

surveying

# Severn Partnership keeps ahead of the High Output Ballast Train



**High Output Ballast Cleaning - Sleeper carrying wagons.**

First Swietelsky is a joint venture partnership between Babcock Rail and Swietelsky GmbH, Europe's most progressive High Output Track Renewals specialist. It has commissioned Severn Partnership to supply the railway track survey data for permanent way design so enabling the Plasser & Theurer high output ballast cleaner and Matisa track relaying system to operate to schedule for Network Rail. This service is offered via First Swietelsky.

HOTR has played a significant role in developing cost-efficient track renewals and limiting track possession times to an absolute minimum. Operating with an average track renewal of 350 metres per hour, with the adjacent line open in areas of twin track or more, means that keeping a steady supply of survey data to strict deadlines is essential.

**09-3X with Levelling and Alignment Laser.**

**Three dimensional CAD surveys**

In the past, railway track survey for design

and construction works was normally completed using Hallade survey techniques. The advances in electronic distance measurement (EDM) permit absolute track designs - meaning that the design is always valid. Even if both tracks move, a resurvey of the rails is only needed to regenerate the setting out data, whereas a Hallade design would need to be redesigned. Three dimensional CAD surveys by Severn Partnership are cost effective and leave a positive legacy for Network Rail to maintain the track.

For small railway sites, local plane rectangular grids with scale factor 1 satisfy the requirements for p-way design alignment. However, for large 'parallel line' projects such as ECML, MML and MLN, understanding the wider picture is crucial.

Severn Partnership has the in-depth experience and theoretical knowledge, backed up with the necessary qualifications at all levels, to advise on the setting up of the correct survey grid for different railway sites. Put simply, if the shape and height of the earth is not taken into consideration over these long narrow corridors, then the acquired survey data will be worthless for p-way design and costly if allowed to be used.

**Custom site grids**

Using its experience on long, linear rail projects - most notably on the East Coast and Midland Mainlines - Severn Partnership commissioned University College, London and Dr J Iliffe from the Department of Geomatic Engineering to produce a custom site grid using the SnakeGrid software. The grid maintains a scale as close to unity as possible along the route of a project, accounting for horizontal and vertical scale distortions. This allows a single grid to cover

the whole of a project without the need to compromise accuracy with local scale variations.

Severn Partnership has been working across the whole Western Territory for First Swietelsky, surveying many disparate sites. It was deemed appropriate to survey these to common custom site grids. Three grids were commissioned over hundreds of miles -

- CCWGBD09 grid, Westerleigh Junction via Gloucester, Birmingham and Clay Cross
- GWPBS09 grid, Paddington to Swansea via Bristol Parkway
- GWRWT09 grid, Reading to Plymouth via Pewsey, Taunton and Exeter.

The advantages to be gained from a single seamless grid are many when all the project processes of survey, design, construction and as-built are considered. Providing survey data accurately to a known grid allows data sets from different times to be combined successfully. Using the same permanent ground survey control reduces costs.

Severn Partnership provides a permanent primary and secondary control network which can be used for many years to come on future mainline railway survey updates and design construction projects.

**Track machine guidance**

Severn Partnership surveyors have the necessary site experience in setting out these large scale control systems using dual frequency GPS receivers linking into the OS GPS active network. Ultimately, the surveyors transfer these networks to the trackside in the form of concreted survey monuments or track machine guidance spigots (TMG).

TMG's have been installed on OLE gantries



and coordinated in three dimensions over many track route miles. Survey prisms can be attached to the spigots, allowing accurate surveying of track using the latest high accuracy magnetic drive total stations. Engineering trains position themselves from the spigots in order to set out the Through Alignment Designs or TAD.

**The problem with 'black box' systems**

The recent increased use of GPS technology has led to the switch of the national provision of level data from fixed benchmarks to national GPS active networks. Whilst GPS provides an efficient survey tool with many benefits, there is a risk of poor data if it is not used and checked carefully. This is a common problem with many 'black box' systems.

One such check on computed GPS primary and secondary level data is a comparison with the double spirit-levelled data using Zeiss DINI high accuracy digital levels across sites. This is a check for gross errors in the GPS and substantiates Severn Partnership's rigorous GPS site and processing work. A further check on the GPS processing and the custom SnakeGrids completed by Severn Partnership is to measure on-site, with total stations, the straight line horizontal distances between some of the GPS primary and secondary control points and compare

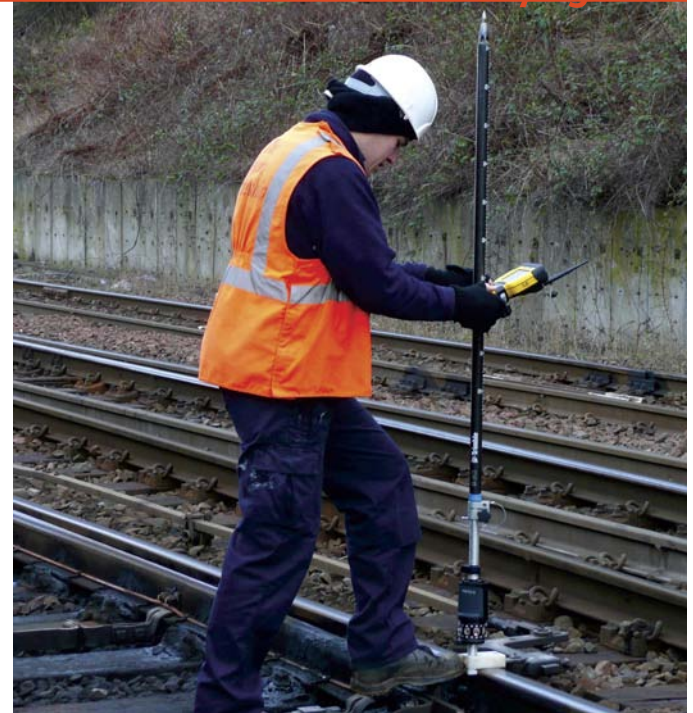
measured with final adjusted values. The differences have all been less than 10mm.

The commissioning, installation, observation and checking of custom, large scale grids is a speciality of Severn Partnership which understands the importance of working 'from the whole to the part' and how critical it is for control networks to be correct. It is important to allow for the effective and efficient manipulation of different survey data sets including track, platforms, buildings and infrastructure such as bridges, roads and car parks.

**Latest Bluetooth technology in possessions**

Severn Partnership is able to keep possession use to a minimum. When necessary, survey productivity is maximised using the latest one-person magnetic drive robotic S6/S8 total stations through structures such as stations and tunnels. This Bluetooth technology is used in all aspects of Severn Partnership's working methodology with blackberries, laptops, GPS, Severn Gauge Bar and laser scanning. Survey teams update site progress on the online schedule after each shift allowing efficient resource management back in the Shrewsbury office.

Continual report feedback to First Swietelsky is critical, allowing them to



manage the HOTR trains to the exacting deadlines set by Network Rail.

Severn Partnership also understands the nitty-gritty of track - the knowledge of p-way infrastructure and associated supporting equipment. Whilst surveying insulated joints is a must, the lesser known items such as lateral and resistant plates are also important. Severn Partnership knows what they are and where to find such railway infrastructure detail! ■

One person Robotic Total Station Surveying.

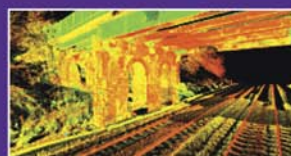
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