



MAX BÖGL

Progress is built on ideas.

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TR Guideway Girders

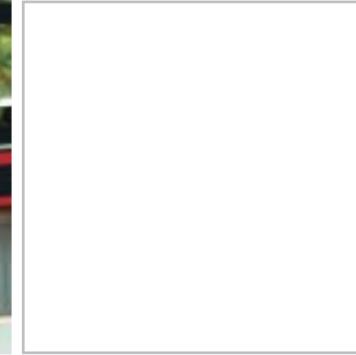
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Dieter Klinger,
Supervisory Board, Max Bögl



Preface

The Transrapid: Today's modern transportation that anticipates many mobility requirements of the future. Superior economic performance is the benchmark for developing prestige and working lines and thus Max Bögl is able to identify with the Transrapid in many respects. Serving as general contractor, the Max Bögl Group has contributed in an exemplary manner to the economics and dependability of the Transrapid through its original design of the magnetic levitation (maglev) railway. The basis for this success stems from company know-how in the field of steel construction and bridge building plus decades of experience in manufacturing superior quality prefabricated concrete modules.

Using the so-called "Hybrid Modular Construction" method, prefabricated girders were developed for the first commer-

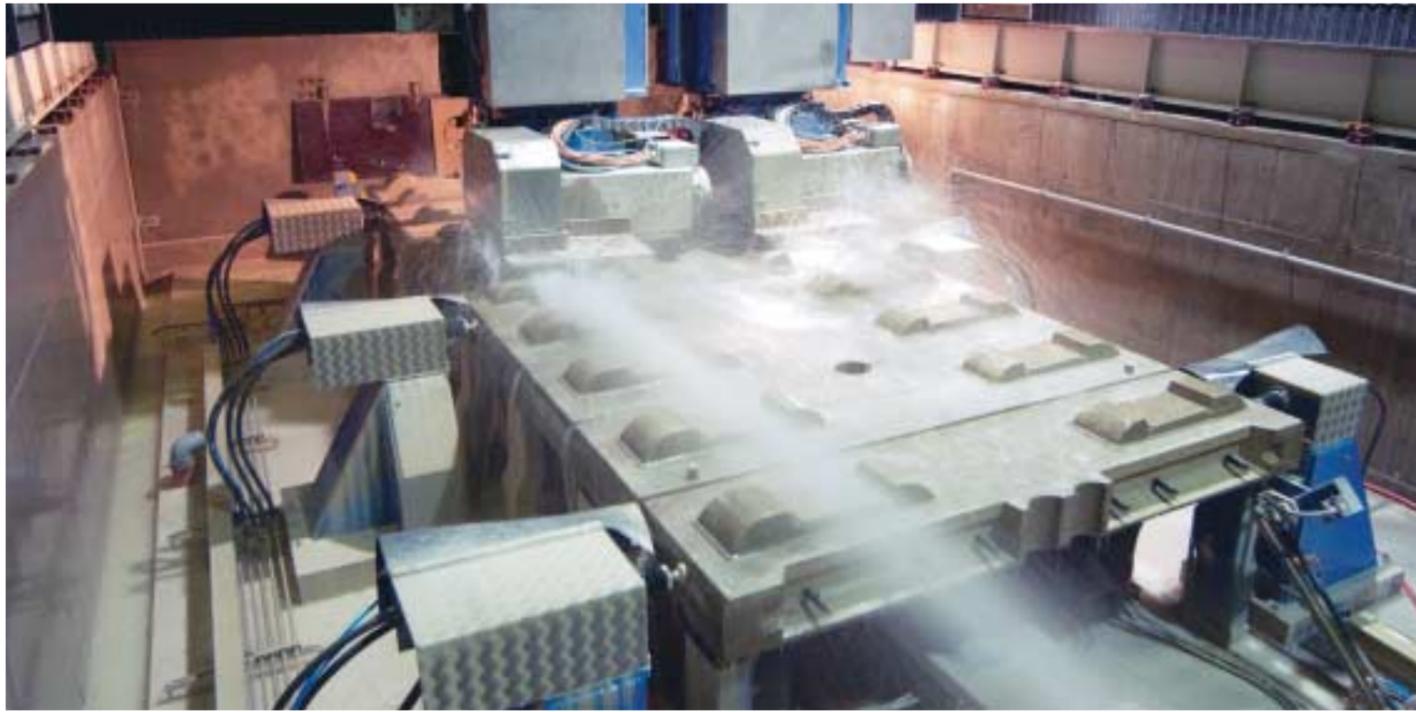
cially planned line in Germany between Berlin and Hamburg. This procedure combines the advantages of pre-stressed concrete with those of steel construction. The first international line to be used commercially was built in China (Shanghai) using a modified and further developed version of this construction method.

Direct experience gained from the China project and the ICE Nuremberg–Ingolstadt high speed line plus Company development of innovative construction methods and use of new concrete recipes and building materials has provided the groundwork for becoming a market leader while ensuring a secure future for Max Bögl. All these company developments have culminated in improved guideways, both from an economical and qualitative perspective. Moreover, new challenges are constantly on the

horizon, ranging from revised specifications of the systems industry, for example, to the demands posed by the needs of new and potential operators.

A whole new generation of guideway girders has been developed in this manner since 2003 – impressively demonstrating the capabilities of Max Bögl Group with respect to guideway technology in the area of high speed applications.

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Grinding of the rail geometry into the rail support points of the slab track system Bögl



Headquarter of the Max Bögl Group near Neumarkt – one of six prefabrication plants of the group in Germany



Slab track system Bögl at the ICE-high-speed-line Nuremberg–Ingolstadt

Our Core Capabilities

Decades of experience are invested in the guideways which were gained from the spectrum of intensive in-depth processing of company-owned construction management. This represents a "One Source" solution for our clients, a very special constellation generated by economic and technical synergies resulting from girder planning, technical measurements and surveying, manufacturing, warehousing, shipping and assembly. And the inclusion of roadbed substructures, foundations and customized constructions serves to underscore this uniquely positive constellation.

Our expertise gained from developing large infrastructure projects continually flows into company resources. Thus high-speed line projects such as Cologne–Rhein/Main, or Nuremberg–Ingolstadt, and Beijing–Tianjin all reflect the motto "Building Progress on ideas". Max Bögl Group offers its clients a complete spectrum of services and exclusive know-how based on company-developed software, machine and production technologies, and of course our own specialists and experts. This constellation assures our clients' success. And thus, their satisfaction – which is our primary objective.

Listed below are a few services extracted from our total product package:

- Consulting and Engineering for Basic Development, Route Layouts, Foundation Work, Road Beds and Guideway Construction
- Education and Training
- Construction Management for Guideway Systems Including Ancillary Services
- Planning of Manufacturing Facilities for On-site Construction and Equipping



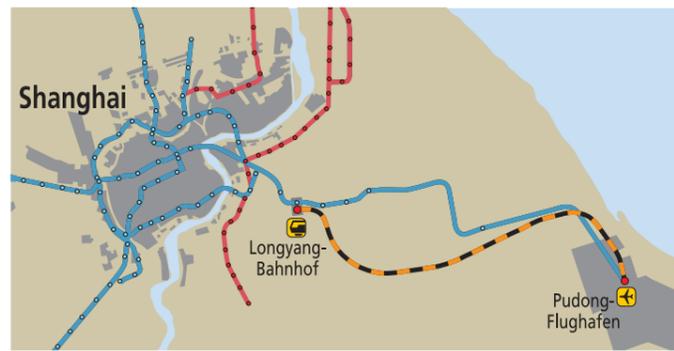
Transport of the girders to the Transrapid experimental location Emsland (TVE)



Photo: Transrapid International

Transrapid Shanghai

The First Commercially Used Line Worldwide



In its search for track-bound high speed transportation, the Chinese Government selected Germany's magnetic levitation (maglev) technology in the summer of 2000 – the Transrapid.

A suitable location for the first demonstration line was quickly selected as well: the connection between the new international Shanghai Airport with Pudong business centre. The Shanghai Maglev Transportation Company (SMT) was founded for the purpose of developing this line.

This company was also responsible for building guideways. Since China had no experience in laying out and building such lines at that time, Commander Wu engaged the Max Bögl Group to come to Shanghai as consultants for planning, producing, equipping and assembling guideways. Our hybrid girder that was successfully tested in the TVE served as the basis for this guideway.



System Start-up

This ambitious goal was finally attained on 31 December 2002. At a projected speed of 430 km/h, the first trial run was completed on one of the twin tracks. Many additional tests have been conducted since. The completed system started commercial operations at the beginning of 2004.

The decisive factor for success in China was the extreme precision achieved in building the guideway. The Max Bögl girder concept successfully stood the test with flying colours in its first commercial run consisting of 10 minute intervals with oncoming traffic and up to eight vehicle units. It is the only system worldwide that is serially manufactured, and it has been tested up to speeds over 500 km/h under all operating conditions.

Continuing Development and Perspectives



New Materials and Production Methods

Self compacting concrete permits manufacturing products with homogenous structures and dense surfaces.

Furthermore, the use of steel fibre concrete is also being tested to further optimise material performance under dynamic loads.

Four prototype girders are being tested in the south loop area of the Emsland Transrapid experimental location (TVE) in a test series that began July 2005. Analysis of test results to date indicate that a girder in concrete modular construction has been developed by the Company Group that is distinctly future oriented, both technically and economically.



Ground-level guideway developed by Max Bögl

Optimising Girders

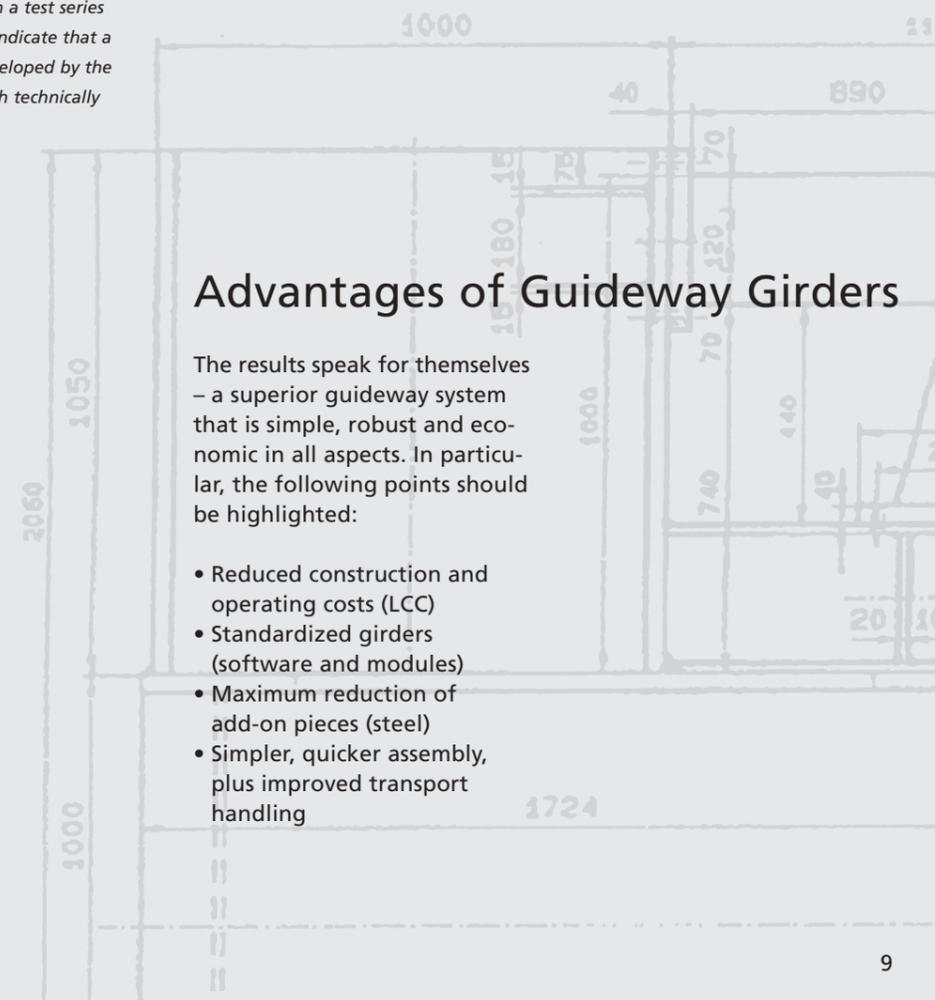
Since their engagement to transfer know-how via the Shanghai-Pudong project, Max Bögl engineers continue work on developing guideways. While optimising the system technically and economically (under the engineering maxim "Keep it simple stupid"), they focus on experience gained in China and in HSR projects. The most important insights stemming from this maxim are: Standardization, One-Field Girders, Precision Manufacturing and Reduction of Share of Steel.

The revised specifications of the systems industry and other demands arising from new lines being planned worldwide (such as the TR 09 combined passenger and freight traffic, for example) provide good reasons for realignment. Innovative materials and production methods are also being tested for use with the magnetic railway.

Advantages of Guideway Girders

The results speak for themselves – a superior guideway system that is simple, robust and economic in all aspects. In particular, the following points should be highlighted:

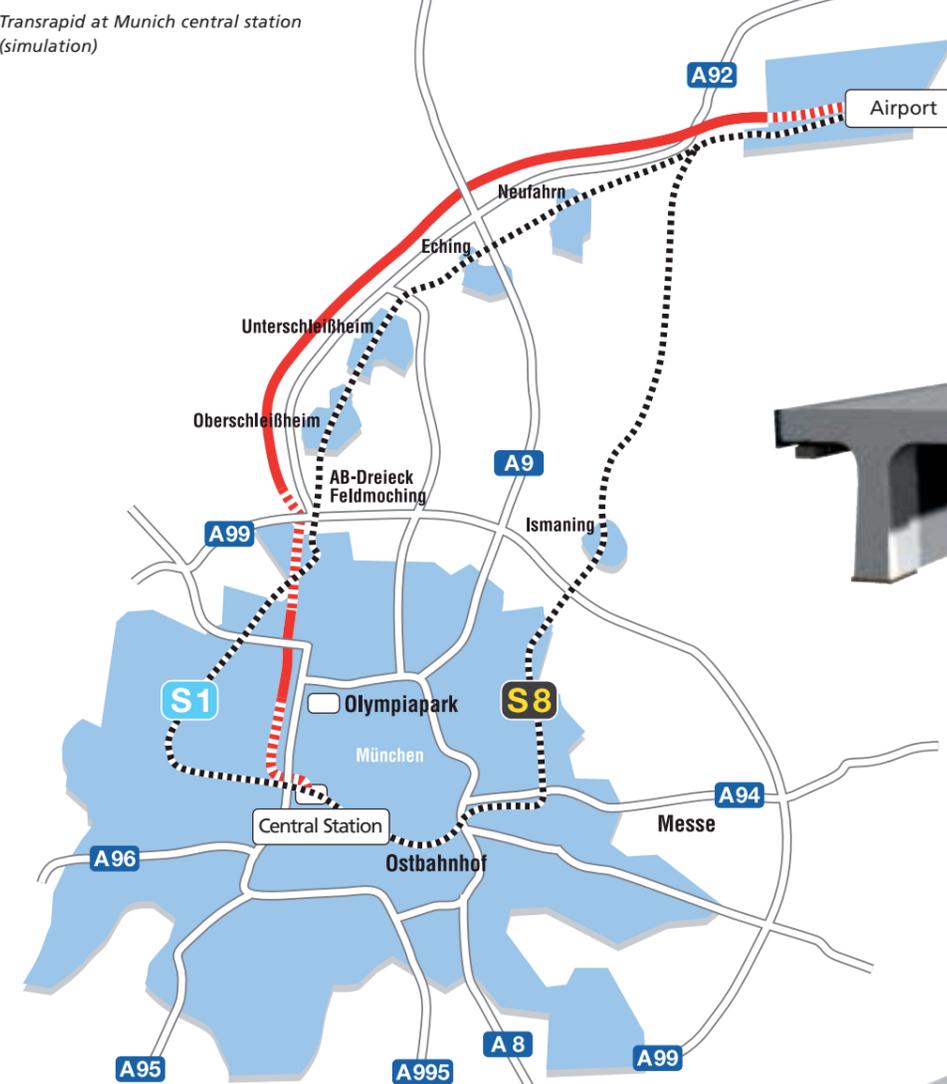
- Reduced construction and operating costs (LCC)
- Standardized girders (software and modules)
- Maximum reduction of add-on pieces (steel)
- Simpler, quicker assembly, plus improved transport handling



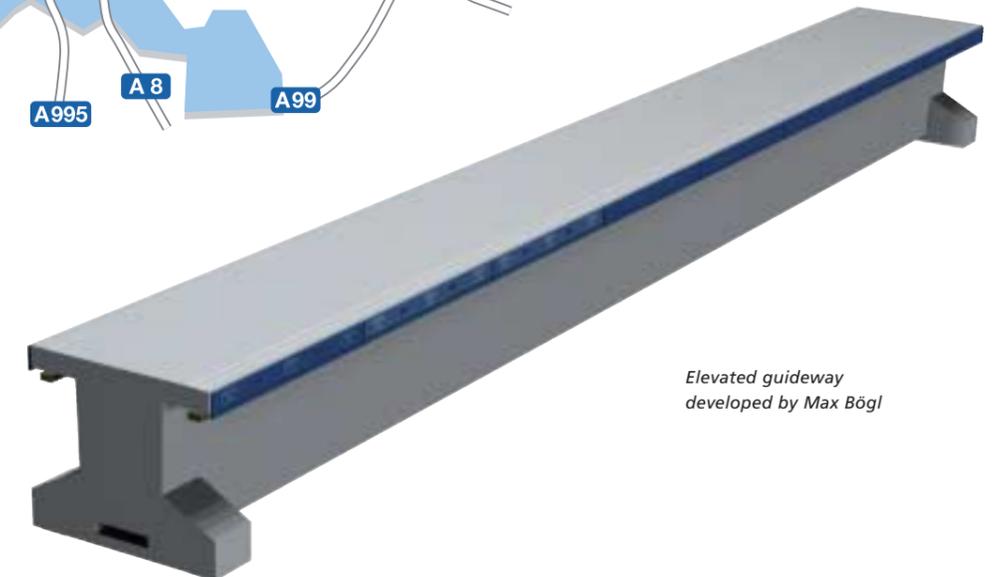


Transrapid at Munich central station (simulation)

Animation: DB Magnetschienen GmbH



Ground-level guideway developed by Max Bögl



Elevated guideway developed by Max Bögl

Munich Transrapid

Filled with confidence for the future and for the Transrapid project in Munich in particular, the Max Bögl Group has designed and constructed a guideway system that can be operated both at ground level and in tunnels. This modified guideway girder can also be installed as a mass-spring system to provide added protection in this regards to vibration/noise.

We also offer a 25 m girder for bridges and intersections, as well as for so-called elevated guideways. A product of continuing research and development, this design employs technology that is essentially identical to the 9.3 m long ground-level girder. When compared to the Shanghai girder however, it also has a hollow case section optimised for noise abatement and production technology. Exact banking up to 12° is possible using various base mountings in connection with precision grinding.

In order to assure operations during snow and ice, a supplementary and practical solution was successfully developed and tested. It is designed for use during so-called winter operations for track grades with slopes exceeding 4 %. In-house R&D is also currently developing concrete switches as part of its total systems approach.

Transrapid worldwide

Max Bögl Group is making an important contribution to the potential development of Transrapid projects worldwide such as those in the USA, China, England and the Gulf States.

