DELIVERING INNOVATION
SLAB TRACK SOLUTIONS FOR UK HIGH SPEED RAIL

WORKING IN PARTNERSHIP
“The precision and quality of Max Bögl’s slab track system coupled with Tarmac’s wealth of expertise in developing and supplying construction materials for complex rail projects offers a fully developed and economic solution for UK high speed rail.

“Our companies share common values with ‘one team’ working integral to our approach with both customers and suppliers. Tarmac is a trusted and reliable partner in many Joint Ventures in the UK with a track record of delivering quality and value, and we look forward to building on this with a successful working relationship with Max Bögl.”

Mark Joel
Managing Director
Building Products
For over two decades Max Bögl have engaged in developing and constructing advanced, maintenance-free and durable ballastless tracks made of prefabricated parts for slab track systems.

The experience we have gained from delivering high-speed rail projects around the world has led to an extensive knowledge and understanding of requirements so that we can now confidently offer a complete range of slab track solutions to cover all modern railway construction.

Bringing our slab track expertise to the UK rail sector in partnership with Tarmac, who can clearly add their wealth of experience in materials supply and production to the partnership, was a natural step to take. We look forward to our already strong relationship growing further in the coming years.”

Johann Holzinger
Member of the Board for Infrastructure
The Joint Venture brings together the technical expertise of a specialist slab track manufacturer as well as the precision and quality of the Max Bögl FFB slab track system which is both tried and tested. Tarmac are the ideal partner for the Joint Venture and will provide the expertise in developing and manufacturing the FFB Slab Track System here in the UK. Tarmac will utilise their strong asset base as well as their business units specialist services for the supply of the various construction materials, the logistics planning and the installation.

Max Bögl’s slab track system is being used on 4,500 km of high speed railways across the world – more than any other competing system – providing comfort, reliability, low lifecycle costs and safety to network operators.

The Joint Venture will draw upon Tarmac’s proven manufacturing capability for the UK rail industry and combine with Max Bögl’s extensive experience of working on high speed projects in Germany, Italy, China and Israel.

Due to its versatility, the Max Bögl Group is able to execute turnkey projects from slab tracks of underground/suburban railways to reconstruction routes to high-speed lines.

INTRODUCTION

The high degree of prefabrication of the slab enables short installation times.

Due to its versatility, the Max Bögl Group is able to execute turnkey projects from slab tracks of underground/suburban railways to reconstruction routes to high-speed lines.
PLANNING

Max Bögl has developed planning software for the FFB Bögl system which generates an installation plan from the track-geometric project containing all relevant data for the slab track. These are the basis for the entire logistics – that is production, stocking, transport and installation – as well as for quality assurance and inspection measurement. Adding to this, Joint Venture also plan special solutions, such as transition areas or construction of prefabricated elements for various types of switches.

INNOVATION

Construction is a unique environment and by definition is a creative industry. The Joint Venture acknowledge that no single project is the same, and that diversity breeds innovation and problem solving at the practical level. Our Joint Venture has ample opportunity to embrace this and continue to innovate and develop unique solutions.

Our Joint Venture intellectual property will centre on practices and processes that occur on site in the form of logistics, health and safety, training and development, people management and planning. This will be taken from past best practice exemplar projects. Slab Track in the UK is a new form of modern construction, and yet the FFB Max Bögl Slab Track system is tried and tested. As such our innovation will also focus on the technical solution and the associated materials and processes that will need to be made as efficient as possible.

MANUFACTURING/ MACHINE TECHNOLOGY

within the Joint Venture both groups of companies have decades of experience in advanced prefabricated construction.

The Joint Venture will plan, build and operate the project specific production facilities as well as the plant and equipment for the assembly.

The Joint Venture will provide the full turn-key solution here in the UK for all high speed rail projects.

QUALITY MANAGEMENT

The Joint Venture will combine Tarmac’s operational expertise with the Max Bögl management system, and will encompass the most efficient methods and best practice from both organisations.
Pre-fabricated pre-stressed slabtrack units are produced using state of the art off-site manufacturing techniques. These techniques have been developed throughout the delivery of previous high speed projects and include efficient and repeatable process steps as follows:

- Cleaning and preparing the formwork
- Installation of the reinforcement and dowels for the rail fasteners
- Prestressing
- Concreting and aftertreating
- Cutting through the prestressing wires
- Lifting and storage of the slabs
- Mechanical processing of the rail support points
- Assembly of the rail fastenings
- Intermediate storage of the final product or delivery “just in time”
TALLINGTON: PRE-CAST MANUFACTURING

The Building Products arm of Tarmac has over 70 years’ experience in the supply of prestressed and reinforced pre-cast products. The Tallington factory in Lincolnshire was established primarily for the manufacture and supply of concrete railway sleepers. In 1943 it was the first factory in the world to successfully produce prestressed concrete sleepers and has been supplying to the UK and on occasions the UK rail infrastructure ever since.

Over the years we have worked closely with the rail authorities in the UK to design, develop and extend our range of products and have also developed the infrastructure necessary to support the demands of supplying to the UK railways.

Tallington has the infrastructure suitable for the manufacture of a wide range of factory engineered pre-cast products.

MANUFACTURING

The Tallington factory is a strategic location for the manufacture of slab track. Located approximately 15 miles north of Peterborough it benefits from excellent road and rail access on the East Coast main line railway. The factory benefits from its own private siding with its current capacity governed by the limit of the external shunt siding at 400yds (366m) which is equivalent to 11 salmon wagons.

A number of schemes have been developed previously in order to increase the capacity of the rail loading siding in order to meet potential project requirements; something which we envisage for HS2.

In addition to the delivery of pre-cast products the rail connection has previously been used for the delivery of incoming raw materials, an activity which could be re-established if required for HS2.

The access to the rail network combined with Tarmac’s relationships with the UK Rail Freight Hauliers represents a significant opportunity for the utilisation of the Tallington sidings infrastructure and it should be noted that there are no restrictions in respect of accepting night shunt services.
PRE-CAST CAPABILITY

In addition to the factory infrastructure the industrial workforce at Tallington has the skills and experience to expertly manufacture high quality prestressed (to tolerances of ±1mm as cast) concrete sleepers on a repeatable basis.

STOCK YARD CAPACITY

The Tallington factory has in excess of 15 acres of concrete hard standing, with additional land holdings accessed within 100 metres of the entrance. All of which will be considered to be a significant benefit to a major pre-cast operation of this type.

It has been conservatively estimated that the concrete hardstanding within the factory would be sufficient to stock one year’s production of slab track units for HS2.
FFB – SLAB TRACK BÖGL
SYSTEM DESCRIPTION

The FFB Bögl system consists of prefabricated, prestressed slab tracks which are coupled in longitudinal direction. This construction method leads to a homogenous trackway with a good long-term behaviour. The system can be used on earth structures, in tunnels and troughs as well as on bridges.

Earth structures are stabilised in such a way that the requirements for tolerable remaining settlements are met with. The earth subgrade is covered with an anti-frost layer for protection against climatic impacts (frost heavings). The slab tracks are placed on a hydraulically bound layer (THB) or alternatively on a reinforced concrete base layer (BTS). In tunnels and troughs, these requirements are already fulfilled without further action. Standard slabs lie on bridges on a gliding, reinforced concrete base layer (BTS) which are anchored with the bridge superstructure in defined spaces (Bögl integral). Alternatively, it is also possible to design individual slabs, which are not prestressed, according to the instructions of the German Railway to install the slab track on bridges.

The THB or BTS base layers provide continuously decreased stiffness and load transfer. At the same time, they are blinding layers and support for the slab tracks. In trough and tunnel structures, the existing blinding concrete replaces the HGT/BTS.

PICTURED ON PAGE 9:
1 FROST PROTECTION LAYER (FSS)
2 HYDRAULICALLY BOUND LAYER (THB), D = 30 CM
3 GROUTING MASS
4 SLAB TRACK
5 DESIGN CRACKING JOINT
6 RAIL SUPPORT POINT
7 OPENING FOR GROUTING MASS
8 GEWI STEEL
9 PRESTRESSED STEEL
10 TURNBUCKLES AND NUTS
11 CONSTRUCTION JOINTS
The slab tracks are installed with a standard spacing of 5 cm. Vertical and horizontal adjustment takes place using spindle devices and a computer-aided surveying system. The vertical gap between slab and base layer is sealed and subsequently fully filled using a specially developed grout. Then the longitudinal coupling process of the slabs follows so that a monolithic, continuous band is created with a high resistance to longitudinal and transverse displacement. The longitudinal coupling counteracts the so-called “whipping effect”, which is a warping of the slab ends due to thermal differences.

A characteristic feature of the slab tracks are the predetermined breaking points that are arranged between the rail support points. This will prevent an uncontrolled crack development.

In order to drain the surface water, every slab is manufactured with a transverse slope of 0.5 % by default. The rail support points can be mechanically processed via a computer-controlled grinding machine. This allows an extremely high accuracy of the track bed. The slab production is finished with the assembly of the rail fastenings. All rail fastenings systems which are approved and suitable for ballastless tracks can be used according to the track requirements.

The slabs are adjusted only on defined measuring points on the rail supporting points without the use of a mounting rail. Therefore the main disadvantage due to deformation of a mounting rail as a result of temperature changes during fine adjustment of the slab tracks is solved. Complicated measuring work as well as correction of the track geometry after installation of the rails are unnecessary.

<table>
<thead>
<tr>
<th>Technical data of the FFB Bögl System:</th>
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<tbody>
<tr>
<td>Construction height (from OK THB to OK rails):</td>
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<tr>
<td>Slab length (System length: nominal 6.5 m):</td>
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<tr>
<td>Slab width:</td>
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<td>Slab height:</td>
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<td>Rail supports:</td>
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<td>Prestressing:</td>
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<td>Longitudinal coupling:</td>
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<td>474 mm</td>
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<td>6,45 m</td>
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<td>2,55 m</td>
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<td>0,20 m</td>
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<tr>
<td>10 pairs per slab; spacing 650 mm</td>
</tr>
<tr>
<td>transversal</td>
</tr>
<tr>
<td>GEWI steel</td>
</tr>
</tbody>
</table>
TYPICAL CROSS-SECTION FOR FFB BÖGL ON AN EARTH STRUCTURE

- Rails UIC 60
- Asphalt gutter
- Slab track $h = 20\,\text{cm}$
- Grouting mass $h = 3\,\text{cm}$
- Hydraulically bound layer or asphalt base course with $h = 30\,\text{cm}$
- Frost protection layer $Ev2 \geq 120\,\text{N/mm}^2$
- Transverse drainage $DN\,150$
- Discharge to the top of the embankment or to deeper drainage
- Broken rock to prevent washouts and frost effects
- Edges covering
- Space for cable channel

TYPICAL CROSS-SECTION FOR FFB BÖGL IN TUNNELS

- Passable slabs for the Bögl system
- FF Bögl slab track
- Grouting mass
- $\pm 0.06$
TYPICAL CROSS-SECTION FOR FFB BÖGL ON BRIDGES

TRANSITION OF THE FFB BÖGL TO A BALLAST ROADBED AND TRACK
Based on the idea to implement railway lines without using a cast-in track panel, but rather by means of prefabricated slabs, the Max Bögl Group has developed a system for gauge change devices. From the conventional turnout sleeper plan of the switch manufacturer, a slab installation plan is generated. The slab dimensions are, on the one hand, dependent on economic transport sizes and weights, and mechanical and electrical facilities have to be taken into consideration on the other hand. Due to the switch geometry, the precast slabs for switches & turnouts have different dimensions and most various arrangements of rail fastenings.
However, there is one thing that all precast slabs for switches & turnouts have in common: In longitudinal direction, plain benchings and transversely inclined areas change in turn with unchanging widths. The inclined areas serve for surface drainage. The rail fastenings are mounted on the benchings. In order to be able to ensure the precise position of the benchings, the fastening holes are drilled using a CNC drilling station. Already in the prefabricated parts plant, the precast slabs for switches & turnouts are equipped with through-bolted connections which are required for fastening the rails. At the place of installation, the precast slabs for switches & turnouts are put down one after another in the planned order and aligned and undercast. The grouting mass consist of self-compacting concrete and is reinforced. Reinforcement stirrups at the bottom side of the precast slabs for switches & turnouts, which are anchored with the undercast concrete, ensure that their position is secured.

Assembly of the precast slabs for switches & turnouts takes place without turnout rails and accessory. Exact fit of the rail fastenings requires no adjustment later on. The complete switch, including all accessory parts, is only mounted after the precast slabs for switches & turnouts have been undercast. That way, no switch components are soiled or damaged. In contrast to conventional assembly, considerably smaller components can be delivered, reducing costs for transport and assembly cranes. Construction times are considerably shortened.

Approval of field testing by Germany’s Federal Railway Office (EBA) was the condition for the implementation within the first FFB high-speed line in China. In 2007, two switches were manufactured as cross-over in the new line between Beijing-Tianjin. In follow-up projects, some further 100 high-speed switches were installed in the new lines Wuhan–Guangzhou and Beijing-Shanghai. After numerous successful operations in China, this technology will now also be implemented for the German Railway in two overtaking stations of the new line Ebensfeld–Erfurt.

INNOVATIVE SLAB TRACK SOLUTIONS FOR UK HIGH SPEED RAIL
DERAILMENT PROTECTION (1)

The Max Bögl group offers solutions to protect derailment for new tracks as well as upgrading the system FFB Bögl. Prefabricated parts are fixed by dowels between the rails of the slab track. Standard slab tracks with additional supporting points between every two neighbouring rail fastenings were produced for this project. On this integrated concrete support points load distributing steel plates and a flexible layer are placed. This flexible base is matched to the stiffness of the rail in order to absorb the vibration. Positive results were achieved with this continuous support.

NOISE PROTECTION/ VIBRATION PROTECTION

Continuous support (2)

In 2004 the promoted project “Hypertrack” (High Performance Track) was tested near the station of Foggia, south Italy. A solution developed for the Slab Track Bögl. For this research project, standard FFB slabs were manufactured with additional support points between two neighbouring rail fastenings each. On these integrated concrete support points load distributing steel plate (b) and an elastic layer (c) were aligned. These flexible supports, which are adjusted to the track stiffness, absorb rail vibration & noise emission. The results achieved by means of this continuous support were positive. The airborne sound could be reduced by 2-3 dB (A), and the structure-borne sound could be reduced by up to 5.5 dB (A). That way, perception of the noise volume for the human ear is reduced almost by 50 percent.

Mass-spring system

Vibrations generated by wheel-rail contact can be reduced by means of so-called mass-spring-systems in a targeted way. Depending on the relevant degree of efficiency, it is distinguished between light and heavy mass-spring systems.

Heavy mass-spring system (3)

By means of individual supports (d), the slab track is decoupled from its constructional environment in a targeted way, thus enabling free swinging. This ensures a cushioning effect up to very low frequencies. The individual supports have the function of springs. The FFB slab (e) is integrated into a trough forming together with it the mass element. The mass and spring stiffness of the individual support are dimensioned in such a way that the system achieves the intended cushioning effect.
Light mass-spring system
In case of low demands on the vibration protection, the FFB system is decoupled via a spatial support from the constructional environment. The mass is only generated by the self weight. Flexible mats are glued underneath the slabs. Using variable slab thicknesses and defined spring coefficients of the mats, the system can be adjusted to the relevant situation.

NOISE-PROTECTION WALLS (4)
In 2010, the German Railway put into effect the revised Guideline 804 5501 on “Noise-protection Installations on Railway Lines”. The dimensioning takes into consideration the static and dynamic stress changes owing to pressure and suction impacts from train service. Based on this guideline, the Max Bögl Group was granted type approval by the German railway authority (EBA) for a noise-protection system made of prefabricated concrete elements for high-speed traffic up to 350 km/h. The noise-protection elements can be designed both as absorbing on one and on two sides. They are modularly designed and can be combined to wall heights of up to 5 m. This system will be used for the first time on the new line Ebensfeld–Erfurt.

TRAFFICABILITY IN TUNNELS (5)
Modern rescue concepts demand, among other things, trafficability of the tunnel by means of rescue vehicles linked to wheels. For this purpose, the Max Bögl Group offers a prefabricated element which also offers a high degree of safety during construction works. Prefabricated parts are installed on the slab track between and next to the rails and fastened. Their geometry is adjusted to the slab track system in such a way that the gap between rail and prefabricated part becomes as narrow as possible. Inspection and maintenance of the safety-relevant parts of the slab track, such as the rail fasteners, are possible without dismounting these prefabricated parts, however. Assembly is integrated into the process of the general trackway works without any problems.

BÜB – LEVEL CROSSING BÖGL (6)
With the directly passable prefabricated concrete slab for level crossings with inserted rail, Max Bögl delivers a carriageway slab which can be used right away without an additional cover, such as mastic asphalt. In combination with the inserted rail, the carriageway can be made available within a very short time both for rail vehicles and wheeled vehicles. The rail is embedded in a prefabricated polyurethane jacket and elastically anchored in the concrete channel. The slab can be used as level crossing for mainline railways, as tram slab and as passable slab for emergency vehicles in tunnels. Apart from the directly passable slab with level crossings, the inserted rail can also be used on the FFB – Slab Track Bögl and is thus suitable for the high-speed range.
The Max Bögl FFB slab track system’s main constituent is readymix concrete. Tarmac is the UK’s leading innovative readymix concrete supplier: a 3,000,000+ m³ per annum business. Our technical expertise is totally committed to delivering innovative solutions to meet the specific requirements of the customer on a project by project basis. We have an experienced team of engineers dedicated to gaining an understanding of client needs; supporting them in developing their specifications to satisfy the challenges of a project.

In the context of the joint venture we will collaborate with you using our innovative and bespoke solutions to develop readymix concrete designs by our experienced technical team in concrete technology. Our unique product range includes 1,000’s of different formulations, for virtually any application, ranging from innovative, self-compacting concrete that flows easily through congested, heavily reinforced areas and fills the most intricate moulds and formwork, to high performance concrete that has been specifically developed for use in the harshest environments, including chemical plants, metal foundries, oil rigs, and coastal defence systems.

We have vast experience in designing concrete mixes in technically challenging conditions taking into consideration all aspects of the construction phase. From obtaining the customer brief, through to site construction, Tarmac offers unrivalled technical support.

With direct access to the unrivalled resources of our aggregates and cement supply, consistency of supply is assured whatever the size or location of the contract. Our seventeen regional support teams provide a truly local service which includes monitoring road and weather conditions so that deliveries can be planned to avoid local traffic problems and make the most of weather windows. We have many years experience in commissioning and operating mobile batching plants for major infrastructure projects, including Heathrow Terminal 5 and the London 2012 Athletes Olympic Village.
The Joint Venture will, as part of the full turn-key solution, provide the installation of the slab track system. The Tarmac Contracting business constructs and services over 7,680km of road every year, maintaining 22,000 km of highway.

ROAD SURFACING

Every year Tarmac install more than 3.2 million tonnes of asphalt for a diverse range of contracts, from the resurfacing of motorways, roads and pathways, to the construction of car parks, runways and running tracks. In the process we excavate and responsibly dispose of over 1 million tonnes of road arisings. Much of this is recycled either off-site by our nationwide network of asphalt plants, or utilising our industry-leading ULTIFOAM system, which enables up to 95% of all road arisings to be recycled and reused on-site quickly and efficiently.

HIGHWAYS MAINTENANCE

With many years’ experience working on major contracts for the Highways Agency, local authorities and clients from the private sector, we offer a complete range of highways maintenance services, all of which can be accessed individually or as a total end-to-end package. These range from the maintenance of roads and associated assets, including street lighting, signage and fencing, right through to the design and implementation of traffic management systems, the provision of emergency response, grass cutting, and winter maintenance.

PARTNERING

We don’t just work for our customers, we work with them. Helping them forecast, plan and manage their budgets to provide best value and cost certainty. Our Highways Asset Management service takes this to a whole new level. Working with asset management specialists Gaist, we provide local authorities with an accurate evaluation of their entire network and help them to secure funding to bring everything up to standard, without diverting funds from other services. We also put in place a proactive maintenance plan that minimises costs and delivers long-term savings.

EARLY CONTRACT INVOLVEMENT

Tarmac Contracting undertakes around 5,000 individual contracts per annum throughout the UK, varying in size and scope from minor resurfacing schemes to large-scale reconstruction projects. The earlier we get involved, the more we can add. Early involvement with supply chain partners enables us to identify and solve any potential problems before they occur. Early engagement with our management and technical teams results in greater innovation, improved risk management and safer, more affordable solutions.
81
PAVING GANGLS

94
PAVING MACHINES

3.2M
ASPHALT LAID PER YEAR

300K TONNES
RECYCLED/CEMENTITIOUS PRODUCT

1M TONNES
OF ROAD PLANINGS RECYCLED

70
RECYCLING OPERATIONS

100
STRONG FLEET OF ROAD PLANING AND SURFACING MACHINES

22,000KM
OF UK ROADS MAINTAINED
RESERVES & RESOURCES

Tarmac controls substantial mineral assets primarily through the operation of a network of quarry sites which are located extensively throughout mainland UK and Northern Ireland. These quarries are used to producing a comprehensive range of aggregates and other industrial mineral products which will satisfy the demands of High Speed Rail and the manufacture of slab track with Max Bögl. The product ranges produced are focused on providing solutions to our customers and are principally derived from hardstone (greywacke sandstone or igneous types), limestone and sand & gravel.

As at 01/01/2015 our total reserves base was reported as follows:

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<thead>
<tr>
<th>Assets</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>0.61 Bn Tonnes reserves at Cement units</td>
<td></td>
</tr>
<tr>
<td>0.28 Bn Tonnes reserves of marine mineral assets (sand &amp; gravel)</td>
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<tr>
<td>0.84 Bn Tonnes reserves Limestone</td>
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<tr>
<td>0.17 Bn Tonnes reserves terrestrial Sand &amp; Gravel</td>
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<tr>
<td>0.46 Bn Tonnes Reserves at Hardstone units</td>
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<tr>
<td><strong>2.36 Bn TOTAL Tonnes total permitted reserves</strong></td>
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HIGH-SPEED LINES
BEIJING–TIANJIN AND BEIJING–SHANGHAI

Following the signing of the contract for the technology transfer of China’s first high-speed route in 2005, 36,000 slab tracks were manufactured in only nine months and installed in less than three months on the 115 km long line between Beijing and Tianjin. With the exception of the regular passenger service for the Olympics in August 2008, the FFB Bögl slab track system made speeds of up to 350 km/h at high comfort possible. To our group of companies it was a big challenge to not only accompany this prestige project in an advising function, but also to ensure the execution according to European quality standards as well as completion on schedule.

In time for the celebrations surrounding the 90th anniversary of the Communist Party, the World’s longest high-speed line from Beijing to Shanghai was also opened in China on 30th June 2011 – following a record construction time of just 38 months, including trial operation. The superstructure FFB Bögl slab track system CRTS II ensures high comfort and high-speed conditions on the 1,318 km long line, reducing travel time from once ten hours to less than five hours from the capital to the eastern Chinese port city. Manufactured in 17 prefabricated component plants along the line, a total of nearly 400,000 slab tracks on a length of 1,270 km and approx. 7,500 switch slabs for more than 200 high-speed switches were installed mainly on bridge structures.

Already today, the nationalised system of FFB Bögl is successfully used on more than 6,000 km of high-speed lines in China.
ICE HIGH SPEED LINE
NUREMBERG-INGOLSTADT

The Max Bögl Group was commissioned by the DB AG as general contractor in a consortium to build the new railway track Nuremberg-Ingolstadt functionally, including the roadbed and track. As an innovative type of roadbed and track, the FFB – Slab Track Bögl was used commercially for the first time. The track was designed for a draft speed of 300 km/h and an axle load of 25 tons with a service life of 60 years. The 35 km long roadbed and double-track system with 10,600 standard, special and compensation slabs was installed in earth structures, frame bridges, tunnels and troughs as well as on long viaducts. For areas with very difficult geologic conditions, special earthwork measurements were developed and carried out.

WORLD RECORD ON FFB BÖGL BETWEEN NUREMBERG AND INGOLSTADT: IN A SPEED OF 357 KM/H, THE “TAURUS III” LOCOMOTIVE SET A NEW SPEED RECORD FOR ELECTRIC LOCOMOTIVES ON A NON-PREPARED TRACK.

THANKS TO THE FFB BÖGL SLAB TRACK SYSTEM, THE NEW ICE LINE FROM NUREMBERG TO INGOLSTADT HAS THE HIGHEST TRAVELLING COMFORT OF ALL GERMAN RAILWAY LINES, AS PROVED BY MEASUREMENTS OF THE TRACK GEOMETRY.
Tarmac have over 60 years experience in the supply of railway sleepers into the UK rail network. The Tallington factory in Lincolnshire was established primarily for the manufacture and supply of concrete railway sleepers. In 1943 it was the first factory in the world to successfully produce prestressed concrete sleepers and we have been supplying to Network Rail and its predecessors since that date.

Over the years we have worked closely with the rail authorities in the UK to design, develop and extend our range of products & services including developing the infrastructure necessary to support such a diverse product range. All of which has ensured that our client targets are achieved.

Since 2003 sleepers have been supplied under a direct supply agreement with Network Rail for free issue to contractors. Under this direct supply agreement peak levels of activity have seen in excess of 340,000 sleepers per annum manufactured and despatched to Network Rail.

Operations have been managed through detailed processes of procurement & supply chain (both inhouse and client free issue component manufacturers and hauliers), manufacturing, stock and delivery planning all against a 26 week forward order book (exact call off firmed up 14 days prior to delivery) with despatches by both road and rail to numerous locations on the UK rail network.
The new world-class, 60,000 seater Emirates Stadium was constructed for Arsenal FC on a 17 acre site in North London and is the centrepiece of a much bigger £500 million project to regenerate a run-down part of North London.

For the stadium itself Tarmac Pre-cast designed and supplied over 20,000 tonnes of pre-cast concrete to the project, totalling over 8,500 individual pre-cast units, including terracing units, parapets, vomitory walls, raker beams, stairs and step blocks.

Our early involvement in the design process allowed us to work closely with the project team to deliver the end product desired by the client. The Emirates Stadium is now regarded as the benchmark both for the architectural design and the quality and finish of the materials incorporated in its construction.

In addition to the major involvement by Tarmac Pre-cast, Tarmac had also secured the contract to supply Byrne Bros with readymixed concrete for the reinforced concrete sub-structure and superstructure works for the stadium. Tarmac and Byrne Bros worked closely together to tackle the issues relating to the limited space available. Tarmac supplied 46,000 m$^3$ of readymixed concrete to the construction of the stadium between February 2004 and December 2005.

In addition to the stadium build itself Tarmac was heavily involved in the larger ‘Arsenal on the Move’ Contract which combined the stadium with a further three separate construction projects. Working closely with Byrne Bros. and Jackson CE, and installing site batch plants Tarmac supplied a further 30,000m$^3$ of readymixed concrete to the 3 phases including micro silica mixes up to 60N/mm$^2$

- Lough Road Waste Transfer Station
- 2 new footbridges
- The Northern Triangle Residential Scheme

The stadium, and associated works were completed with zero overspend, just over 2 weeks ahead of schedule and in time for the 2006/2007 football season. The project won ‘Major Project of the Year’ at the Quality in Construction Awards 2006.