
CV - Andy Foan

Consultant - Switches & Crossings

Independent S&C specialist since March 2012.

Chartered engineer and innovator, Andy has extensive experience of the manufacture of special trackwork for clients both at home and overseas and for railway applications of all types.

As convenor of the CEN working group and UK mirror group he leads the development of European standards in this subject area.

From 1988 - 2012 he was Chief Engineer responsible for S&C design and product development at Progress Rail's manufacturing site (formerly part of Balfour Beatty Rail).

Contact

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Profession

Chartered Mechanical Engineer with over 35 years experience.

Professional associations

Fellow of the Institution of Mechanical Engineers and Fellow of the Permanent Way Institution.

Convenor of European Standards Committee (CEN-TC256/SC1/WG18). UK Principal representative on other European Standards Committees.

Qualifications

Bachelor of Science. First Class Honours in Mechanical Engineering 1975. University of Southampton.

Awards and publications

Institution of Mechanical Engineers prize "Best Honours Project", University of Southampton, 1975.

Paper "European Special Trackwork", Transportation Research Board Conference, Washington USA, 1990.

RIA Track sector course papers "Special Trackwork Developments" and "Design for Light Rail", 1992.

Lectures on modern S&C to audiences in York, Birmingham, Leeds, London, Manchester.

Section 2.6 "Switches and Crossings", Wheel-Rail Best Practice Handbook, Univ. of Birmingham Press, 2010.

Paper "18 months under 40 tonne axle loads", Heavy Haul Conference, Calgary 2011.

Paper "Unprecedented Connections", Civil Engineering, American Society of Civil Engineers, March 2014.

Paper "A CESuRa in the Track", The Journal, Permanent Way Institution, January 2015.

Paper "Dynamic Simulations in Support of Light Rail Tracks on Homer Hadley Floating Bridge", Stephenson Conference, Institution of Mechanical Engineers, 2015.

Patents

Sliding buffer stop

Jointless swing nose crossing

Oblique hollow steel sleeper

Elevated shoulder fastening system

Track hinge joint for large angular bridge movements

Key skills

Mechanical engineering design

2D and 3D visualisation and presentation

Engineering stress analysis

Switch and crossing design

Special trackwork research

Wheel/special trackwork interaction studies

Switch flexure (point operation) optimisation

Obtuse crossing and diamond design

Swing nose crossings and switch diamonds

Engineering risk management

Friction and fixed buffer stops

Urban rail junctions

Mixed traffic and high speed special trackwork

Heavy haul turnouts

Standards and specifications

Selected professional history

Network Rail - improvement projects

- Hosted the development of shallow depth switches in the UK from 1988.
- Developed a novel modular friction shoe and sliding buffer stop and tested it under traffic impact as an industry response to the Cannon Street incident in 1989; this began a successful continual development to this day with many installations in the UK (Waterloo, Portsmouth, LU), Singapore and USA, India and Portugal.



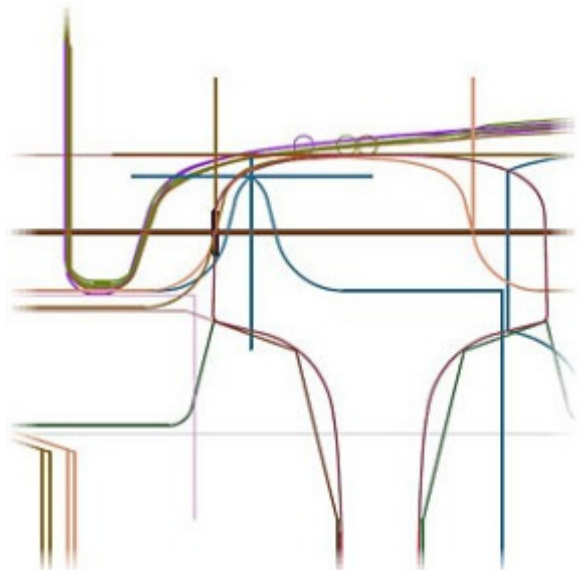
- Participated in the development of specifications for the development of switch systems in 1994.
- Proposed and pursued the development of an improved range of S&C for high speed crossovers in UK premium locations. Commissioned by Railtrack to develop this concept into a workable specification which emerged as RT60 in 1999.
- Led the design of a full range of RT60 special trackwork incorporating novel geometry, inclined rails, concrete bearers at 650mm centres, screwless fastenings and open architecture point equipment configurations. Introduced the idea of hollow steel bearers, articulated stretcher bars and torsion backdrives for switches and augmented switch machining to improve the life of switches from birth. Many of these innovations continue in the current NR60 range of high performance turnouts.
- Participated in a series of improvement and optimisation projects since 2012, including the development of a new range of CEN60 turnouts for possible future use in Network Rail's infrastructure.
- Building on experience of existing vertical and inclined turnouts, investigated and optimised geometrical design, machining profiles, flexure behaviour and obstruction detectability of switches.



- Commissioned to work with Network Rail experts on the building of a critical rules network and the updating and improvement of internal specifications and maintenance standards.

Sheffield Supertram - Light Rail S&C

- Team leader for the design of turnouts for light rail, introducing tangential geometry and conducting detailed calculations for wheel/rail interaction especially in the small radius crossing panels.
- Invented a cam-operated manual switch operating device with the objective of reducing the manual thrust input requirement for lighter persons.
- Developed ramped flangeway diamonds for large-angle junctions in order to support the passage of wheels across crossing gaps.
- Invented a lateral movement joint for interfacing between abutments and bridges with lateral movement.



London Underground

- Developed an improved range of CEN56 shallow depth vertical switches. Called BB54m, these required lower operating forces thereby improving reliability.
- Developed a lighter version of the sliding buffer stop.

PATH New York - Tangential switches & CMX

- Designed tangential geometry turnouts and cast manganese crossings (CMX) for PATH's unusual (cylindrical tyre) wheels incorporating flexible guarding through the switches right up to the back of the headcut, thereby providing both switch flangeway opening and wheelset guidance wherever feasible.
- Increased PATH's switch and crossing life fourfold by introducing modern design principles and up-to-date materials and practices.

Amtrak - High Speed S&C for NEC, USA

- Led the design team in tackling the many challenges in developing a suitable high speed turnout configuration.
- Designed the high speed crossover geometry, shallow depth switches and jointless swing nose crossings to suit Amtrak's Northeastern Corridor mixed traffic configurations.
- Developed a novel fastening system which eliminated the need for screws to hold baseplates down; spring fasteners were used instead. Also developed the bearer joining system which allowed concrete bearer lengths to be limited to 5 metres and which therefore promoted modular turnout handling and installation in the US.



- The early installations have carried in excess of 500 MGT without major attention except routine maintenance, and are still in service.

Centre-guide switch for Mucha line Taiwan

- Led the design of a switch for guiding rubber-tyred vehicles when they pass across junctions. These systems have unique challenges and are typically used for airport passenger transit systems.

Heavy Haul Turnouts - FMG in Australia

- Devised a configuration suitable for 40 tonne axle loads at 90 kph, then led the team carrying out the design and development of the products and systems needed for the prevailing environment in the Pilbara, Western Australia. The turnouts used the 136RE rail profile with 136TW (thick web) in the switches. Particularly novel (and patented) was the cradle-type rail-bound swing nose crossing.
- The first installation was in October 2010.



Track Bridge Joint - Sound Transit in Seattle

- Sound Transit wishes to convert a highway into a rail route, but the highway passes over Lake Washington on a mile-long floating pontoon which rises and falls annually a significant amount.
- Engaged to advise on track and special trackwork issues, and in the early stages to describe my experience of finding a solution to the lateral bridge movement problem of Sheffield Supertram. Commissioned to study the design concepts presented as contenders for a prototype track bridge joint, and to review and report accordingly.
- Invented a solution which had the potential to eliminate all the problems of the existing contenders and satisfy the client's wish for a higher speed solution too. Attended a workshop and presented the idea and its characteristics to the incumbent design team.
- The concept is called CESuRa (Curved Element Supported RAIL) and in suitable configurations can enable track to tolerate pitch and yaw while preventing undue rail stresses. It has been subjected to thorough analysis by the Seattle-based design team and was selected as the preferred solution by the Sound Transit.

- A pair of full scale prototypes was built and installed at TTCI in Pueblo, USA and a train set was trucked from Seattle for extensive (and successful) testing over 4 weeks during 2013.

- Commissioned to compile the Inspection and Maintenance Manual. System is due to go into service in 2023.

Other Project Examples

- Vancouver Skytrain;
- Channel Tunnel (Terminal and Rail Link);
- Singapore MRT;
- Hong Kong MTRC (including Lantau & Airport Railway);
- Tuen Mun Light Railway.

