

1 Quality

1.1 IRIS

1.1.1 What is IRIS?

The International Railway Industry Standard was launched by the Union des Industries Ferroviaires Européennes (UNIFE) together with railway system manufacturers.

IRIS specifies the minimum quality requirements for railway manufacturers as well as their suppliers and service providers.

In addition to railway-specific rules, IRIS is based on the requirements of ISO 9001.

2 Safety

2.1 Fire protection

2.1.1 EN 45545

2.1.1.1 What is EN 45545?

The International Union of Railways (UIC) developed the EN 45545 standard in cooperation with various European countries on the basis of existing fire protection measures for railway systems; it thus replaces the relevant national standards.

EN 45545 governs fire safety measures and the associated verification processes in Europe. The primary objective of the standard is to enable passengers and staff to evacuate railway vehicles and reach a safe location in the event of a fire.

2.1.1.2 Specifications and requirements of EN 45545

To reduce the risk of fire, the standard contains provisions covering the following topics:

- Design specifications for equipment and the vehicle layout
- How to minimize the likelihood of fire from accidents or acts of vandalism
- Fire detection
- How to reduce the spread of fire
- Material specifications for reducing the spread of smoke, heat and toxic gases
- Fire control

EN 45545 divides rail vehicles into four operation categories (OC 1 to OC4), with OC 1 being subject to the least stringent requirements.

The following factors play a role in determining the operation categories:

- Time it takes the railway vehicle to come to a stop
- Maximum tunnel length along the track
- Type of railway vehicle
- Speed of the railway vehicle
- Evacuation options
- Type of track

The following table provides a rough overview of the requirements:

Operation category	Tunnel length	Time it takes the railway vehicle to come to a stop in case of fire	Min. average speed (regulated infrastructure)
OC 1	< 1 km	Minimum permissible delay	Not applicable
OC 2	< 5 km	4 min	80 km/h
OC 3	> 5 km	15 min	80 km/h
OC 4	> 5 km without evacuation	4 min	-

In addition to the operation categories, the standard also distinguishes between different design categories:

- Category N: Standard vehicles
- Category A: Automatic vehicles having no emergency-trained staff on board
- Category D: Double-decker vehicles
- Category S: Sleeping and couchette cars

Once both of these categories have been determined, a hazard level can then be assigned.

Operation category	Design category			
	N	A	D	S
OC 1	HL 1	HL 1	HL 1	HL 2
OC 2	HL 2	HL 2	HL 2	HL 2
OC 3	HL 2	HL 2	HL 2	HL 3
OC 4	HL 3	HL 3	HL 3	HL 3

Depending on the hazard level, different fire protection measures apply.

2.1.13 Switchgear certification

Switchgear installed inside a certified technical cabinet are considered to be non-classified components.

In general, Table 2 of EN 45545-2 specifies the test requirements for equipment used in trains.

The required testing procedures are usually carried out on semi-finished products, making it difficult to certify assembled devices in accordance with the provisions listed in this table. Fully assembled devices can therefore also be certified according to the grouping rule.

2.1.1.4 Standards in force in other countries

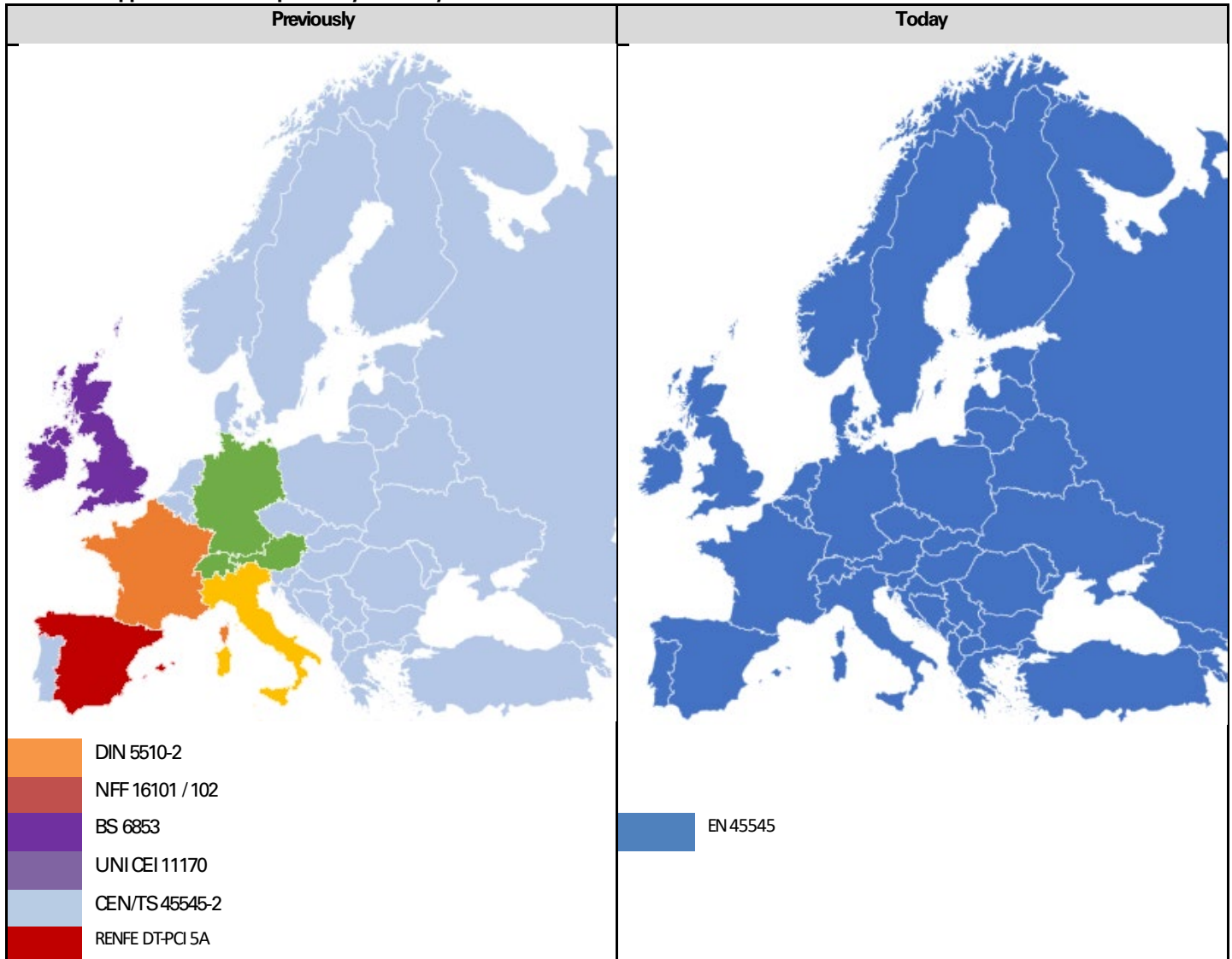
The following fire safety standards apply in other regions:

- North America
 - NFPA 130: "Standard for Fixed Guideway Transit and Passenger Rail Systems"
 - SMP 800-C: "Toxic Gas Generation"
- Asia
 - UIC 564-2: "Regulations relating to fire protection and firefighting measures in passenger carrying railway vehicles or assimilated vehicles used on international services"
 - TB/T 3237: "Flame retardant technical specification of decorating materials for multiple unit train"

2.1.1.5 Previous European standards (replaced by EN 45545)

- DIN 5510-2
- NFF 16101 / 102
- BS 6853
- UNI CEI 11170
- CEN/TS 45545-2
- RENFE DT-PCI 5A

2.1.1.6 Applicable standards previously and today



2.2 Shocks and vibration

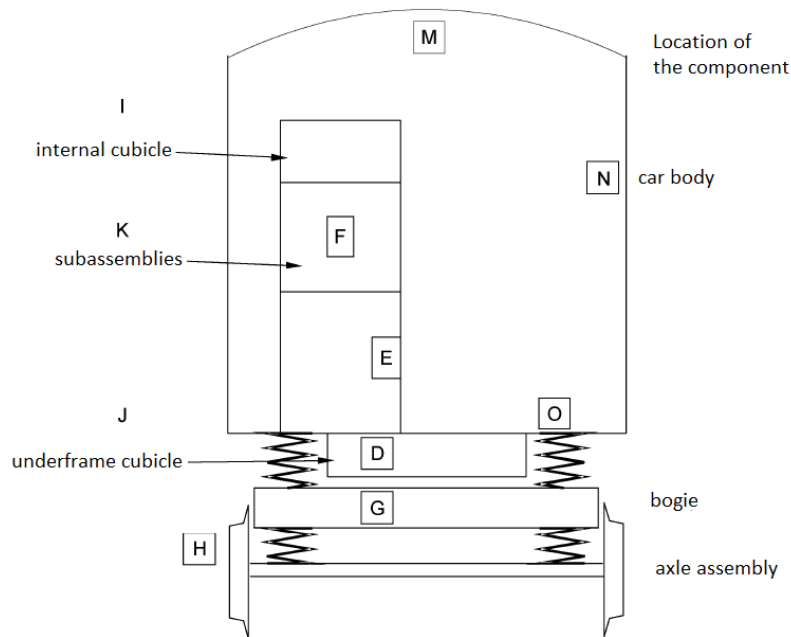
2.2.1 EN 61373

2.2.1.1 What is EN 61373?

This standard contains the vibration and shock testing requirements for equipment installed in railway vehicles. The only applicable method for the approval of equipment/components is vibration testing.

Depending on where the switchgear is installed, it must be able to withstand different types of acceleration. If the equipment is located inside a railcar, it must withstand different accelerations than if it were mounted directly on the wheel.

Category	Location	Location where the equipment is installed
1 Class A	M N O I and J	Components which are mounted directly onto or under the car body
1 Class B	D	Components mounted into an underframe cubicle which is in turn fixed to the car body
1 Class B	K and E	Components mounted into a large internal cubicle which is in turn fixed to the car body
1 Class B	F	Components mounted into subassemblies which are in turn mounted into a cubicle which is in turn fixed to the car body
2	G	Cubicles, subassemblies, equipment and components which are mounted on the bogie of a railway vehicle
3	H	Subassemblies, equipment and components or assemblies which are mounted onto the axle assembly of a railway vehicle





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