



DESIGN QUALITY REQUIREMENT FOR PREMIUM SEATING PRODUCTS

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Record of Revisions

| Rev. | Date | Reasons for Revision |
|------|----------|----------------------|
| New | Jan 2021 | Initial issue. |
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Glossary

| Abbreviation | Description |
|--------------|--|
| " | inch |
| AC | Advisory Circulate |
| CIE | The International Commission on Illumination |
| CS | Certification Specification |
| EASA | European Aviation Safety Agency |
| EPF | Emergency Passenger Function |
| FAA | Federal Aviation Authority |
| FOD | Foreign Object Debris |
| IFE | In-flight Entertainment |
| IAT | In Arm Table |
| IAM | In Arm Monitor |
| LRU | Line Replaceable Unit |
| PED | Passenger Electronic Devices |
| QTR | Qatar Airways |
| SVDU | Seat Video Display Unit |
| TBD | To Be Defined (later) |
| TTOL | Taxi, take-Off and Landing |

1. Introduction

The purpose of this document “Quality Requirements Document for Cabin Products” is to provide the quality requirements, specifications, functionalities and features that Qatar Airways Cabin Product shall include to ensure product robustness during in-service life.

2. Interpretation

- The use of the words “**required**”, “**must**” or “**shall**” in this document indicates a requirement, specification and/or a feature that the offered Product must have and is an absolute requirement for the quality of the product.
- The use of the words “**must not**” or “**shall not**” in this document indicates an absolute prohibition of the specification.
- The use of the words “**should**” or the adjective “**recommended**” in this document mean that there may exist valid reasons in special circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- The use of “**should not**” or “**not recommended**” in this document mean that there may exist valid reasons in particular circumstances when the particular item or requirement is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any item or requirement.

3. General Design Requirement

- a) Product shall be have no sharp edges on all passenger accessible areas.
- b) Product shall have consistent finishes.
- c) Gaps common to doors, between trim and structure, shall not exceed the value agreed as part of quality criteria document.
- d) Product shall have proper/smooth operations of doors, shelves, latches, locks, and orientation of handhold devices.
- e) Product shall have latch mechanisms engaging receptacles. Closed doors should not rattle for the duration of the products in service life due to design.
- f) All parts and LRU replacement time shall be defined.
- g) All adjacent parts shall have no color deviations that is verified based on CIE system (L, a, b).
- h) Product material shall be able to withstand environmental conditions, humidity up to 72% average as per Qatar Meteorology Department, ambient temperature up to 52 C in summer, and dust.
- i) Maintenance access shall allow suitable posture and anthropology for maintenance activities
- j) Product shall not have any special tool to support operation or maintenance, unless consent from QTR is provided.
- k) Product shall be designed to avoid FOD entrapment in areas exposed to passengers. Any translating component such as Moveable Armrest, Privacy Divider (Single & Multi Tier), etc. shall have a closeout seal or equivalent.
- l) The force of any manually operated translating component, not defined in this document shall not exceed 15lbs.
- m) The area behind the Seat assemblies, where electrical components are installed, shall have a closeout panel
- n) All Electronic boxes shall have a drip shield

4. Premium Seating Products – Mechanical Requirements

4.1 Suite Sliding Doors (if installed)

4.1.1 Operational Design Requirements:

- a) Sliding door shall have minimum functional gap with the surrounding to eliminate any chaffing condition.
- b) Sliding door translating mechanism shall operate smooth with no juddering condition. The force requirement for operation shall be agreed upon during design development of the product
- c) Sliding door TTOL locking mechanism requirements:
 - Activation by means of a mechanical button or sliders
 - Deactivation by means of discreet button accessible only to the crew not visible to passenger
 - There shall be a visual indicator to allow the crew to identify the positive engagement of the lock (Engraved / Color coded)
 - The location of the locking mechanism shall be accessible from aisle only.
- d) The sliding door shall have detents to hold them in position should the locking mechanism fail to avoid inadvertent movement of the door during TTOL configurations.



- e) EPF (Emergency Passage Feature) design requirements below:
- EPF design shall be simple with no complex mechanism.
 - The reset procedure shall be user friendly and designed to be operated by a non-technical person (Cabin Crew) with minimum briefing and effort.
 - There shall be a visual indicator, visible from the aisle, to indicate the crew of any inadvertent activation of the door.
 - The reset of the door shall be by means of a discreet button operated by Crew / Maintenance only. The reset shall normalize the visual indicator as well.
 - The EPF activation handle shall be located at a place where it would be easy for the operator to see even under dark cabin environment (no lights).
 - The EPF handle shall have a visual indicator for the crew to determine any inadvertent activation by the passenger.

4.1.2 Maintenance Design Requirements:

- a) Any associated maintenance requirement for the EPF, TTOL lock & door mechanism shall be able to execute with minimum access removals and within minimum turnaround time of 1 hr.

4.2 Translating Video Monitors (if installed)

4.2.1 Operational Design Requirements:

- a) Translating Video Shrouds.
- There shall be minimum functional gap between the translating shrouds to eliminate chaffing / rubbing condition
 - The primary locking and unlocking mechanism shall be push button (or similar) activated and have auto latching mechanism in the extended and retracted positions.
 - There shall be a secondary locking system, to prevent the possibility of passenger activating the primary latching system.
 - The translating mechanism shall be easy and smooth with no juddering condition. The slider mechanism force shall enable the crew to operate and engage from the aisle. The force requirement for operation shall be agreed upon during design development of the product.
- b) Hinging Video Shrouds (The following applies to translating video shrouds that can be folded and stowed).
- The points highlighted under TRANSLATING VIDEO SHROUDS apply to the translating part of the assembly.
 - There shall be a hinge lock system activated and locked in normal configuration to prevent the swinging of the video shroud assembly during the folding and the stowing operation.
 - The philosophy of hinge lock shall be either of the following:
 - Push button (or similar) activated to disengage
 - Auto disengage by the translating part of the shroud in complete stowed configuration (preferred)
 - The hinge shall be equipped with a primary locking mechanism, which would engage automatically in fully folded configuration.

- There shall be a secondary latching system, to prevent the possibility of passenger activating the primary latching system.
 - There shall be sufficient gap available between the surround in folded configuration to avoid interference.
- b) There shall be a minimum functional gap between the bottom face of the translating shrouds and the credenza to avoid interference.
 - c) The location of the primary and secondary locking mechanism access points shall be accessible standing from the aisle.
 - d) The secondary locking/latching mechanism shall be robust and does not add any in-service issues and additional burden to maintenance

4.2.2 Maintenance Design Requirements:

- a) Any associated maintenance requirement for the primary & secondary locking mechanism shall be able to execute with minimum removals for access and within turnaround time of 1 hr.

4.3 Privacy Dividers (if installed)

4.3.1 Operational Design Requirements:

For Independent Suite configuration (Single panel divider or similar):

- a) The divider shall be designed as a separate independent assembly
- b) Divider design shall follow simple kinematics and locking system
- c) Preferred actuation system would be Electrical over Mechanical considering the weight and maintenance impact (for wide body aircrafts seating)
- d) Divider deployment shall be equipped with an independent system able to be activated from both suites through a push button or similar (for wide body aircraft seating)
- e) The translation mechanism of the divider shall have a damping function
- f) The force of stowing for mechanical dividers shall be within (TBD- To be agreed during design development)
- g) Mechanical override for electrical dividers shall be in discreet location and away from passenger view or access.
- h) Mechanical override operation for electrical divider shall be smooth with minimum effort to operate.
- i) Mechanical override for electrical divider shall have a closeout panel or similar which can be removed and installed by the crew without the use of standard tools should a requirement arises to operate the divider manually during flight.
- j) There shall be sufficient functional gap between the panel and cavity to eliminate chaffing / rubbing damages
- k) There shall be a closeout seal or similar to prevent FODs entrapment within the divider assembly

For Bed Suite configuration (Multi panel divider or similar) (Wide Body Aircraft Seating):

- a) The divider shall be designed as a separate independent assembly
- b) Divider design shall follow simple kinematics and locking system

- c) Preferred actuation system would be Electrical over Mechanical considering the weight and maintenance impact
- d) Divider shall follow two configuration in terms of actuation and as follows
 - Configuration 1 (Lounge) : Fully extended to Intermediate and vice versa
 - Configuration 2 (Bed): Intermediate to fully stowed and vice versa
- e) Configuration 1 (Lounge Mode)
 - Actuation system of the lounge mode shall be designed for passenger operation.
 - Activation of lounge mode, intermediate to fully extended, shall be equipped with an independent system able to be activated from both suites through a push button or similar
 - The kinematics shall be designed to prevent passengers to operate the divider into bed mode (mechanical divider).
 - The force of stowing the divider to lounge Mode shall be within (TBD- to be agreed during design development) for mechanical dividers
- f) Configuration 2 (Bed Mode)
 - Actuation system of the Bed Mode shall be designed for Cabin Crew operation.
 - Activation of Bed mode, intermediate to fully stowed position, shall be equipped with an override mechanism activated through a push button or similar to a mechanical divider operation. It shall be a common mechanism to operate the divider at all positions. For electrical actuation concept, passenger concurrence logic or similar through the HMI / PCU shall be followed.
 - The location of the override mechanism shall be at a discreet position not easily accessible or visible to the passengers.
 - The frequency of usage of the override mechanism shall be considered while choosing the material of the lock.
 - The locking mechanism of the divider in fully stowed position shall be robust and reliable. The locking mechanism shall have a firm holding grip that can sustain turbulence and TTOL phases of flight.
 - The force requirement for operation shall be agreed upon during design development of the product
 - There shall be closeout seal or similar to prevent FOD entrapment within the divider assembly

4.3.2 Maintenance Design Requirements:

- a) For electrical actuated dividers, access to electrical and electronic components shall be considered. Enough access shall be provided to electrical actuators or harnesses, to accomplish the task with minimum removals and within minimum turnaround time of 1 hr. Actuators shall qualify as an LRU with maximum removal and installation timing of 30 mins.
- b) For mechanical dividers, access to actuation components such as gas strings, lock mechanisms, mechanical cables etc (if equipped), shall be considered. Enough access shall be provided to address any operational concerns that may arise in service with minimum removals and within minimum turnaround time of 1 hr.
- c) Mechanical components that directly affect the operation of the dividers shall meet maximum removal and installation timing of 30min
- d) The divider removal and installation task as an assembly (wide body aircraft seating) shall be achievable with minimum disturbance to the suite / interfering surfaces and within the grounding time of a Weekly Check (4 hrs)

4.4 Meal Table Assemblies

4.4.1 Operational Design Requirements:

Standard Footwell Meal tables design

- a) Meal table shall have minimum functional gap with the surrounding shrouds / panels to eliminate any chaffing conditions.
- b) Meal table shall not rattle in stowed configuration during TTOL phases.
- c) Meal table shall lie flat and level (parallel to the floor) with no drooping condition in fully deployed configuration
- d) Meal table shall be equipped with a table levelling mechanism to facilitate any levelling requirement
- e) Meal table (Bi-fold design) shall be equipped with a hinge flap to hide the hinge assemblies installed between the leaves.
- f) There shall be a meal table support on the console for bi-fold table designs
- g) Meal table (Bi-fold design) shall orient flush or with negligible gapping with the meal table support structure or soap dish in fully deployed configuration. The gap shall be such that the same must sit flush with the support or soap dish under the weight of a glass of water or wine. This requirement is to avoid flapping or knocking of the meal table leaf with the support or soap dish upon application of pressure during dining.
- h) Meal table assembly sliding mechanism shall be smooth with no juddering or grinding condition
- i) Meal table (fwd – aft sliding, if equipped) shall be smooth with no juddering or grinding condition. The mechanical components of the sliding mechanism shall be machined parts. No plastic or Teflon material is preferred to be part of the sliding mechanism due to harsh operating environment and reliability concerns.
- j) Meal table locking mechanism shall be simple with no complexity.
- k) The meal table latch handle operation shall be smooth and effortless with no grinding condition
- l) The force requirement for operation shall be agreed upon during design development of the product
- m) There shall be an override mechanism to facilitate stowing or deployment of the meal table should the primary locking mechanism fail (for standard footwell tables)
- n) The preferred mechanism philosophy (lock and override) is mechanical linkage over cable operated.
- o) The location of the override mechanism shall be at a point where it is easily accessible for Cabin Crew to action and discreet from passenger view. The preference to have the override mechanism as an independent system and not a part of the primary locking mechanism.

Cavity Stowed Meal Table Design (Vertical / Horizontal)

- a) The meal table shall have a damping function during stowing of the meal table
- b) The meal table shall have minimum functional gap with the surround to prevent any chaffing or rubbing conditions
- c) The meal table shall orient straight with no wobbling effect during the stowing operation
- d) Meal table (fwd – aft sliding, if equipped) shall be smooth with no juddering or grinding condition. The mechanical components of the sliding mechanism shall be machined parts. No plastic or Teflon material is preferred to be part of the sliding mechanism due to harsh operating environment and reliability concerns.
- e) Meal table (fwd – aft sliding, if equipped) shall be equipped with a centering mechanism to facilitate ease of stowing operation. The mechanism shall only engage when the table is

- centered and in line with the stowing cavity. This is to prevent table being able to be lifted for stowing when the leaf is moved out of center which can cause damages to the table / surround
- f) The locking mechanism of the meal table shall be robust and reliable. The locking mechanism shall have a firm-holding grip, which can sustain turbulence and TTOL phases of flight and should not release the table when in stowed configuration.

4.4.2 Maintenance Design Requirements:

- a) Mechanical components that directly affect the operation of the meal table (locking mechanism, override mechanism, levelling mechanism) shall meet maximum removal and installation timing of 30min.
- b) Meal table replacement shall meet the maximum removal and installation timing of 30 min.

4.5 Moveable Armrest Assemblies

4.5.1 Operational Design Requirements:

- a) The preferred armrest assembly design to be an independent assembly than being part of the passenger seat assembly.
- b) The armrest assembly shall have minimum functional gap with the surround panels or shrouds to eliminate chaffing or rubbing condition
- c) The armrest sliding mechanism shall be smooth with no juddering or grinding condition
- d) The armrest kinematics and locking mechanism shall be simple with no complexity
- e) The armrest locking mechanism shall facilitate positioning of the armrest at any desired position by the user
- f) The armrest latch handle operation shall be smooth and effortless with no grinding condition with no excessive force requirement
- g) The force requirement for operation shall be agreed upon during design development of the product
- h) The preferred locking mechanism philosophy is mechanical linkage over cable operated.
- i) The lock mechanism shall be reliable in terms of service life
- j) The armrest assembly frames/translating mechanism shall be robust to eliminate any bending and deformation by the passenger weight exerted on them.

4.5.2 Maintenance Design Requirements:

- a) Mechanical components that directly affect the operation of the armrest assembly (gas springs, locking mechanism) shall meet maximum removal / installation timing of 1hr.
- b) The armrest assembly shall be designed as a removable assembly to facilitate easy maintenance activities considering the space constraints.

4.6 Amenity Stowage Compartments

4.6.1 Operational Design Requirements:

Translating Concept – Part of Armrest Assembly (Mechanical)

- a) Amenity compartment kinematics and locking mechanism shall be simple with no complexity
- b) The compartment translation shall be smooth with no juddering and grinding condition

- c) Minimum functional gap shall be provided with the surrounding to eliminate any chaffing or rubbing condition.
- d) The locking mechanism of the compartment shall be smooth and effortless when accessed from any seated position.
- e) The force requirement for operation shall be agreed upon during design development of the product
- f) The operation of the amenity compartment door (Lid concept) shall be smooth with no grinding and squeaky condition.
- g) The latch handle force requirement for Lid concept doors shall be within TBD- To be agreed during design development

Translating Concept – Sofa Design (Mechanical)

- a) The translation of the assembly shall be smooth and effortless with no juddering condition
- b) The force requirement to translate the assembly shall be within (TBD- To be agreed during design development)
- c) The assembly locking mechanism shall facilitate positioning of the armrest at any desired position by the user
- d) The assembly frames translating mechanism shall be robust to eliminate any bending / deformation by the passenger weight exerted on them
- e) The lock mechanism shall be reliable in terms of service life
- f) The latch handle operation shall be smooth and effortless with no grinding or excessive force requirement
- g) The force requirement for operation shall be agreed upon during design development of the product
- h) The assembly shall collapse by itself, in extended position, when excessive force exerted on it to prevent damage to the internal frames and kinematics. The collapsing force shall be TBD- to be agreed during design development

Fixed Stowage Design

- a) Compartment door swing design concept preference to have a pivoting door over hinged door
- b) Minimum functional gap requires to be maintained between the surround to avoid any chaffing condition
- c) Travel limiters depending on the opening requirement shall control the door swing. The door shall not interfere with the surround during the opening operation
- d) Orientation of the door with the frame shall be flush with no stepping or offset design
- e) Door locking mechanism shall be simple with no complexity

4.6.2 Maintenance Design Requirements:

- a) Mechanical components that directly affect the operation of the assembly (Gas springs, locking mechanism) shall meet maximum removal / installation timing of 1hr.
- b) The assembly shall be designed as a removable assembly to facilitate easy maintenance activities considering the space constraints.

4.7 Console Design

4.7.1 Operational Design Requirements:

- a) Any electrical / IFE equipment / wiring located within the console shall be liquid spill proof.
- b) Any cavity / opening that have potential to liquid ingress shall be sealed.

4.7.2 Maintenance Design Requirements:

- a) Cocktail table (if installed) attachment methodology shall be straight forward to facilitate ease of replacement
- b) Console closeout panels attachment methodology shall be straight forward to facilitate ease of replacement
- c) PCU / HMI design shall qualify it as an LRU and shall meet the maximum replacement time of 30mins.

4.8 Passenger Seat Assemblies

4.8.1 Operational Design Requirements:

- a) The mechanical override operation of the electrical actuators shall be smooth with minimum effort.
- b) The location of the mechanical override buttons or lever shall be easily accessible to the Cabin Crew without the requirement of additional removing for access and accessible from the aisle.
- c) The backrest assembly shall be removable for access to electrical or electronic installed behind the seat assembly.
- d) The seat dress cover (backrest & bottom) shall be designed as one piece to prevent passenger personal items (PEDS, wallets, card holder etc.) fall behind the seat.
- e) Shoulder straps, if installed, shall orient flush on the seat backrest in normal configuration. Offset / raised strap tip is not allowed.

4.8.2 Maintenance Design Requirements:

- a) All electrical actuators shall meet the standard LRU replacement timing of 30min
- b) All mechanical override cables shall meet the standard LRU replacement timing of 30 min
- c) The seat bottom pan shall be designed as removable for ease of accessing the seat electrical system (if electrical any electrical components installed below the seat)
- d) The backrest assembly shall be designed as removable for accessing the electrical system (if electrical components located behind the seat assembly)

4.9 Dress Covers (Pax)

4.9.1 Maintenance Design Requirements:

- a) Dress cover design shall facilitate replacement of dress cover within short turnaround time of 1hr. Design shall be straight forward without the requirement of removal additional components for access. The dress cover maintenance shall meet the standard LRU replacement timing of 30min

4.10 Closeout Panels (Furniture / Seat Assemblies)

4.10.1 Maintenance Design Requirements:

- a) All closeout panels shall be designed as removal and replaceable parts.
- b) No parts shall be designed as part of the primary structure. Eg: Décor laminated Backshell / Footwell primary structure.
- c) Closeout panels attachment methodology shall be easy and straight forward. Eg: Polycarbonate parts attached by mean of clips bonded to the panel tends to damage the panel during the maintenance process
- d) Parts designed around the passenger direct contact area shall follow easy maintenance design. Eg Aisle area, Backshell area, Footwell area, Console area

5. Premium Seating Products - Electrical Requirements**5.1 Design and Installation Requirements:**

- a) The design of an electrical system together with all electrical components, functionality and installation shall comply with Aviation Authorities' related standards, policies and regulations, including but not limited to EASA CS-25 and FAA AC 25.1701-1, manufacturers' approved product specifications and engineering drawings, and Operator's design and functionality requirements.
- b) The selection of materials and components for the electrical design shall consider their regulatory qualification for airborne use, physical and technical characteristics suitable for its intended function, normal environmental conditions where these will be situated, mechanical durability and expected service life, resistance to vibration, potential as a safety hazard to affect the aircraft's airworthiness.
- c) The sub-parts of an assembly shall conform to the approved specifications and shall be assembled in accordance to the approved manufacturer's procedures using the correct prescribed tools and equipment.
- d) Component identification shall be:
 - correct, durable,
 - readable until its expected service life,
 - the appropriate size,
 - placed on components where they are easily visible,
 - placed near the connectors in the case of harnesses.
- e) Wires and harnesses shall have no:
 - workmanship or factory defect,
 - evidence of unwanted cut, break or impacted pressure on any section,
 - excessive bend radius,
 - mechanical strain,
 - excessive slack,
 - excessive length than required,
 - contact with mechanical moving parts or sharp edges, hot surfaces, any form of liquid,
 - potential chaffing with structures,
 - exposure to passengers' view

- f) Wires and harness shall have:
- rigid mounting board platform to prevent any vibration,
 - consistent routing on similar modular assemblies in accordance to the manufacturer's specifications and engineering drawings,
 - applied method to avoid it from damages due to maintenance passenger or activity,
 - a method to easily separate electrical wiring modules for shipment and installation purposes
 - easy access for removal and installation for frequently replaced harnesses,
 - a method of security by the use of approved and agreed cable ties, clamps, covers, and standoffs,
 - enough grip to their support but not too tight that it could damage the wire insulation or degrade its characteristics,
 - drip loop when required,
 - protective sleeves to cover and protect all sections of harnesses except the harness identification tag,
 - a method of separation from other systems in accordance to the prescribed distance as stated in the approved manufacturer's engineering specifications and drawings,
 - enough slack and wire protection when it is defined as a moving harness,
 - a perpendicular orientation with respect to the LRU connection ports, with enough slack to allow easy connector removal and installation,
 - adequate clearance within panel cutouts to allow removal and installation
 - proper termination of harness shields,
 - no splice or a repaired section,
 - easy access and visibility on its connector ends for inspection, removal and installation of connector pins
- g) Line Replaceable Units shall:
- be easily accessible and visible for inspection, removal, and installation,
 - be situated on an area where the ventilation requirements are met,
 - be situated on an area where no or at least a small number of panels / covers shall be removed
 - be situated on an area where moisture and liquid contamination are least likely to occur,
 - be removable and installable within the agreed timings and no special tool is needed,
 - be removable and installable in segments as in the case of long wash light strips,
 - be removable and installable on their own when integrated into a higher assembly LRU,
 - not be operating with rattling motion, excessive heat or noise.
- h) Passenger units such as reading light, IFE peripherals, and where installed - feature light, wash light, control buttons shall:
- be designed and mounted in a manner that it doesn't cause a safety or health hazard (including but not limited to electric shock, hot surface, sharp edges, presence of splinters, finger trap, etc)
 - be responsive as soon as commanded,
 - have firm physical buttons for units with command buttons, and these are not sensitive to light touches, and for units equipped with motion sensors these shall not be hypersensitive to activate background lights unnecessarily,
 - have the best aesthetic appearance that is not confusing and misleading,
 - have lights with intensity that don't give disturbance and annoyance to passengers,



- operate as per design requirement
- i) When equipped in a suite, in-suite lights (reading light, feature light, accent lights, service light, wash light) shall:
 - be illuminating their respective designated areas as required,
 - have no gap or spot in the case of wash lights illuminating a certain length,
 - have the consistent and correct intensity and temperature as required,
 - present the correct mood colors in accordance to the agreed scheme
 - have a single switch to turn off all lights completely
- j) A drip shield shall be designed to effectively divert debris and liquid from contaminating the under seat box.
- k) Kill switch (for both IFE and Seat Actuation system) shall be installed for the purpose of isolating the suite circuitry from the network and shall be easily accessible by crew or maintenance staff.