

Regulations for High-speed Maglev System

No. 127

Ullrich Kinski

Federal Ministry of Transport, Building and Urban Affairs, Germany

ullrich.kinski@bmvbs.bund.de

ABSTRACT: The realisation, approval and operation of transport systems are based on generally accepted rules of technology. Unlike a conventional wheel-on-rail system for which numerous national and international standards have been developed, there were still no self-contained body of rules for Maglev yet.

The German Federal Ministry of Transport, Building and Urban Affairs therefore initiated the development of engineering rules for Maglev by forming a technical committee in cooperation with other technical experts and renowned specialists in order to promote the application of Maglev. The technical committees functioned under the leadership of the German Federal Railway Authority. Based on national and international regulations for conventional railway systems and under consideration of specific experiences from the development and testing of the Maglev technology, the technical and operational requirements for a Maglev system were determined and incorporated into a comprehensive set of regulations in general terms and independent from a specific application.

On the 23rd of October 2007 the “Design Principles High-Speed Maglev System” were published as regulations for Maglev by the Federal Railway Authority. Thereby these constitute a basis for planning, approval and operation of Maglev projects and are also suitable for international use.

INTERNATIONAL PROGRAMS FOR THE DEVELOPMENT OF MAGLEV TECHNOLOGY

Since 1972 the Federal Republic of Germany supports the development of Maglev technology, which has been tested and demonstrated on the Test Facility Emsland (TVE) since 1984. The original objective was to establish a new high speed transportation system to allow a fast long-distance passenger and containerized freight transport with a speed up to 500 km/h.

After successful testing of the developed sub-systems vehicle, guideway, propulsion system, operation control system and the complete system the Transrapid Maglev System was declared ready, without restriction, for revenue service in application projects in 1991. Between 1992 and 1996 the specific system components were improved distinctly by means of an optimization program. With the completion of the type approval program in 2000 and comprehensive safety tests by the Federal Railway Authority an efficient new technology for high-speed railway system became available for application in Germany as well as for export.

Analysis carried out in 2001/2002 showed that besides long distance super speed transportation other fields of application are also conceivable. Results showed that all high performance and high quality point-to-point connections (e.g. airport connections and fast regional transport) appear as interesting application area. In 2002 the Federal Republic of Germany assigned an Advanced Development Program [1] with the objective to suit the Maglev technology to requirements of regional transport and update the Maglev technology.

The result of the Advanced Development Program, which will be completed in 2009, will be a Maglev System, that is technically and economically optimized and applicable for regional as well as for long-distance transport.

LEGAL FRAMEWORK FOR COMMERCIAL USE OF MAGLEV TECHNOLOGY

For commercial utilization of magnetic levitation technique for transportation of passengers and goods a comprehensive legal and regulatory framework was established by the Federal Republic of Germany in the nineties. This framework includes the General Maglev System Act (AMbG)

and the Maglev System Planning Act (MBPIG) as well as the Maglev System Construction and Operation Regulations (MbBO) [2].

While AMbG and MBPIG regulate general allegiances of Maglev operators, the procedure of planning approval process and the broad function of the Federal Railway Authority as inspection authority, authorizing agency and planning approval authority, the MbBO establishes the safety-related requirements, which have to be complied for construction and operation of Maglev systems. The MbBO addresses to Maglev operating companies and the inspection authority, which controls and monitors the compliance during the certification process and commercial operation.

The general structure of MbBO conforms to the German Railway Construction and Operation Regulation, which experiences in railway operations for decades have been expanded into. The high safety standard, that predominates the approved German railway systems is ensured by a strict official certification and inspection process, and is thus also valid for Maglev systems.

The MbBO includes comprehensive and precise regulations for construction and operation of Maglev systems concerning operational facilities, vehicles, revenue operation and staff. According to § 3 Art. 1 of MbBO safety is guaranteed either by the consideration of these regulations or, if some areas are not specified, by general state-of-the-art regulations.

3 IMPLEMENTATION OF STATE-OF-THE-ART REGULATIONS

State-of-the-art regulations are (by prevailing case law):

- science-based,
 - practically proven and tested
 - sufficiently approved
- rules accepted by the majority of experts solving technical tasks.

Technical and operational data and characteristics have already been comprehensively specified in a project-independent manufacturer documentation for Maglev systems. However, these did not form an exhaustive regulation and were not sufficient for the approval in sense of MbBO, because basic elements of aforementioned technical rules were missing. For legally compliant approval procedures according to

MbBO explicit and compared to railways similar requirements and test norms for all applicants were needed.

As part of the Advanced Development Program assigned in 2002 the Federal Republic of Germany therefore initiated a process to develop the technical standards and to create accepted technical rules for Maglev systems according to the aforementioned definition.

With the beginning of 2004 different committees for several sub-systems and a technical committee “General Maglev System” have been under the leadership of the Federal Railway Authority. The technical committee consisted of acknowledged experts from system industries, railway companies, safety assessment experts and authorizing agencies to contribute their different perceptions and experiences. The task assigned to the technical committees was to compile project-independent state-of-the-art regulations for Maglev systems and each sub-system according to the preparation of engineering standards.

In April 2006 the standards developed and approved by the technical committees were published as a preliminary version to give an opportunity for discussion to the public. After a period of three month, several objections and comments were discussed by the technical committees and - if justified - were adopted in the final version. Each objector was given the opportunity of oral explanation.

After completion of the notification process within the European Union the German Federal Railway Authority was able to publish the state-of-the-art regulations of the Maglev system on October 23rd 2007.

At the same time the Federal Railway Authority declared to adopt the documentation as state-of-the-art regulations according to § 3 Art. 1 of MbBO [3].

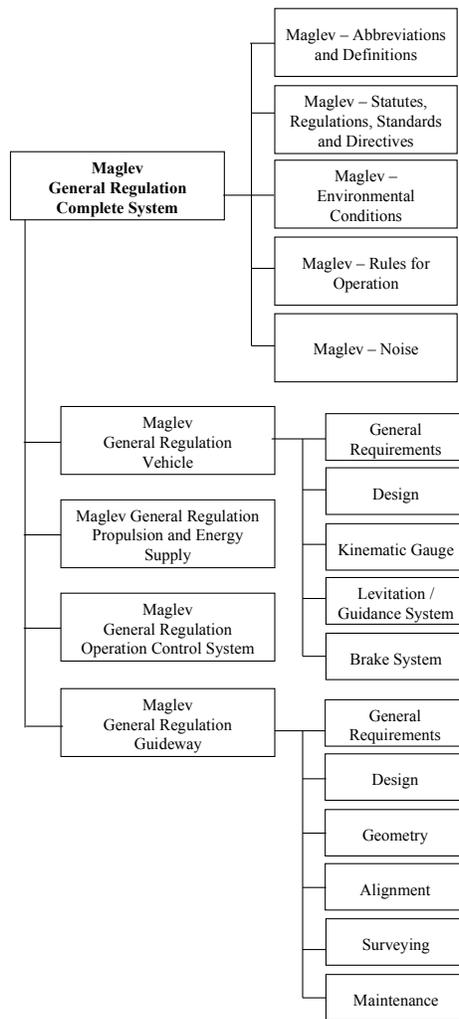


Figure 1. Structure of state-of-the-art regulations of Maglev systems

4 OUTLOOK

Since the mid nineties the technical development of the Maglev system has been accompanied by the establishment of a regulatory and legal framework, that constitutes the general requirements for construction and operation of a commercial Maglev application.

With the state-of-the-art regulations the technical and operational requirements for a Maglev system are now substantiated independent from a specific project. The concretion was carried out in a

transparent process and with participation of experts from authorities, industries and the scientific community. Since the publication by the Federal Railway Authority on October 23rd 2007, the state-of-the-art regulations constitute the basis for design, planning, realization and operation of a Maglev Project.

These regulations can also be taken as a qualified basis for an international Maglev application.

5 REFERENCES

- [1] Nissen, G.: Current Status of Maglev Development Program: MAGLEV'2006, p. 45
- [2] Kraft, W., Rebentisch, M.: Approval for Maglev Projects in Germany: MAGLEV'2006, p. 148
- [3] Eisenbahn-Bundesamt: Bekanntmachung der Ausführungsgrundlagen Magnetschwebbahn vom 23.10.2007; VkB1. 2007, S. 692

6 LINK

Link to "Design Principles High-Speed Maglev System":
http://ec.europa.eu/enterprise/tris/pisa/app/search/index.cfm?fuseaction=pisa_notif_overview&iYear=2007&inum=384&sNLang=DE&lang=en