

<PRESERVING RAILWAY SAFETY KNOWLEDGE IN A CONTEXT OF WITHDRAWAL OF HISTORICAL NATIONAL PRACTICES AND RULES", >

<Frédéric Lisiecki >

< Project officer in vehicle specification >

<French National Safety Authority: Etablissement Public de Sécurité Ferroviaire>

SUMMARY

France, like other countries, has its own rolling stock design rules. Historically, these regulations were overseen by the then railway authority and arose from a long process of feedback and experience in France. Since 2006, responsibility for these regulations has been entrusted to the French national rail safety authority (*Établissement Public de Sécurité Ferroviaire (EPSF)*). Since then, EPSF has managed the maintenance of these rules in an environment which has seen considerable changes, in particular with the advent in 2004 of the European Railway Agency. The announcement of a Unified Infrastructure Manager in France from 2015, ending the separation between the solely proprietary infrastructure manager and the appointed infrastructure manager who oversees operations, heralds an opportunity for a new framework. The opening to competition, which will become general over the course of the next few years, of the internal passenger transport market underlines the need to adapt the national regulatory framework by aligning it with EU regulations, and making it accessible to any rail company wishing to operate on the French national rail network, while ensuring interoperability with neighbouring systems. In this respect, the management of the technical recommendations has become a crucial issue, especially with respect to the maintenance of safety standards. It is this work, undertaken by the EPSF on the body of national recommendations, which is presented below. This exercise was begun in 2012 and is set to continue for a further

INTRODUCTION

The French state, through its rail regulations, decrees and orders among other things, has chosen to present requirements that are expressed in terms of performance targets. 125 articles are included in the French "safety" order of 19 March 2012, entailing about 200 requirements related to safety objectives, operations, infrastructure and rolling stock. Some twenty requirements for the design of rolling stock and its compatibility with the infrastructure are included in the order.

Procedures to satisfy the requirements of the order are found either in the European technical regulations, or in the French national technical recommendations.

Since 2006, the EPSF has undertaken the publication of these national technical recommendations for the design and operation of rolling stock on the national rail network. They are the best known and most formalized practices in France. They consist of design specifications related to safety and compatibility with the infrastructure, which have been proven in the preceding period, where a single integrated rail operator existed. These rules constitute a gateway that allows technical solutions, and their performance, to be related to a high level regulatory requirement.

This paper deals only with the recommendations for rolling stock design.

These recommendations are made available to applicants seeking authorizations to operate. When they are considered and applied, they confer a presumption of compliance with the French "safety" order of 2012, which is

a mandatory regulation containing high-level requirements. Since 1996, the EU directives on interoperability have led to the composition of technical specifications for interoperability which are common to all Member States. These regulations therefore include certain European regulations for the design of rolling stock. These two frameworks - national and European - now coexist and are referenced in the allocation of authorizations to operate. The question is how to manage national know-how in a manner which is compatible with European regulations. The ultimate goal at the European level is clear - to limit the number of national regulations, or ideally, to dispense with these completely in favour of harmonised EU regulations. It is in this context that technical, cultural and psychological changes take place for all industry players, whether designers, operators or suppliers. Despite the differences of opinion according to the interests of the industry or the railway company, there is a common desire to achieve the ultimate objective and all players wish to arrive at the highest level of safety possible, as handed down by the historic railway company.

I. NATIONAL REGULATIONS : ORIGIN AND CONTENT

a. Origin of national technical regulations

These design regulations were intended to regularise the design of rolling stock at a time when several regional companies shared the geographical rail network in France. They were intended to facilitate interoperability across different regions and to set common goals, almost a century before the advent of European interoperability.

Originally, they constituted SNCF's technical purchasing specifications. Their aim was to define standardized requirements in the design of railway vehicles. They were also used as a reference document for the SNCF which, through a specific department (the forerunner of the EPSF), authorized equipment to operate on the RFN (French National Railway).

Quickly, interoperability began to cross borders with the measures taken by the UIC, which helped usher in intensive technical cooperation and a development of the already advanced harmonization between integrated companies in the various countries concerned.

These rules are mainly known in France as SAMs (Spécifications d'Admission du Matériel). All rail contracts have routinely referenced these documents over the past 20 years. They are used daily by railway manufacturers and operators as essential elements of the French regulatory process. It is important to clarify this context and the intimate relationship rail companies have with these documents. Their preparation is sometimes the result of concerted efforts between the railway companies and manufacturers. For this reason, they have a deep attachment to these specifications.

Following the publication of the first set of European texts on interoperability and safety, these regulations were subsequently included in French national regulations, in the 2000s, by way of a "first generation" order. The technical appendix to this order, twenty pages or so in length, recommends technical solutions to meet regulatory requirements. It was the national technical document of reference, mainly based on UIC specifications and French standards.

SAMs do not cover the entire range of technical considerations in the design of vehicles, and seem to have been created gradually and according to the developing needs of national uniformity. New technical developments following the modernisation of hardware, the need to supplement existing standards, and accidents also led to the creation of certain SAMs. The advent of high speed rail meant that signals had to be displayed electronically to drivers, as high speeds made it impossible for drivers to interpret ground signalling, and this development required the creation of new SAMs. The regulations for installing national safety systems in new equipment (such as speed control) emerged following a number of accidents.

And so, over time, experience and the development of the assessment and acceptance of risk, a relatively safe environment has emerged. Consequently, our accident indicators are among the lowest in Europe (see Figure 1,

an extract from the 2014 ERA safety report). And yet, recent events remind us that nothing is to be taken for granted, that the relevance or effectiveness of a rule can come under scrutiny at any time and what seemed certain at one time may no longer be at a later stage. Vigilance is required and it is essential to ensure that national regulations are met in order to maintain a high level of confidence, as rail accidents are particularly unacceptable to society.

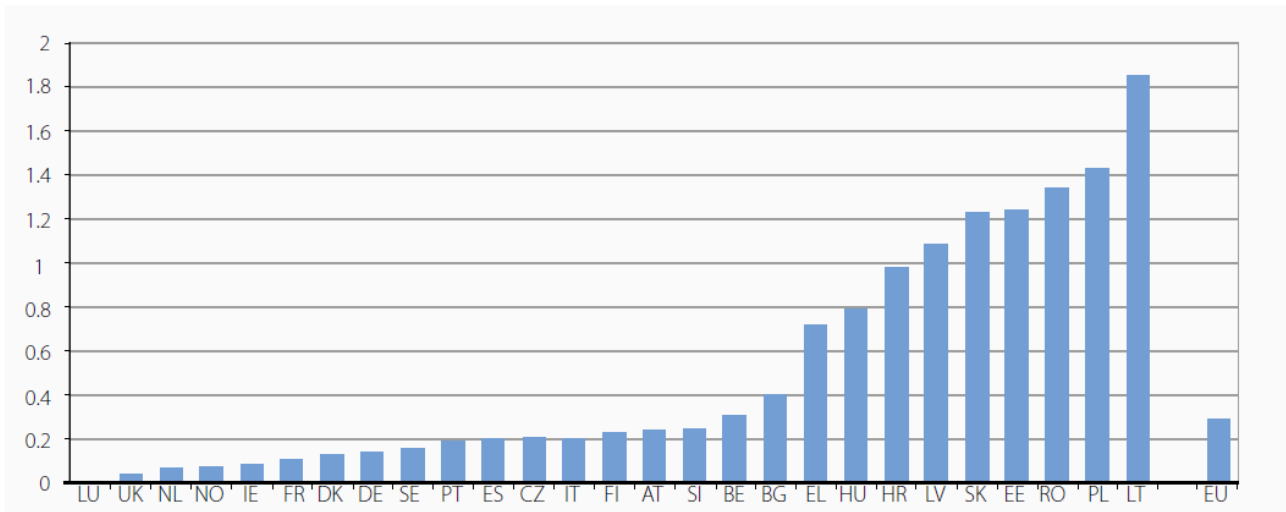


Figure 1: Railway fatalities and weighted serious injuries per million train-km (2007-2012)

b. Content of national regulations

These national technical recommendations are not mandatory and are regarded as good historical practice, ensuring easy access to the network and the maintenance of national standards in terms of safety, reliability and availability of rolling stock. Few ignore them, however – in favour of certainty. These recommendations have, for many years, been wrongly considered to be obligatory.

They are of unequal quality, of varying levels of detail, more or less homogeneous in their format, and sometimes prepared extemporaneously following the occurrence of a disaster.

Importantly, some requirements do not relate to design as such, and concern operations or compatibility with the infrastructure, the vestige of an era before a distinction was made between general infrastructural managers and rail companies, without a national safety authority.

Finally, since the publication of the technical specifications for interoperability by the European Commission and the legal obligation to apply them, national regulations may sometimes seem unnecessary, obsolete or even contradictory with respect to European regulations.

These regulations concern 57 documents.

Topics covered are:

- Coupling
- French signalling systems such as beacon speed control systems (KVB), automatic train-stopping, the brush/crocodile system,
- Braking in general and the different types of brake (electromagnetic, dynamic, immobilising, eddy current)
- Track Machine Transmission (TVM430)
- Safety objectives in braking architecture (i.e. maximum failure level) associated with dangerous situations (catastrophic scenarios in nominal and degraded mode)
- Shunting performance (which relates to the detection of a train on the track)

- Axle boxes
- Fire prevention and firefighting
- Compatibility between signalling systems and rolling stock
- Electromagnetic compatibility
- Safety equipment
- Driver alertness monitoring device
- Alarm signal for passengers
- Tachometry
- Recording of events linked to traffic safety
- Lubrication, sanding
- Certification of results of trials
- Passenger access doors
- Track-to-train radio
- Side winds
- Ballast pick up
- Compatibility between power supply and rolling stock
- Compatibility of rolling stock vis-à-vis signalling and telecommunications
- Technical reference material for wagons
- List of prohibited materials

II. MANAGING CHANGE

a. Opportunities and difficulties entailed in fundamental change

A change to the industry framework is in order. Which regulations should be kept, and which should be discarded from the set of French reference documents?

France began to develop its railways around the same time as its immediate neighbours, such as Switzerland, Belgium, Germany and the United Kingdom. The first rail cars pulled by horses appeared in 1823 and electric traction around 1900. All countries that adopted this means of transportation established at the same time the principles of rail safety which gave rise to a range of rules of all kinds.

Given the importance of these regulations in French railway culture, it seems as though we are dealing with a monument in the national heritage, a dogma, anchored deeply in the approach of all rail companies which have been operating on the French national rail network. An unprecedented opportunity to reconfigure this heritage in terms of safety is before us today, as a showcase of French expertise.

The publication in France of a new Safety order in 2012 (order of 19 March 2012), which repeals the preceding order and does not include the technical appendix specifying French design regulations has shaken the sector's practices considerably. The EPSF now has the task of preparing and adapting these regulations, and publishing them as "acceptable means of compliance", a principle notably adopted in aviation.

The documents cited in the previous paragraph are therefore considered acceptable means of compliance, but on condition that they are associated with French regulatory requirements. The following is an example from the order which requires that:

"r) Rolling stock is designed and manufactured in order to be electromagnetically compatible with the devices, equipment and public or private networks with which they may interfere"

A recommended means to meet this requirement is presented in SAM S006, Electromagnetic Compatibility.

This means that the adoption of SAMs by the industry affords presumption of compliance with French regulations. However, technical alternatives are admissible provided that it is demonstrated that functional requirements and associated performance standards are met.

Recourse to such alternatives in equipment operating on the national rail network is actually quite rare, the sector preferring to adhere to recommendations in order to facilitate applications for authorizations to operate. If this were not the case, safety demonstrations would be required to demonstrate equivalence of performance. This would lead to an extension of the planning permission and inevitably to an increase in costs associated with the project, with no guarantee of success for alternative solutions.

The freedom enjoyed by Member States to maintain its national regulations are set by European interoperability regulations.

A Member State may not give precedence to a national rule under certain conditions.

This is the trigger for the general revision of traditional national regulations. It is no longer possible to retain two standards (national and European) which, due to common subject matter, are sometimes redundant, sometimes conflicting, sometimes more demanding nationally, while a Member State may, in a given area, legislate only for European interoperability specifications.

As for equipment that is already authorized to operate in another Member State and which operators wish to enter into operation in France, if such equipment is found to comply with the technical specifications for interoperability in another Member State and it operates there, any additional national requirements of the new host country must be duly justified so as not to impede free movement.

b. Strategy adopted for the optimization of national regulations

The task here is to define the principles for the retention or otherwise of national regulations according to the nature of the documents to hand.

The limits set by European legislation in this field are now clear. A national rule can exist only if the technical specifications for interoperability so authorize.

Four such scenarios are:

- A technical issue remains unresolved in a technical specification for interoperability: a standardised solution could not be found during the establishment of European regulations. In the meantime, the Member State may offer its own solution.
- A technical issue covering a special case in a technical specification for interoperability: a member state is authorized to apply a different solution to that required by European specifications due to the specificities of its existing rail system. An adaptation of rolling stock to these particularities is essential. This mainly concerns interfaces with infrastructure such as overhead lines, detection of hot boxes, line circuits.
- A technical area is considered a “Legacy System” if it concerns an interface with existing national signalling systems on the ground, before the ERTMS substitutes such systems in the future. Mention may be made in France of well-known cases such as beacon speed control (KVB), Track to train transmission (TVM) and intermittent signal repetition (RPS).
- Other considerations, which are not dealt with in the first three points, which allow Member States to adopt national regulations but only where these do not conflict with interoperability regulations. An example is the reaction time of the driver vigilance detection system in the cab (the driver must establish that they are present during operation by periodically operating a device; otherwise the train stops using its emergency brake).

The substitution of French regulations by EU regulations is obligatory for regulations which do not meet the four points above.

To summarize, the thrust of the guidelines is:

- A classification of national regulations according to the four categories above
- The identification of regulations considered acceptable means of compliance
- Analysing the risk taken by deviating from certain national regulations

The resulting regulations are then analysed in detail in order that only specific French requirements with respect to the following are retained:

- Regulatory requirements
- Functions
- Design
- Existing configurations
- Settings
- Expected performance
- Safety, reliability and maintenance performance
- Demonstration of compliance with corresponding national recommendations

It is important to note that the evaluation of the compliance of equipment is conducted by independent bodies which must submit reports which the applicant must then forward to the National Safety Authority (in France, the EPSF) as part of its request for authorization.

The evaluation of compliance with technical specifications of interoperability is conducted by NoBos (Notified Bodies).

The evaluation of compliance with national regulations is conducted by DeBos (Designated Bodies).

The set of points to be evaluated by each party should be clearly identified to avoid needless evaluations.

Existing national recommendations which are not accepted because they do not meet the above criteria are handled on a case by case basis. The objective is to identify the risk taken if these national recommendations are abandoned to the extent that they result from French feedback on technical solutions.

Once these principles have been acquired, they must be communicated to the sector. Industry associations are essential as contributors to the updating and optimization of the French national regulations.

The following working groups have been established for each of the 57 documents:

- The rail industry, through the Railway Industry Association, to which 260 member companies belong, including suppliers such as Faiveley, Knorr Bremse and integrators such as Alstom Transport, Bombardier, Siemens
- Manufacturers from other European countries
- The Qualified and Notified Organizations, which serve the function the function of DeBos (Designated Bodies) in France, responsible for the independent technical assessment on compliance with the technical specifications for interoperability and national regulations
- Railway operators such as the SNCF, TP Ferro and RATP
- The SNCF engineering centre, which developed the set of national regulations before they were assigned to the EPSF and which, better than anyone, understands the history of the technical requirements, the rationale behind the French specificities and the rationale behind each requirement.
- All other relevant stakeholders concerned with authorizations to operate on the national rail network (railway companies from other European countries, for example wishing to operate in France).
- Réseau Ferré de France, the infrastructure manager, which is also affected by some national regulations that relate to the operation and the infrastructure itself.

The management of changes develops through exchanges at various levels, either with engineers and technicians, specialists and experts in technical fields, between different National Rail Safety Authorities, through various committees charged with assessing proposed European specifications. France, as a result of measures taken by the EPSF, works to include the best French practices within European regulations.

The management of changes, once the process of updating is defined and mature, also involves explaining to all partners and stakeholders presented earlier what it will mean to transfer EU regulations into French regulations, to work with them daily through exchanges at themed conferences, working groups and even the projected EPSF "hot line" in order to meet the range of demands.

Change management requires having an idea of the future for the following reasons:

- Growing concern in the face of new standards that require that industry actors adapt and reposition themselves within the industrial market
- There is a need for the national safety authority to give confidence to players in managing change, as this body ultimately decides whether companies may operate on the network. The new regulations must be clear and unambiguous.

As with any change, adopting new regulations (rather than recommendations, because European specifications are mandatory), and dispensing with those which, for over 20 years ensured a certain acceptance in terms of safety, which often constituted a French cultural exception, represented expertise, an enormous time input, and collaboration between stakeholders at all levels must inevitably lead to reluctance, and even resistance.

Change must take place with serenity and confidence. All this concerns regulations that facilitate interoperability while maintaining the existing level of safety. Safety is a sensitive topic. When accidents happen, as we saw in recent events, the causes must be identified and responsibility determined. The echo resounds in all spheres, be they social, technical, legal or political.

The change must not show weaknesses or discrepancies and must take account of feedback. The lessons of the past must be formalized and national regulations may be a means of sustaining knowledge. In any case, change, must be used to ensure that the current level of safety is maintained (what is known as "GALE" with respect to a standard - Globally At Least Equivalent) and even improved.

Maintaining the level of safety is a recurrent point in this program. Is this a reality, an impression, or a normal reaction to the loss of a set of standards? The process adopted and described here allows a partial response and also justifies some of the reluctance encountered in the adoption of new regulations and the gradual abandonment of practices known and mastered. Figure 2 illustrates the safety indicator in France over several years, published by the EPSF. It provides a reference for identifying an improvement or decline in safety levels.

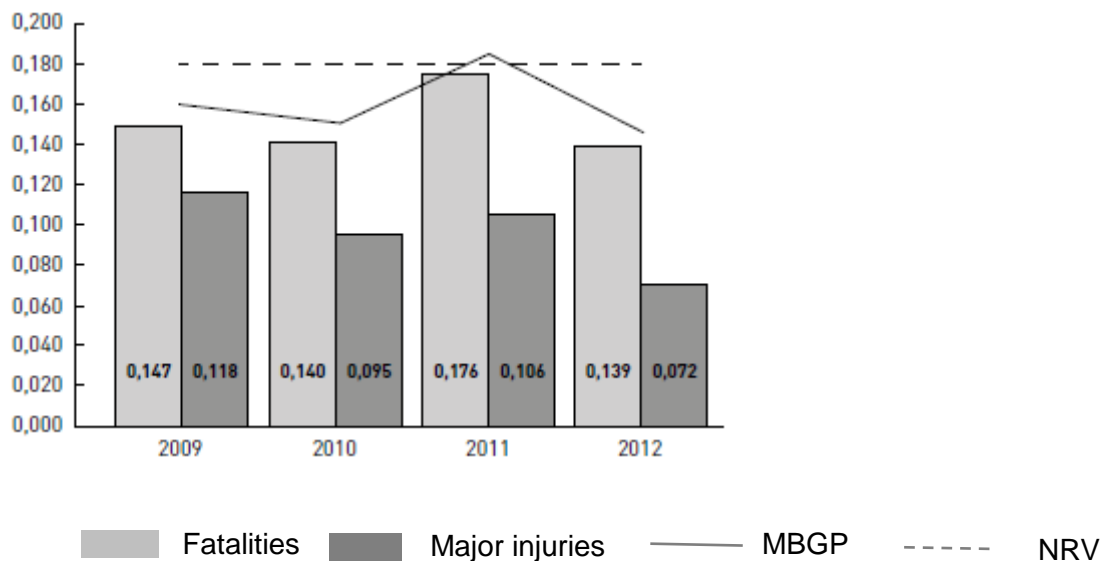


Figure 2 – Relative numbers of people killed and seriously injured per million train-km (MBGP is Pounded Fatalities Major Injured, NRV is the National Reference Value)

An NSA should be prepared, have a long-term vision, be confident and convincing in communicating with the sector and, importantly, be at its disposal to answer questions, which is a quite natural process in the midst of any kind of change.

Doubts do remain, however - it would be presumptuous to say that the situation is completely clear with respect to the process described above for the following reasons:

- The EU regulations are sometimes subject to interpretation, allowing a certain direction of change to be chosen rather than another, according to opinion.
- The development of European regulations is long and complex, with webs of influence which are often more cultural than factual.
- Some grey areas are sometimes puzzling, even the NSA in confusion.

c. The different families of document to revise

A look at the various types of document gives the following results:

Family of texts relating to 4 authorized scenarios	Type
"Legacy system" or heritage (safety)	KVB, TVM, RPS, DAAT, Capture, CEM-Telecom, shunting, DBC, CDV recorder, track-train radio
Open point / specific case	FCF lubrication, sandblasting, crosswinds, ballast pick up, CEM, catenary interface
Member State issue	Driver alertness monitor

Table 1 – Families of authorized national recommendations

Family of texts not relating to 4 authorized scenarios	
Requirements not identified by TSIs or the European Regulations, absence of norm	Recognition of trial results, fire prevention and firefighting
Standards discrepancy	Fire prevention and firefighting
Operation	Emergency device, single-operator operation, speed calculations, acceleration, etc.
Infrastructure – non-safety	Power limitation, power factor, etc.
Other:	Braking, passenger access, tachometer, Catastrophic safety event, brake, brake demonstration file

Table 2 - Families of residual national recommendations

We have a first family of about half the volume of the French corpus (26 texts out of 57) which relates to the first 4 scenarios and which a member state is authorized to retain (a legacy system, open point, specific case and freedom left to the Member State). These recommendations are or will therefore be retained and revised to form the new technical benchmark for the design of rolling stock. These recommendations are supplementary to the European technical regulations.

Then in the second table, the texts (about 31) which do not relate to the 4 scenarios authorized. These are the residual recommendations, which are not supposed to appear in the national technical standards.

These include the design regulations of the braking system, a veritable backbone in terms of safety assurance in the field of rail transport, but also regulations identified as related to operation, compatibility with electric power, between the rolling stock and the infrastructure.

One of these rules relate to points not mentioned in European regulations (how to establish if a test result is acceptable in conjunction with the ISO9001 concept of quality assurance for example, or certification by the national certifying body). A rule covers a discrepancy identified in the European EN 45545 fire safety standard (until it is updated and passed).

It therefore appears that, for historical reasons, some documents are a legacy of the period when the traditional integrated company was in control of infrastructure management and the operation of the equipment. With the creation of the RFF, the French GI, the transfer of some texts from the EPSF to the infrastructure manager is thus legitimate (return to the source).

III. CONSEQUENCES

a. The future of residual regulations

It is simply not possible, overnight, to dispense with the recommendations from table 2 that do not correspond to specific cases or to an open point identified in European regulations.

There are national technical recommendations whose content is also included in whole or in part in the European regulations or European technical standards (due to the involvement of representatives from the French sector in standardization work and work in Europe). These now replace the UIC standards, which were, before European harmonization, the main reference for international traffic under the RIC Convention (Regolamento Internazionale Veicoli) as well as the French standards.

French standards and UIC norms were, until March 2012, the primary vehicle design standards. Since the implementation of the new order in March 2012, the effort to review national recommendations also involves adopting European standards in place of the French and UIC standards.

These residual technical recommendations may not only be redundant in light of technical interoperability specifications, but may even contradict, or diverge from, European regulations, (changes in calculation assumptions, for example).

In conclusion, the residual recommendations from table 2 are no longer updated by the EPSF and are maintained in their current state, remaining applicable for equipment already authorized or currently seeking authorization to operate. They are no longer applicable to new contracts. It is important to note that the European technical specifications for interoperability or updates to French regulations do not affect existing equipment. There is to be no retroactive effect.

Other residual recommendations are set by the infrastructure manager Réseau Ferré de France (RFF) as operating rules or in relation to infrastructure, as, on analysis, they were found to be of a different nature.

The EPSF also monitors norms through the railway standardization commission: indeed European standards are a recycling of French know-how, even if this cannot be retained as a national recommendation. This approach also has the advantage of giving feedback a long-term effect, by giving it a European dimension.

Recommendations not recognized as acceptable means of compliance are sometimes reclassified as technical guidelines without a direct relationship to French regulations, while maintaining their coherence.

b. Consequences of the programme outside France

The revision of national regulations not only impacts operation on the national rail network, but also neighbouring countries such as Belgium, Spain, Italy, Germany and Switzerland, for example.

Authorization applications also come from outside for equipment operating abroad and needing to operate in France.

Agreements between countries for the mutual recognition of the authorization of vehicles exist. These agreements list regulations of hardware design for each country. These regulations are then compared and classified as equivalent or not in terms of safety objectives. Where regulations are deemed equivalent, the process of vehicle authorization on these points is facilitated. The revision of the corpus of French regulations, involving changes to regulations and the removal of others, therefore simplifies these agreements and will therefore progressively facilitate the task of foreign applicants seeking authorizations to operate.

CONCLUSION

The review programme of French national regulations by the EPSF, initiated in 2012, with respect to the technical specifications for interoperability continues to this day. The consultations, meetings, working groups, liaisons with the sector, will continue until all documents have been reviewed.

These are now consistent with the interoperability specifications and European standards that are referenced. Successive developments in European technical regulations and European standards require constant monitoring by the EPSF vis-à-vis the French national recommendations and Acceptable Means of Compliance.

Beyond the technical aspects, legal aspects are also taken into account to define the scope of "acceptable means of compliance" and other recommendations issued by the EPSF.

Step-by-step, the new regulations are published by the EPSF and constitute the new national reference used by all applicants for authorization to operate on the national rail network.

The management of change is conducted by the EPSF on behalf of all stakeholders. The centre of attention of the programme remains the maintenance of the safety level through the retention of lessons learned from the past and the assurance of national and European consistency in every implementation of the programme's objectives.

Change and its consequences is a delicate exercise that must enjoy consensus at all levels (social, economic, legal, political) and, through communication and ongoing exchanges, achieve an overall acceptance as to what the future corpus will look like.

NOTATION:

• CDV:	Track circuit	<i>Circuit de voie</i>
• CEM:	Electromagnetic compatibility	<i>Compatibilité ElectroMagnétique</i>
• COFRAC:	French Accreditation Committee	<i>Comité FRançais d'ACcréditation</i>
• DAAT:	Automatic train shutdown	<i>Dispositif d'Arrêt Automatique de Train</i>
• DBC:	Hot box detection	<i>Détecteur de boîte chaude</i>
• EPSF:	French National Rail Safety Authority	<i>Établissement Public de Sécurité Ferroviaire</i>
• ERS:	Catastrophic safety event	<i>Evènement Redouté de Sécurité</i>
• ERTMS:	European Railway Traffic Management System	
• FCF:	Eddy current brake	<i>Frein à courants de Foucault</i>
• FIF:	Rail Industries Federation	<i>Fédération des Industries Ferroviaires</i>
• KVB:	Speed control by balise	<i>Contrôle de vitesse par balises</i>
• NSA:	National Safety Authority	<i>Autorité Nationale de Sécurité</i>
• OTIF:	Intergovernmental Organization for International Carriage by Rail	<i>Organisation Intergouvernementale Pour Les Transports Internationaux Ferroviaires</i>
• RFF:	French Rail Network	<i>Réseau Ferré de France</i>
• RIC:	International vehicle regulations	<i>Regolamento Internazionale Veicoli</i>
• RPS:	Intermittent signal repetition	<i>Répétition Ponctuelle des Signaux</i>
• STI:	Technical Specification for Interoperability	<i>Spécification Technique d'Interopérabilité</i>
• TVM:	Track to train transmission	<i>Transmission Voie-Machine</i>

Source documents:

- Order of 19 March 2012 setting out the objectives, methods, indicators of safety and technical safety and interoperability regulations applicable on the national rail network
- Technical Specification for Interoperability - conventional and high speed rail
- Technical Specification for Interoperability - energy
- Technical Specification for Interoperability - control command and signalling
- EPSF: Annual Report on the safety of rail traffic in 2012
- ERA: Railway safety performance in the European Union - 2014