BS EN 4726:2018
Incorporating corrigendum April 2019



BSI Standards Publication

Aerospace series - Acceptance parameters of aesthetical variations for all visible equipment installed in aircraft cabins under all contractual variations

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National foreword

This British Standard is the UK implementation of EN 4726:2018, incorporating corrigendum April 2019. It supersedes BS EN 4726:2015, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum April 2019 is indicated in the text by ⟨AC⟩ ⟨AC⟩.

The UK participation in its preparation was entrusted to Technical Committee ACE/12, Aerospace fasteners and fastening systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 4726

November 2018

ICS 49.095

Supersedes EN 4726:2015

English Version

Aerospace series - Acceptance parameters of aesthetical variations for all visible equipment installed in aircraft cabins under all contractual variations

Série aérospatiale - Acceptation des variations esthétiques de l'aspect des éléments visibles de cabine d'avion sous toute forme contractuelle

Luft- und Raumfahrt - Abnahmeparameter von ästhetischen Qualitätsabweichungen für alle sichtbaren Flugzeug-Kabinenbauteile in allen vertraglichen Varianten

This European Standard was approved by CEN on 13 May 2018 and includes the Corrigendum issued by CEN on 10 April 2019.

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Full document details: BS EN 4726:2018

Contents

Page

European foreword ... **3**

1 Scope ... **4**

2 Normative references ... **4**

3 Terms, definitions and abbreviations ... **4**

4 Definitions of cosmetic defects, inspection zones and criteria ... **6**

5 Unacceptable characteristics ... **39**

6 Evaluation tables and defect size assessment ... **62**

7 Inspection template to ascertain defect sizes ... **64**

Annex A (informative) **Standard evolution form** ... **66**

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Full document details: BS EN 4726:2018

European foreword

This document (EN 4726:2018+AC:2019) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2019, and conflicting national standards shall be withdrawn at the latest by October 2019.

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

This document includes Corrigendum 1 issued by CEN on 10 April 2019.

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1 Scope

This document defines the inspection rules and the cosmetic acceptance criteria for surfaces of aircraft cabin equipment. Surfaces will be considered under the aspects of technical feasibility of the industrial design.

This document outlines the framework between airlines, supplier and OEMs with regard to cosmetic issues.

This document aims to:

a) provide the supplier or manufacturer with quality criteria, which need to be met during the production, testing- and quality-inspection-process.

b) guide airline-, OEM- and supplier-quality assurance with a description of cosmetic standards for following inspections:

— supplier internal QA inspection;

— first article inspection;

— source inspection;

— incoming inspection;

— final assembly line, cabin inspection;

— customer presentation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 12464-1, *Light and lighting - Lighting of work places — Part 1: Indoor work places*

EN ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

3D	three Dimensional
BFE	Buyer Furnished Equipment (from OEM perspective)
CAS	Cabin Attendant Seat
CDR	Critical Design Review
CIE	international commission on illumination
DPI	Dots Per Inch
DSM	Decorative Sheet Material
e.g.	for example
etc.	and so on
FAI	First Article Inspection
FAL	Final Assembly Line (OEM)
FFF	Fit, Form and Function
HTPT	Hydro Transfer Printing Technology
i.e.	that is to say
ICS	Industrial design Colour Specification (OEM)
incl.	including
LED	Light Emitting Diode
LHS	Left Hand Side
NTF	Non-Textile Floor
OEM	Original Equipment Manufacturer
PTS	Purchaser Technical Specification
PVF	polyvinyl fluoride film
RFC	Request For Change
RHS	Right Hand Side
QC	Quality Control
SCN	Specific Change Note
SFE	Seller Furnished Equipment (from OEM perspective)
SSBFE	Seller Supplied BFE
SU	Standard Unit
UV	UltraViolet

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4 Definitions of cosmetic defects, inspection zones and criteria

4.1 Simplified definition of a cosmetic defect

Cosmetic defects are deviations from the standard or customized specifications/definitions. They are distinct from a certain distance without additional illumination and/or mirror and according to the definitions thereof within this European standard. Cosmetic defects do not affect fit-form-function as a rule, however in certain extreme cases this might actually be the case e.g. if paint build up impedes fitting. The defects listed encompass any process relevant material.

Seller furnished equipment (SFE) or similar status: The supplier is not allowed to approach the airline concerning cosmetic issues or definition changes.

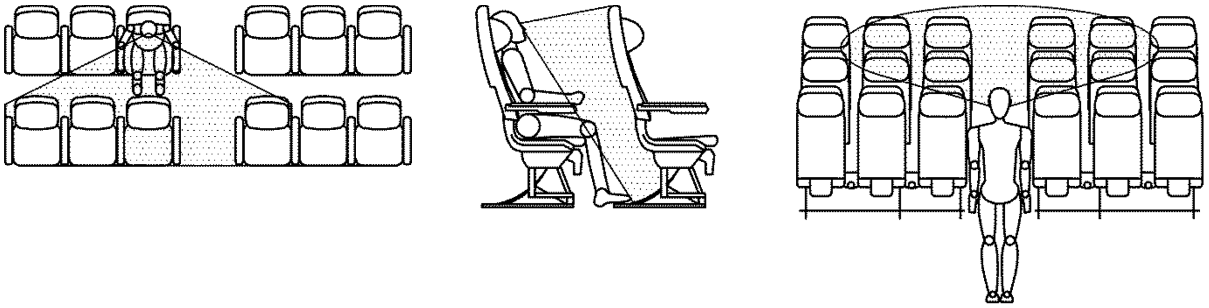
Buyer Furnished Equipment (BFE)/Seller Supplied BFE (SSBFE) or similar status: Pickups or points of contention raised by OEM which are disputed between both parties (OEM and supplier or manufacturer) will be submitted to the customer to make the definitive and binding decision for all parties. Any decision has to be documented by the supplier or manufacturer and accompany each individual unit in a conspicuous legible way without causing damage to the part/parts in question. All parties will adhere to the customer decision until as such times another supersedes it.

For SFE, SSBFE and BFE all samples have to be supplied by the supplier and/or the customer to the OEM in order to validate the inspection.

4.2 Zonal type definition for installed parts

4.2.1 Zone A

All primary viewed surfaces by a potential passenger or crew either walking through the aircraft or in any normal seating position or passenger/crew used furniture, e.g. table top/backs. Any surface which is directly seen, through either expected operation or expected viewing movement, see Figure 1.



a) Passegner and crew member seating, top view **b) Passenger and crew member seating, side view** **c) Passenger and crew member walking**

NOTE The viewing cone would move according to the head movements up/down and left/right.

Figure 1 — Passenger's viewing cone when seating in any position or walking through the cabin

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4.2.2 Zone B

Secondary perceived surfaces - surfaces requiring extreme movement of the viewing angle to be perceived, i.e. the viewer has to abnormally bend to be able to see it. Areas which may be perceived by passengers or crew through normal operation e.g. stowages inside and stowage doors inside. Standard stowage interiors are appraised from the stowage door threshold, not by climbing or poking the head inside.

Purposely designed “walk in” monuments shall be entered and appraised in the standard method from within i.e. interior walls are A zone etc.

4.2.3 Zone C

Surfaces that require - first “opening up”, e.g. folding, moving or removal of primary or secondarily viewed areas, In order to view the area in question e.g. inside a lavatory mirror cabinet. Can only be viewed using equipment. Areas expected to be perceived by support staff and not passengers. Areas not visible after installation and that have no defined aesthetical surface treatment are still within the parameters of zone C; however still maintaining other requirements e.g. closed edges, fit, form and function etc. Sizes/dimensions of areas/surfaces eligible shall be demonstrated in the technical documentation and require the OEM acceptance.

4.3 Classification of surfaces to be inspected

The surfaces to be inspected are classified into three zones (A, B, C).

Customers and suppliers shall document at initial technical coordination meeting or functionally similar meeting latest at Critical Design Review (CDR) or functionally similar meeting areas that may be exceptions after installation in the cabin of the aircraft, all other surfaces according to the below zonal prerequisites unless otherwise agreed.

For BFE additionally (or similar status):

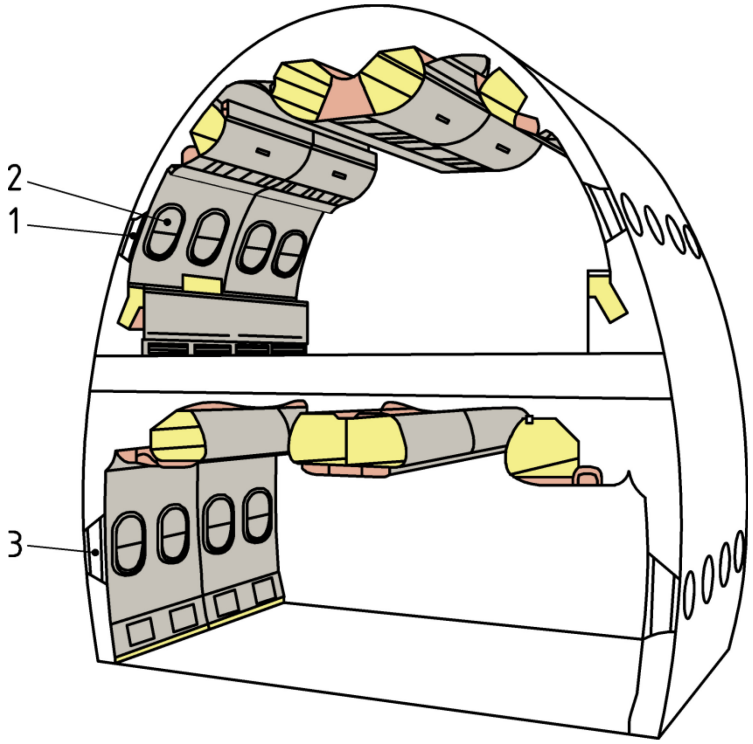
The customer is required to clearly document and inform the OEM and supplier of his expectations regarding classification of surfaces.

Figure 2 shows typical areas for the zones, which are applied cross programm i.e. irrelevant of passenger aircraft model.

Cockpit areas (incl freighters) are considered outside of this European standard and need to be defined on demand between OEM, supplier and customer. The exception to this, is furniture, e.g. lavatories or crew rest that share common walls with the cabin.

Freighters, currier or crew perceived or frequented areas i.e. cabin linings/furniture are “A” zones, cargo areas are considered outside this classification and need to be defined on demand between OEM, supplier and customer.

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Key

1 Outboard side of a window shade is C zone. Inboard A zone

2 Side wall stowage lid shown open to view lid inside

3 Window funnel interior is A zone

NOTE 1 Endcaps on over head stowage compartment is not shown.

NOTE 2 LHS lining is a mirror of the RHS.

NOTE 3 Linings- outboard surfaces are generally C zone.

NOTE 4 Linings- inboard surfaces are generally A zone.

A zone

B zone

C zone

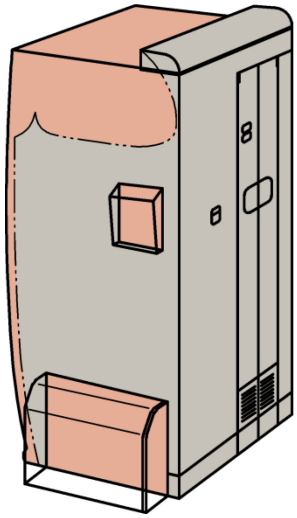
Figure 2 — Cabin lining

The Figure 3 to Figure 14 show typical areas for the zones which are applied cross program, i.e. irrelevant of passenger aircraft model or monument type.

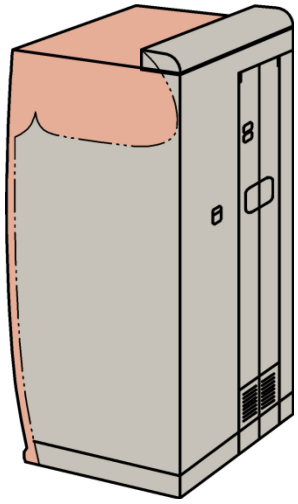
Interior parts of monuments which the cabin crew or passenger potentially frequent, perceive or view, e.g. lavatories, crew rest, special monuments, etc. are equally governed by the same zone classifications as for the outside of SFE (or similar status) monuments.

Areas covered by other components or monuments will be considered as “C” zones unless, see 4.4.

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a) Typical monument with magazine rack and doghouse



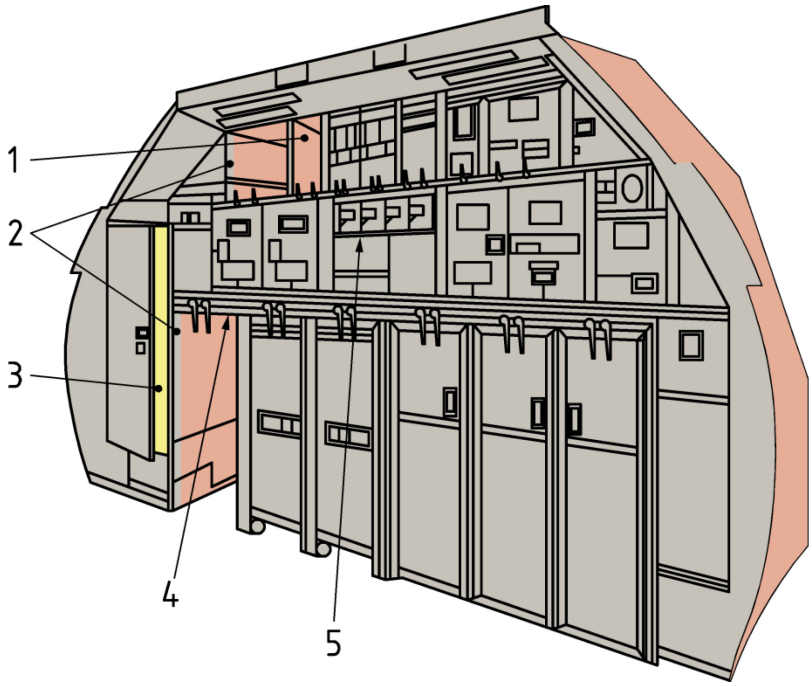
b) Typical monument without additional furnishings

Key

A zone

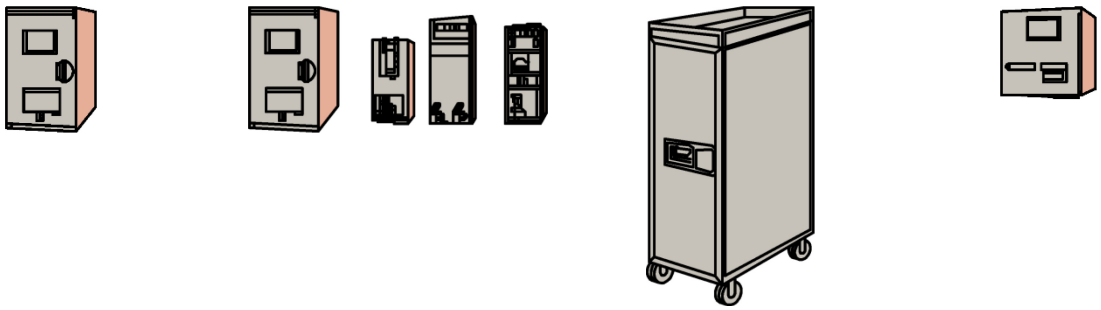
C zone

Figure 3 — Cabin monument



a) Galley overview

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b) Fixed parts e.g. ovens, coffee makers, boilers; no side visible: C zone

c) Fixed parts e.g. ovens, coffee makers, boilers; sides visible: Surrounding gap makes sides visible then first 10 cm (4 inch) of sides are A zone thereafter C zone

d) SFE trolley: outside A zone, door inside, interior: B zone, interior shelves etc.: B zone, underneath: C zone, tyres factory new

e) Removable parts e.g. SU: First 10 cm (4 inch) of sides are A zone, thereafter C zone

Key

1 Walls for fixed parts e.g. ovens, boilers: C zone unless gap makes sides visible then first 10 cm (4 inch): A zone

2 Walls for removable parts e.g. SU first 10 cm (4 inch) is A zone thereafter C zone

3 Stowage inside: B zone incl. door inside trolley doors inside

4 Underneath is C zone

5 Underneath is B zone, because it cannot be directly viewed; if higher this will become an A zone

NOTE Supplied used BFE units e.g. trolleys or standard units etc. shall not be part of an inspection concerning aesthetical deviations, only new and SFE are eligible. Zonal areas are dedicated to the parts in questions according to the expected operational status, i.e. with full compliment of inserts, trollies, standard units etc.

A zone

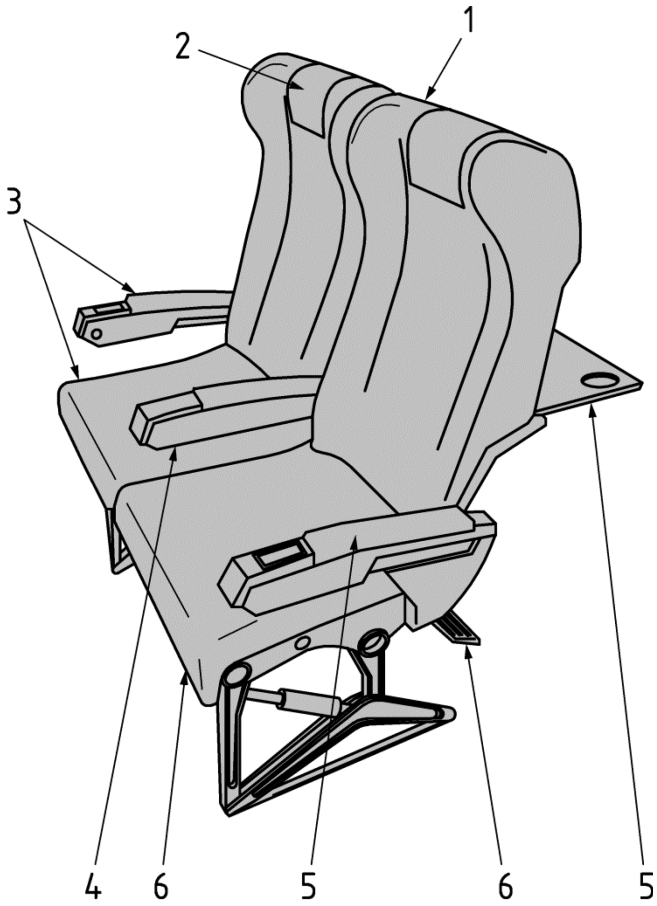
B zone

C zone

Figure 4 — Galley

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Figure 5 shows a typical economy seat. Zones might change with position. Figure 5 shows an example in order to demonstrate the applied theory.



Key

1 Rear sides: if free standing or has any kind of seating behind: A zone. If last row and screened off by a wall: B zone

2 Underneath head cloths (if present): due to the fact, they are not permanent and may be removed in the future: A zone

3 Aisle sides: if aisle side: A zone. If window side: B zone (or next to a structure which screens off viewing the side in question)

4 Underneath armrest: if movable: A zone, if fixed: B zone

5 Tables and mechanisms (incl. hidden in armrest): top and bottom i.e. all sides (incl. IFE if present): A zone

6 Underneath seat: if "with footrest" movable or fixed: B zone. Top of footrest and mechanism when deployed: A zone. Non visible sides when deployed: B zone

NOTE 1 Passenger/crew used furniture directly viewed in open operating position:
Compartments inside: B zone
(assuming surfaces mainly hidden by supplied amenities), Areas of compartments which can be directly viewed when open and seated: A zone

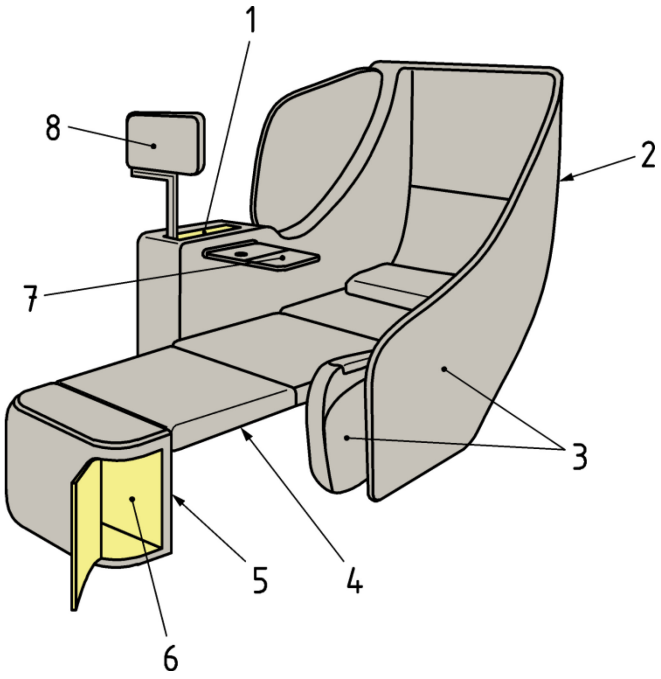
NOTE 2 Lids/flaps inside/outside: A zone

Figure 5 — Economy passenger seat

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Figure 6 shows a typical business class seat. Zones might change with position. Figure 6 shows an example in order to demonstrate the applied theory.



Key

1 Stowages insides: B zone

2 Rear walls, if free standing: A zone; if rear side very close to a wall (i.e. masked by wall): B zone

3 Aisle walls, if aisle side: A zone; if window side: B zone

4 Underneath, if "footrest" returns down and backwards: B zone; if "footrest" returns up and backwards: A zone; if "footrest" cannot be viewed incl. during operational movement: C zone

5 Reade side: A zone

6 Stowage insides: B zone

7 Tables top and bottom: A zone

8 LCD monitor: A zone

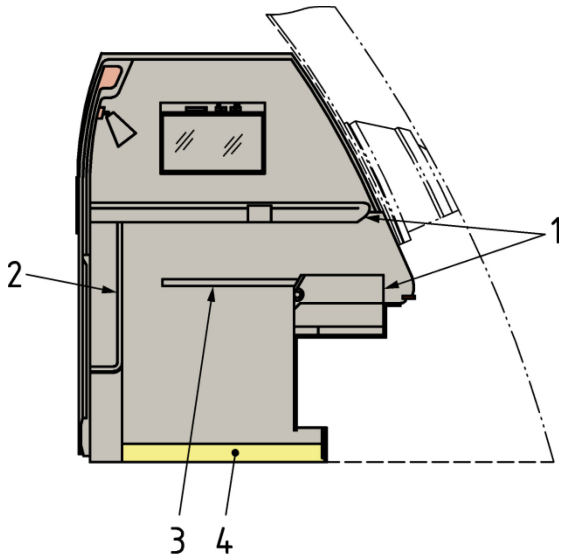
A zone

B zone

Figure 6 — Business class passenger seat

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Figure 7 to Figure 12 show a typical First class seat. Zones might change with position. Figure 7 to Figure 12 show an example in order to demonstrate the applied theory.



Key

1 Hidden sides: not able to be viewed are B zone

2 Inside open cupboards: could be a B zone on the "shadow side only" according to the direct viewing rules, (assuming this side is not visible when entering the compartment), otherwise A zone

3 Moving furniture parts: if, when operating the table, all sides are revealed, then all A zone (underside B zone, only if never viewable)

4 Recessed areas: only ones not naturally visible are B zone

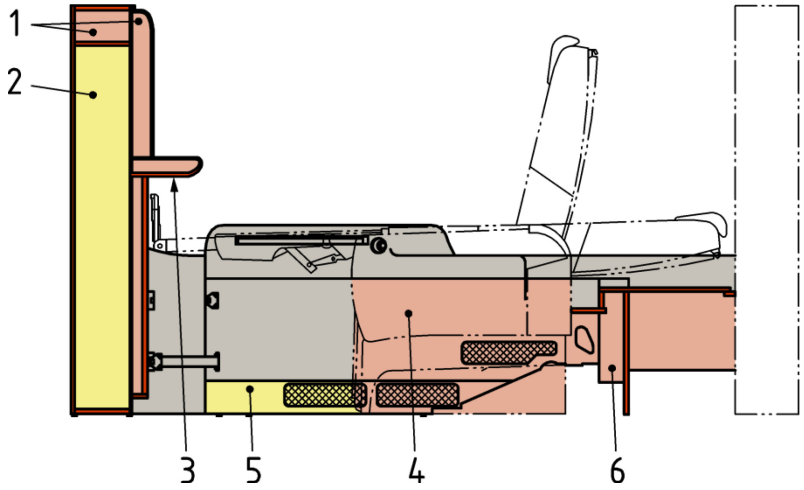
A zone

B zone

C zone

Figure 7 — Typical first class minisuite – inside, front view (looking forward)

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Key

1 blocked off areas: C zone

2 Stowages inside: B zone, incl. door inside

3 Undersides: B zone, unless they can be viewed from other natural positions e.g. sleep, then A zone

4 Covered areas: C zone, areas hidden e.g. by the seat, but run into an A zone at the top. In cases of contention, the highest quality is default. To establish zonal transitions/boundaries, all permutations of natural/possible usage viewing angles are vectored in

5 Recessed areas: only ones not naturally visisble are B zone. If visible when entering minisuite then A zone

6 Blocked off areas: C zone

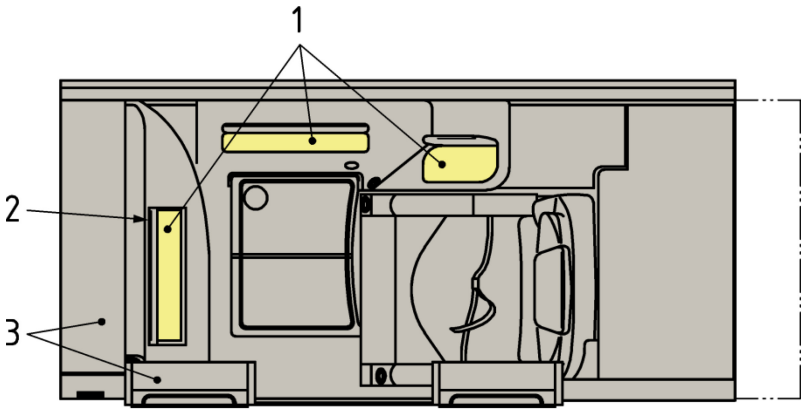
A zone

B zone

C zone

Figure 8 — Typical first class credenza, side view (looking forward)

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Key

1 Passenger seat used furniture directly viewed in open or operating position: compartments inside: B zone (assuming surfaces mainly hidden by supplied amenities), Areas of compartment which can be directly viewed when open and seated: A zone

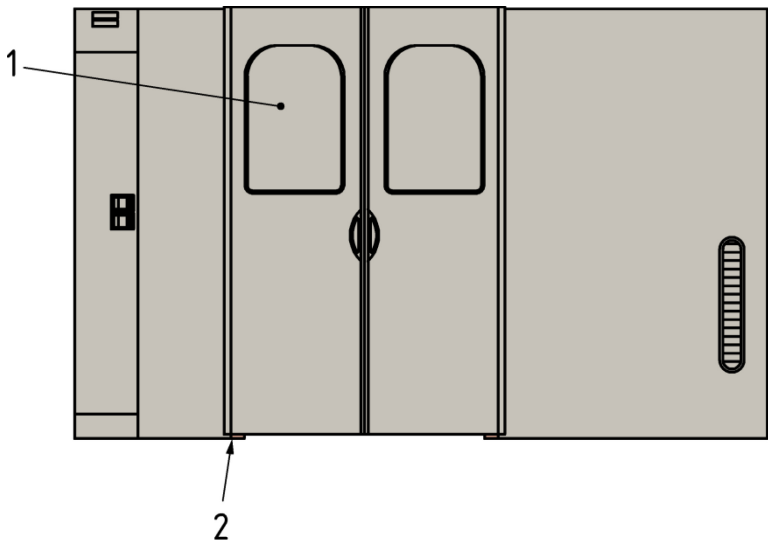
2 Lids/flaps inside/outside: A zone

3 Tops: A zone (unless so high it cannot be viewed from a standing position i.e. over 1,90 m (74.8 inch))

A zone

B zone

Figure 9 — Typical first class minisuite with table deployed and doors open, plan view (looking from top)



Key

1 Plastic screens: A zone (unless otherwise pre-agreed due to manufacturing tolerances)

2 Areas behind moving parts: C zone, incl. door inside areas, as long as they are never visible (rest: A zone)

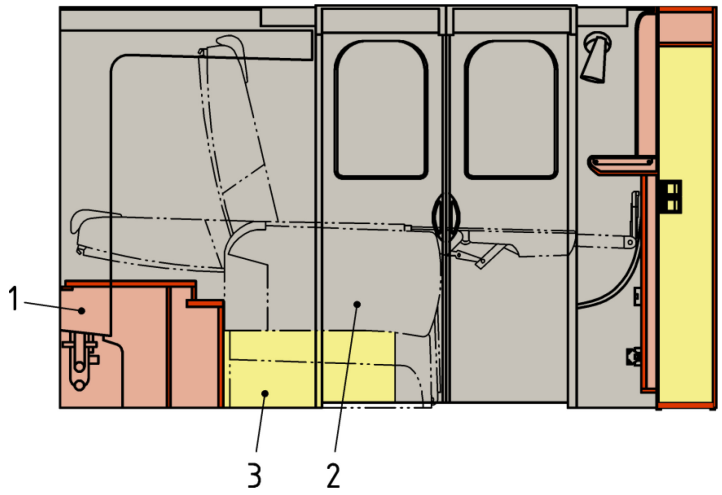
A zone

C zone

Figure 10 — Typical first class minisuite – outside, doors shown closed, side view (looking outboard)

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Key

1 Blocked off areas: C zone

2 Parts close to each other: A zone (where clearly visible)

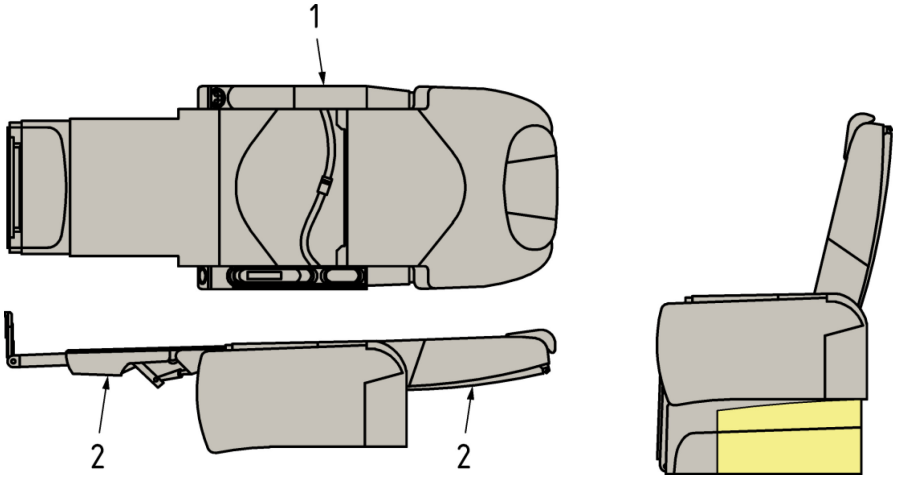
3 Shadowed parts: B zone which will transition to an A zone e.g. the seat and wall are relatively close, the bottom of these parts are in shadow and cannot be clearly perceived. In case of contention, the highest quality is default (to establish zonal transitions/boundaries – all permutations of natural/possible usage viewing angles are vectored in)

A zone

B zone

C zone

Figure 11 — Typical first class minisuite – inside, doors shown closed, side view (looking inboard)



Key

1 Covered area (this side only): C zone

2 Underneath: B zone

A zone

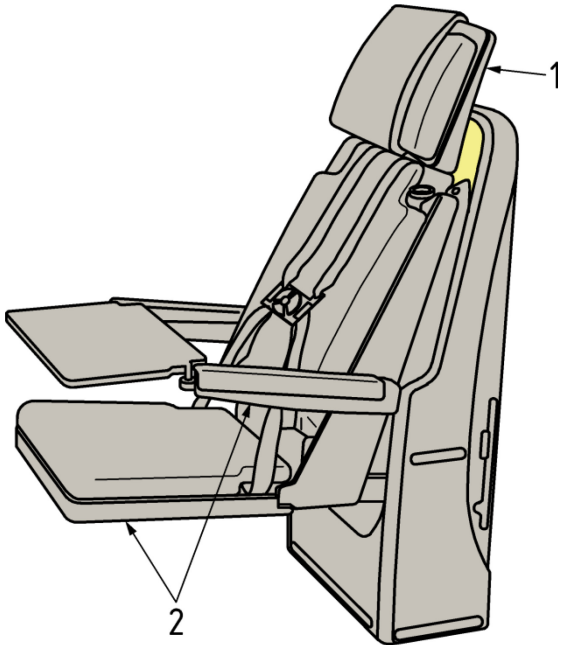
B zone

Figure 12 — Typical first class minisuite seat

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Figure 13 shows a typical cabin attendant seat. Zones might change with position. Figure 13 shows an example in order to demonstrate the applied theory.

Figure 13 shows typical areas for the zonal classification. Areas/parts allowing functional manual or driven movement; thereby becoming fully visible to the passenger or cabin crew are classed as “A” zones. In some cases the installation position is paramount, facets covered up of wall flush items will have an upgraded classification if free standing.



Key

1 Only if flush to a wall: B zone behind headrest, back of seat

2 A zone, under seat pan shroud, underneath of footrest

A zone

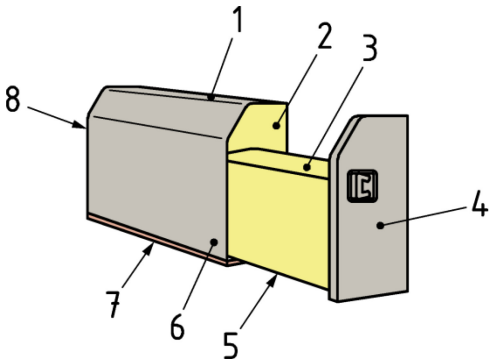
B zone

Figure 13 — Cabin attendant seat

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Figure 14 shows a doghouse, which depends on position in aircraft. Zones might change with position. Figure 14 shows an example in order to demonstrate the applied theory.



Key

1 Corpus outside: A zone; if masked by wall, seat, etc. visible area: B zone, any areas completely not visible: C zone

2 Corpus inside: B zone; if part of inside not visible by normal operation: C zone

3 Drawer and door inside: B zone

4 Door outside: A zone

5 Drawer bottom: C zone

6 Corpus bottom inside: C zone

7 Corpus bottom: C zone

8 Backside if outboard lateral side: B zone; if free standing: A zone

A zone

B zone

C zone

Figure 14 — Example of doghouse

4.4 Exception to classification of surfaces

If the customer has an accepted Request for Change (RFC)/Specific Change Note (SCN) to upgrade a particular area of a monument, e.g. the inside of a stowage door, the door inside shall become an A zone surface instead of an B zone.

4.5 Split lines, definition, cutting and placement of decorative materials and sealing

4.5.1 General

Split lines refer to the physical split of decorative material and not to a pattern alignment which is covered in 4.5.3. Decor split line positions are defined by the pertinent OEM department under advisement and in conjunction with the supplier so as to include all aspects of design prerequisites and feasibility.

Split lines are inherent to a successful and controllable development and in some cases a necessity to achieve pattern harmony; therefore a split line or its position cannot be accepted as a reason for

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customer rejection. Due to the complex nature of the definition process split lines are shown in the corresponding colour specification to provide design direction and understanding.

4.5.2 General split line rules for decorative materials

General split line rules for decorative materials are:

a) Any applied film, split line position tolerance is 2 mm, i.e. ±1 mm (0.079 inch ± 0.039 inch) on curved or wavy surfaces and shall be 1 mm, i.e. ±0,5 mm (0.039 inch ± 0.02 inch) on purely flat surfaces. For decorative sheet material (DSM) film see 4.5.3 b.

b) In cases of split line production templates, the templates may also be used for quality inspection checks.

c) Split line necessity overrules aesthetic reasoning.

d) Parts with integrated deep recesses or 3D shapes surpass most technical solutions for films and therefore generally split lines shall be set or a different medium chosen.

e) Decorative Sheet Material (DSM) (formally known as PVF film) split lines are always overlapped by 10 mm (0.393 inch) and if wrapped around edges, e.g. doors, etc. shall also have a minimum of 10 mm (0.393 inch) wrap around. Reinforced material (DSM film) is always butt jointed.

f) All split lines in all mediums are optically straight, neat (no over spray by painting) and run parallel to edges, i.e. vertical or horizontal, unless otherwise defined. If a split line is noticeable to the eye, i.e. slanted it is considered a defect. Butt joint edges cover the substrate panel completely, i.e. nothing of the panel is visible through the butt joint.

g) Split lines are as a rule visible and are therefore so acceptable, although the goal is always to make them as least obvious as possible.

h) Split lines for Hydro Transfer Printing Technology (HTPT) have a different set of rules and can be found in the HTPT document.

i) Paint split lines whereby two different colours meet on a single part shall have a smooth transition, i.e. no noticeable (to the touch) paint depth difference at the edge (supplier to provide samples for acceptance).

j) DSM cut edges are never left exposed except when an overlap is defined.

k) Split lines that are not to the OEM interior colour specifications i.e. definitions are considered a defect and shall be re-worked.

4.5.3 Pattern alignment over two or more sheets/parts

Pattern alignment over two or more sheets/parts are:

a) Pattern alignment refers generally to the printed decorative layer of a Decorative Sheet Material (DSM) film. Non-standard materials that are embossed, engraved, textile, natural products, imitations of natural products, suspended compounds and special effects or have a structured surfaces etc. shall be handled on a case by case method during the prototyping phase and thereby the parameters documented by the manufacturer and submitted to the OEM for validation.

Documents
Document Sharing Hub
Full document details: BS EN 4726:2018