for use in concrete: Part 2: “Torque controlled anchors”.*

ETAG.001-3, *ETAG Metal anchors for use in concrete: Part 3: “Undercut anchors”.*

ETAG.001-4, *ETAG Metal anchors for use in concrete: Part 4: “Deformation controlled anchors”.*

ETAG.001-5, *ETAG Metal anchors for use in concrete: Part 5: “Bonded anchors”.*

ETAG 001-6, *ETAG Metal anchors for use in concrete: Part 6: Metal anchors for redundant use in concrete for lightweight systems.*

### 3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

#### 3.1 General

##### 3.1.1 ceiling

construction covering the underside of a floor or roof, providing the overhead surface

##### 3.1.2 suspended ceiling

ceiling hung by a suspension from or by a directly fixed substructure or perimeter trim to the load bearing structure (floor, roof, beam and walls) at a distance from the floor or roof above

##### 3.1.3 suspended ceiling for interior application

application not exposed to outside weather conditions (wind, rain, humidity, pollution, etc.)

**3.1.4 suspended ceiling kit**

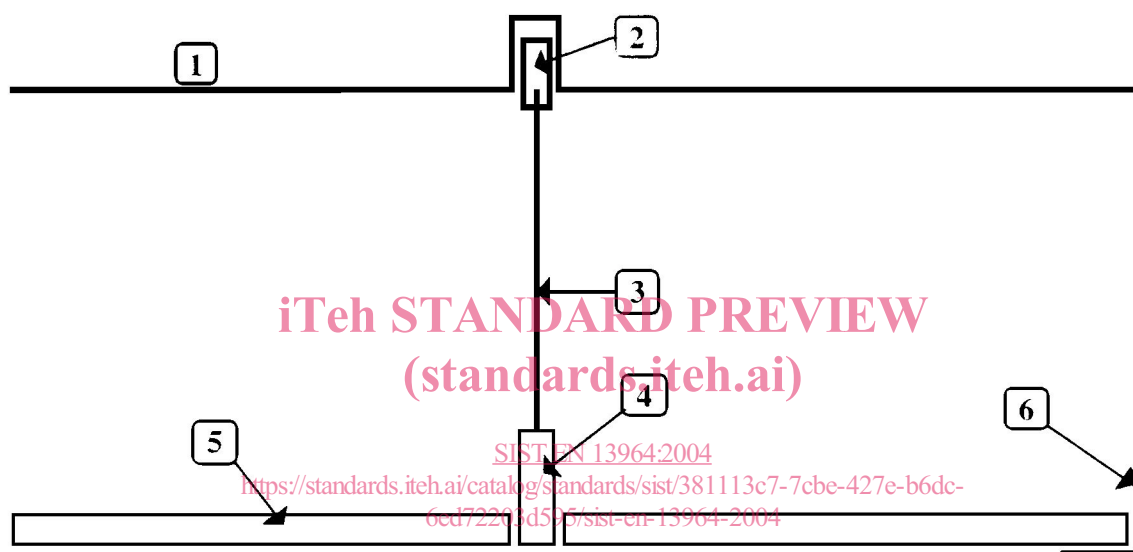
set of at least two separate components that need to be put together to be installed permanently in the works. Although the components of the kit may be produced by more than one manufacturer, it has to be placed on the market in a way that enables it to be purchased in one transaction

NOTE 1 The substructure may be a complete kit or made up of individual components.

NOTE 2 Although it may contain all necessary components, the kit does not have to contain all the components needed to form an assembled suspended ceiling system.

**3.1.5 assembled suspended ceiling system**

suspended ceiling system components that are adapted to each other, and which may originate from different sources, which have been installed together in the works



**Key**

- |   |                        |   |                            |
|---|------------------------|---|----------------------------|
| 1 | Load bearing structure | 4 | Supporting member          |
| 2 | Top fixing             | 5 | Ceiling membrane component |
| 3 | Suspension             | 6 | Perimeter trim             |

**Figure 1 — Principal suspended ceiling components (not all components are necessarily used in an installation)**

**3.1.6 designer/manufacturer/supplier**

person/organisation responsible for demonstrating conformity of the component(s)/kit(s) with the requirements of this standard

**3.2 Suspended ceiling and substructure components (see Figure 1)**

**3.2.1 General**

**3.2.1.1 substructure**

suspending frame that supports the ceiling membrane. May be a complete kit or made up of individual components. There are three types of substructure:

**3.2.1.2 exposed substructure**

substructure whose underside is exposed

**3.2.1.3****concealed substructure**

substructure whose underside is not exposed

**3.2.1.4****semi-concealed substructure**

substructure where the underside is exposed in one direction and the intermediate profiles, which are at an angle to the support profiles, are concealed

**3.2.1.5****suspension component**

part of the substructure, connecting it to the load bearing structure

NOTE May be part of a kit or part of an assembled ceiling system.

**3.2.2 Fixing, connections and supports****3.2.2.1****top fixing**

fixing which connects the suspension components or the substructure directly to the load bearing structure

**3.2.2.2****perimeter trim fixing, including corridor fixing**

fixing which connects the perimeter trim directly to the load bearing structure

**3.2.2.3****sub-structural connection**

fixing component used to connect the anchoring component, suspension component, substructure and ceiling membrane component

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**3.2.2.4****supporting member**

suspended component of the substructure with direct connection to the suspension component or directly fixed component

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**3.2.2.5****cross/secondary supporting component**

component of the substructure which spans between two supporting components and with a direct supporting function for the ceiling membrane component

**3.2.2.6****perimeter trim**

section fixed at the perimeter of the ceiling to support the components of either the substructure or the ceiling membrane, or both, or fixed to and carried by the ceiling membrane itself

**3.2.2.7****access component**

component of the substructure or of the substructure and membrane component with a special access facility to enable a particular part of the ceiling membrane to be removed

**3.2.2.8****splice**

mechanical connection between substructure sections

**3.3 Ceiling membranes and ceiling membrane components****3.3.1****ceiling membrane**

exposed surface of the ceiling facing the room, excluding any exposed substructure

3.3.2

**ceiling membrane component**

product forming part of the ceiling membrane (e.g. a tile or plank)

3.3.3

**volume membrane component**

component of which the edges are shaped within the full material thickness (see Figure 3)

3.3.4

**thin gauge membrane component**

component of which the edges are achieved by forming the basic sheet material (see Figure 4) and where the thickness permits permanent forming

3.3.5

**tile**

square or rectangular component with the length (l)/width (w) ratio within the range  $1 \leq l/w \leq 2$  (see Figure 2)

3.3.6

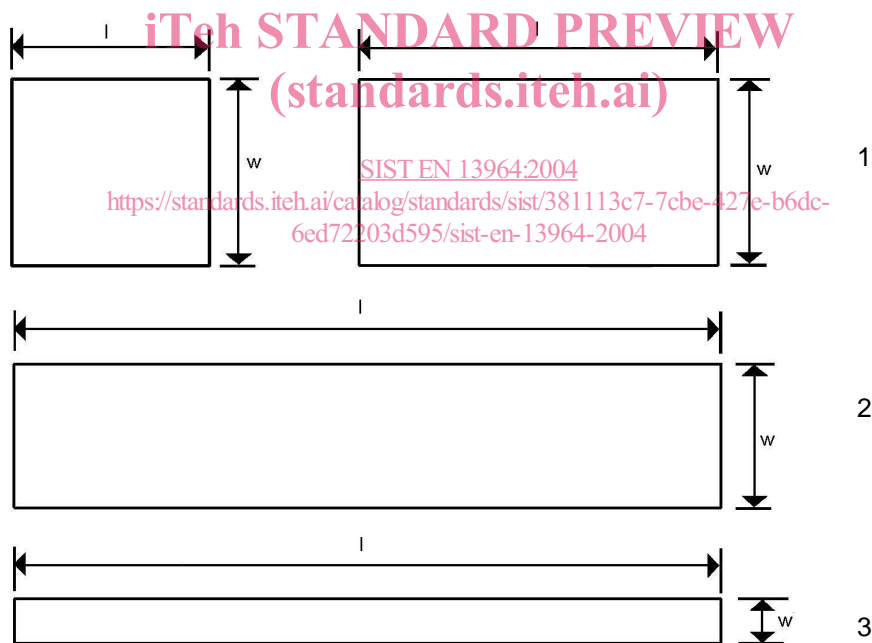
**plank**

rectangular component with the length (l)/width (w) ratio within the range  $2 < l/w \leq n$  (see Figure 2)

3.3.7

**linear component**

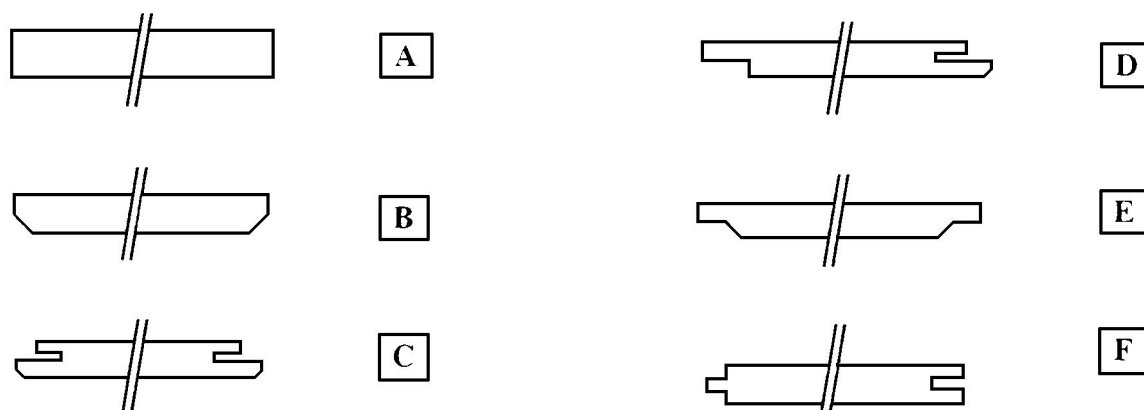
component of relatively narrow width (w) and of which the length (l) is generally made to measure (see Figure 2)



**Key**

- 1 Tile
- 2 Plank
- 3 Linear component

Figure 2 — Ceiling membrane components

**Key**

A	Squared	D	Rebated and grooved
B	Bevelled	E	Rebated
C	Grooved	F	Tongued and grooved

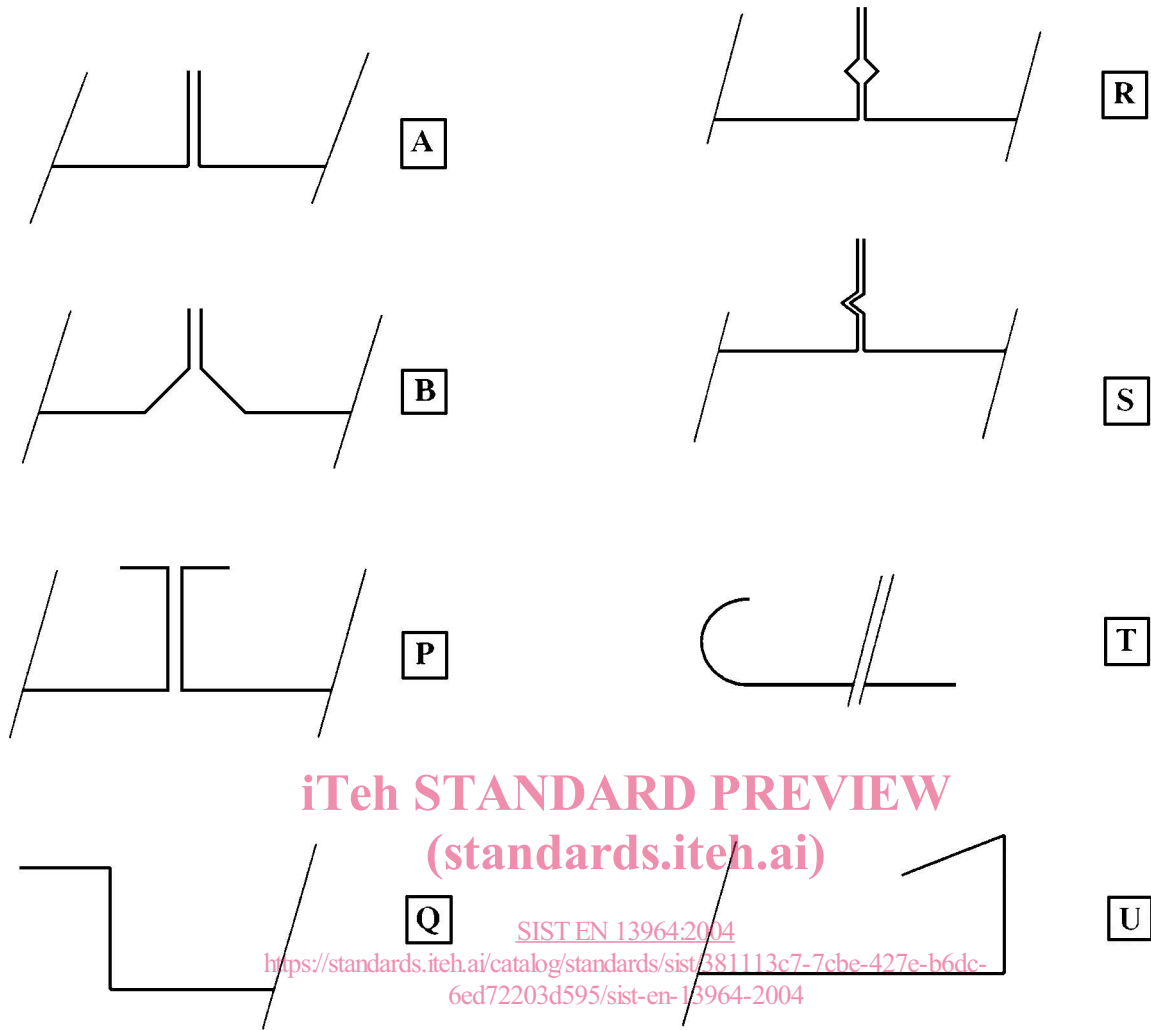
NOTE Various edges may be used in different combinations. Specification of edges by letter code is allowed. Other edge forms are possible and available.

**Figure 3 — Typical edge details of volume ceiling membrane components**

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**Key**

- |                  |                       |
|------------------|-----------------------|
| A Squared        | R Rilled or bumped    |
| B Bevelled       | S Tongued and grooved |
| P Return flanged | T Rounded             |
| Q Rebated        | U Reverted            |

NOTE Various edges may be used in different combinations. Specification of edges by letter code is allowed. Other edge forms are possible and available.

**Figure 4 — Typical edge details of thin gauge ceiling membrane components**

**3.4 Typical suspended ceiling assemblies using volume or thin gauge materials**

**3.4.1**

**suspended ceiling systems with boards fixed on the substructure**

assembly with type A, B or F shaped edges (see Figure 3) where the boards are fixed on the substructure (concealed substructure). The boards are butted and can be visible or jointed (not visible = jointless surface) (see Figure 5)

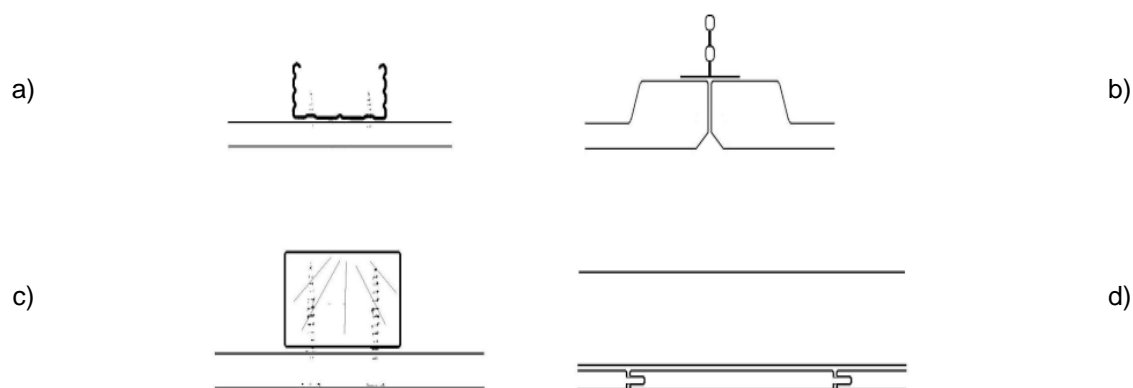


Figure 5 — Examples for possible designs with boards fixed on the substructure

### 3.4.2

**suspended ceiling assembly with various edge types (A, B, C, D, E – see Figure 3) for volume gauge materials and with type A and Q (see Figure 4) edges for thin gauge materials**

assembly in which different edge types are used (see Figure 6 that shows very common applications of how these systems are implemented). The substructure can be exposed, semi-concealed or concealed

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Figure 6 — Examples for possible designs with various edge types

### 3.4.3

**lay-in suspended ceiling system**

assembly with Type A or Type P shaped edges (see Figure 4) that is supported by an exposed substructure (see Figure 7)

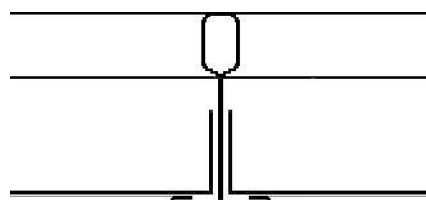


Figure 7 — Example for a lay-in suspended ceiling system (other designs may exist)

### 3.4.4

**rebated lay-in suspended ceiling system**

assembly with Type Q edges (see Figure 4), supported by an exposed substructure (see Figure 8)