AIRCRAFT FIRE REGULATIONS

Gerflor®
theflooringgroup

OVERVIEW

There are two main regulations in the world which are very similar.

➡ The Federal Aviation Regulations, or FARs, are rules prescribed by the Federal Aviation Administration (FAA) governing all aviation activities in the United States.

- **FAR Part 25 – Airworthiness Standards: Transport Category Airplanes**
  - **FAR Part 25.853 – Compartment interiors**
  - **FAR Part 25.855 – Cargo or baggage compartments**
  - **FAR Part 25.856 – Thermal / acoustic insulation materials**

➡ In Europe since 2014, the old rules (Joint Airworthiness Requirements, JAR) have been replaced by the Certifications Specifications (CS), which are managed by the European Aviation Safety Agency (EASA).

- **CS-25 - Airworthiness of Large Aeroplanes**
  - **CS-25.853 – Compartment interiors**
  - **CS-25.855 – Cargo or baggage compartments**
  - **CS-25.856 – Thermal / acoustic insulation materials**

CS / FAR 25 Specifications

		Parts	Test method	Specifications
CS / FAR 25.853 Compartment interiors				
a) Materials including finishes or decorative surface	CS / FAR 25 Appendix F Part I	(i) Interior ceiling and wall panels, Partitions, Galley structure, Structural flooring,	Vertical Bunsen burner test Ignition time 60s (FTMS 191 Method 5902)	Burned lenght (cm) <15 Flame time(s) <15 Drip extinguishing time(s) <3
		(ii) Floor coverings, Textiles, Seat cushions, Padding, Decorative and nondecorative coated fabrics, Leather, Trays and galley furnishings,	Vertical Bunsen burner test Ignition time 12s (FTMS 191 Method 5902)	Burned lenght (cm) <20 Flame time(s) <15 Drip extinguishing time(s) <5
		(iv) Plastic windows and signs, parts constructed in elastomeric materials, seat belts,	Horizontal Bunsen burner test (FTMS 191 Method 5906)	Burn rate (mm/mn) <64
c) Additional requirements for seat cushions	CS / FAR 25 Appendix F Part II	Seat cushions	Oil burner test Calorimeter	Burned lenght (cm) <43 Weight loss (%) <10
d) Additional requirements for interior components for aeroplanes with passenger capacity ≥ 20	CS / FAR 25 Appendix F Part IV	Interior ceiling and wall panels, Partitions, Galley structures	OSU Rate of Heat Release (ASTM E906)	Total Heat Release over the first 2 mn (kW mn/m²) ≤65 Peak Heat Release Rate (kW/m²) ≤65
	CS / FAR 25 Appendix F Part V		Smoke Chamber (flaming mode) (ASTM E662)	Smoke density Ds after 4mn ≤200

CS / FAR 25 Specifications

		Parts	Test method	Specifications
CS / FAR 25.855 Cargo or baggage compartments				
Class C and Class F cargo or baggage compartments	CS / FAR 25 Appendix F Part III	Ceiling and sidewall liner panels	Flame penetration	No flame penetration within 5 minutes after application of the flame source Peak temperature measured at 10 cm above the upper surface of the horizontal test sample must not exceed 204^0C
All other materials used in the construction of the cargo or baggage compartment must meet the applicable test criteria prescribed in Part I of Appendix F, or other approved equivalent methods.				
CS / FAR 25.856 Thermal / acoustic insulation materials				
a) Thermal / acoustic insulation materials	CS / FAR 25 Appendix F Part VI	Installed in the fuselage	Flame propagation	No flame propagation beyond 51 mm Flame time after removal of the pilot burner (s) <3
b) Thermal / acoustic insulation materials	CS / FAR 25 Appendix F Part VII	Passenger capacity ≥ 20	Burnthrough	Flame penetration in less than 4 mn < 2.27 W/cm2 on the cold side of the insulation specimens at a point 30.5 cm

CS / FAR 25

➡The test methods and specifications are different according to :

- the type of products
- the place where it’s installed

➡The differents parameters measured are :

- Self extinguishing
- Flame propagation
- Flame penetration
- Weight loss
- Heat release
- Smoke density (flaming mode)

➡ No mention of smoke toxicity assessment

Additionnal requirements of aircraft manufacturers

Concerning Smoke (density and toxicity), major aircraft manufacturers have developed similar internal standards.

- **For AIRBUS : AITM3.0005**
- **For BOEING : BSS 7239**

Standards based on the smoke chamber method (idem CS / FAR 25 Appendix F Part V) with a measurement of density and toxicity in the same time.

- **Smoke density : same requirement than CS / FAR 25 Appendix F Part V but a non-flaming mode.**
- **Smoke toxicity**

Gas component	Concentration limit
Hydrogen Fluoride (HF)	100 ppm
Hydrogen Chloride (HCl)	150 ppm
Hydrogen Cyanide (HCN)	150 ppm
Sulfur Dioxide (SO_2)	100 ppm
Nitrous Gases (NO / NO_2)	100 ppm
Carbon Monoxyde (CO)	1000 ppm

Conclusion

The requirement of smoke appeared initially with the same objective as the caloric release (OSU) : to control the flash-over (which may seem strange because we don't really see the link between optical density and flash-over).

The authorities considers today that all the regulatory criteria for the selection of materials are sufficient to ensure that a fire will not develop sufficiently (or will be controlled) before the passengers are evacuated, and thus that the production of smoke and effluents toxic substances reach a critical level.

In addition, the light signaling on the ground, the evacuation instructions and the time necessary for the evacuation of the apparatus limits the interest of the criterion of opacity (discussions are ongoing on whether to maintain the smoke requirement).