

TECHNICAL DATA SHEET



PRODUCT NAME

Turnouts

CATEGORY

Perway

COMPLIANCE

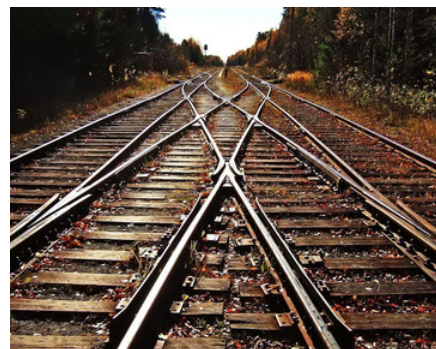
Transnet S422 | SANS | BS 47 |
ISO 9001:2015

SUPPLIER

ZAK Steel (Pty) Ltd

PRODUCT OVERVIEW

Turnouts and crossovers, including switches, frogs, guard rails, stock rails, and closure rails; rail fastening assemblies unique to turnouts; and miscellaneous components associated with turnouts, including switch rods and gauge plates. Crossover tracks, double crossovers including the central crossing frogs or diamond area, and single and double slip switches are included in this category. The cross ties to support turnouts and crossovers can also be considered part of special trackwork, especially concrete switch ties, which require far more design and fabrication effort than ordinary timber switch ties.



Key Components

- ZAK supply turnout sets for sidings, and mainline applications build to the European Standard BS EN 13232 for railway turnouts, switches. It is a comprehensive, multi-part standard titled "Railway applications — Track — Switches and Crossings", engineered for durability, precision alignment, and reduced maintenance intervention
- ZAK provides a comprehensive range of turnout systems engineered for rail profiles from 40 kg/m to 60 kg/m, featuring high-quality rail manufacturing and rail-bound frogs. Our standard crossing configurations include 1:9, and 1:12 geometries, with addition the 1:6 and 1:8 sets.
- Additionally, ZAK delivers custom-engineered turnout solutions tailored to bespoke track gauges and specialized surface rail applications.

Key Components of a Turnout System

Points (switch rails or point blades)

Movable rails which guide the wheels towards either the straight or the diverging track. They are tapered on most switches, but on stub switches, they have square ends. In ordinary conversation, it is common to use the word "switch" when referring to a "turnout," which is technically incorrect.

Stock Rails

The running rails immediately alongside of the switch rails against which the switch rails lay when in the closed position. The stock rails are otherwise ordinary rails that are machined, drilled, and bent as required to suit the design of the turnout switch and the individual switch point rails.

Frog

A component placed where one rail crosses another refers to the crossing point of two rails. The rest of the English-speaking world calls such units by the more obvious term "crossings." Frogs are supplied in rail-manufactured and rail-bound systems.

Closure Rails

The straight or curved rails that are positioned between the heel of the switch and the toe of the frog.

Guard Rail (check rail)

A short piece of rail placed alongside the main (stock) rail opposite the frog. These exist to ensure that the wheels follow the appropriate flangeway through the frog and that the train does not derail.

Heel Block

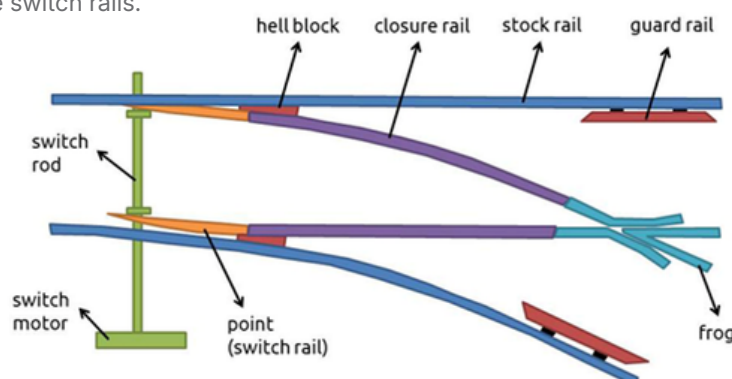
Assemblies are units placed at the heel of the switch that provide a splice with the contiguous closure rail and a location for the switch point rail to pivot at a fixed spread distance from the stock rail.

Switch Point Rail

stops act as spacers between the switch point rail and the stock rail. Stops laterally support the switch point from flexing laterally under a lateral wheel load and thereby possibly exposing the open end of the switch point rail to head-on contact from the next wheel.

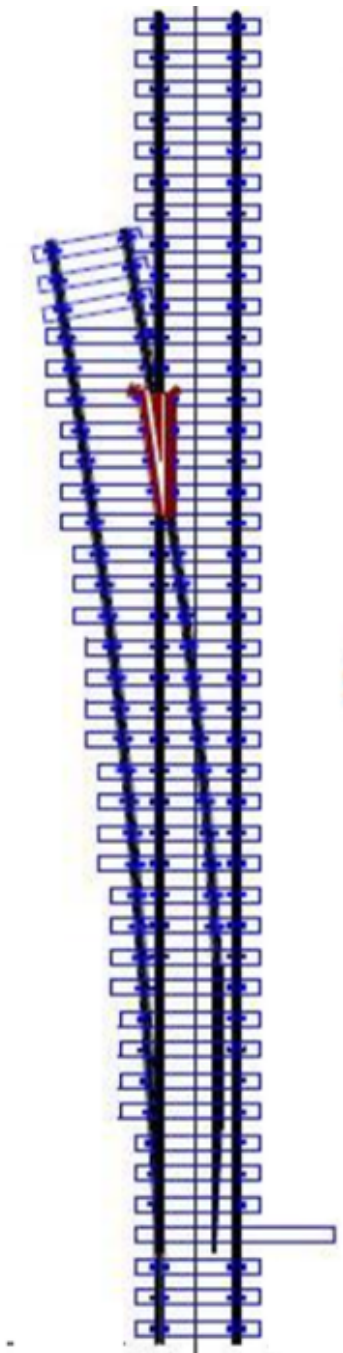
A switch operating device

moves switch rails. Switch rails can be thrown (moved) from one orientation to another by either a hand-operated (manual) switch stand or a mechanically or electro-mechanically (power-operated) switch machine. In both cases, the operating devices are positioned at the beginning of the turnout opposite the switch-connecting rods near the point of the switch rails.

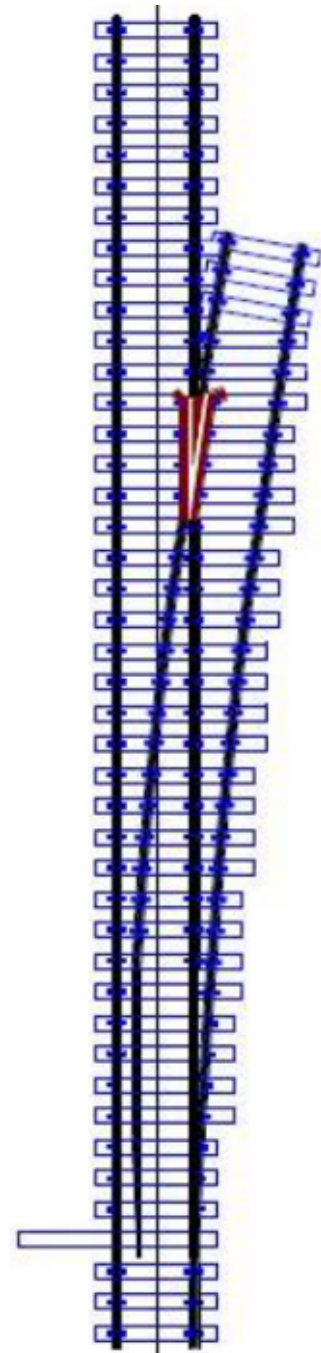


Left & Right hand Turnout Systems

Left Hand Turnout Set



Right Hand Turnout Set



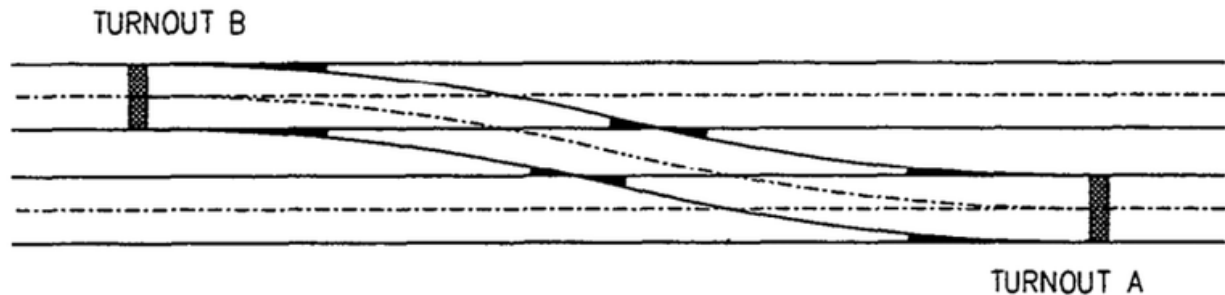
Application & Rail Profile Specifications

- Right-hand turnout in railway and Left-hand turnout in railway are named based on the direction of the diverging track. In a Right-hand turnout, the train diverges to the right, while in a Left-hand turnout, the train diverges to the left.
- The direction of the turnout is determined by the switch point, which is the point at which the two tracks diverge. In a Right-hand turnout, the switch is located on the right side of the turnout, while in a Left-hand turnout, the switch is located on the left side of the turnout.

Turnout Types

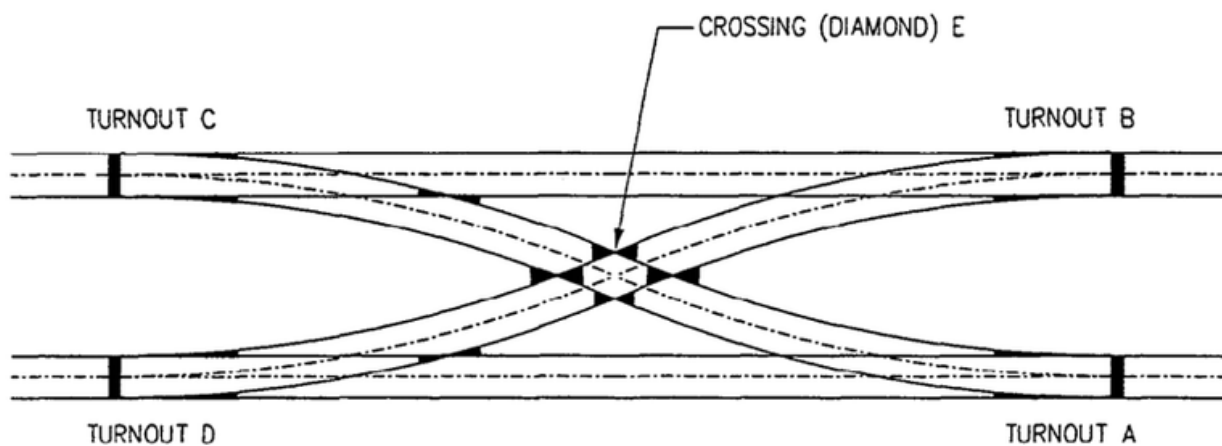
Single Slip

A single slip consists of two turnouts positioned in two tracks that allow the vehicle to go from one track to another. The two tracks are usually, but not always, parallel, and the turnouts are usually identical. A pair of single crossovers—one right hand and one left hand—that are arranged sequentially along the tracks is called a universal crossover.



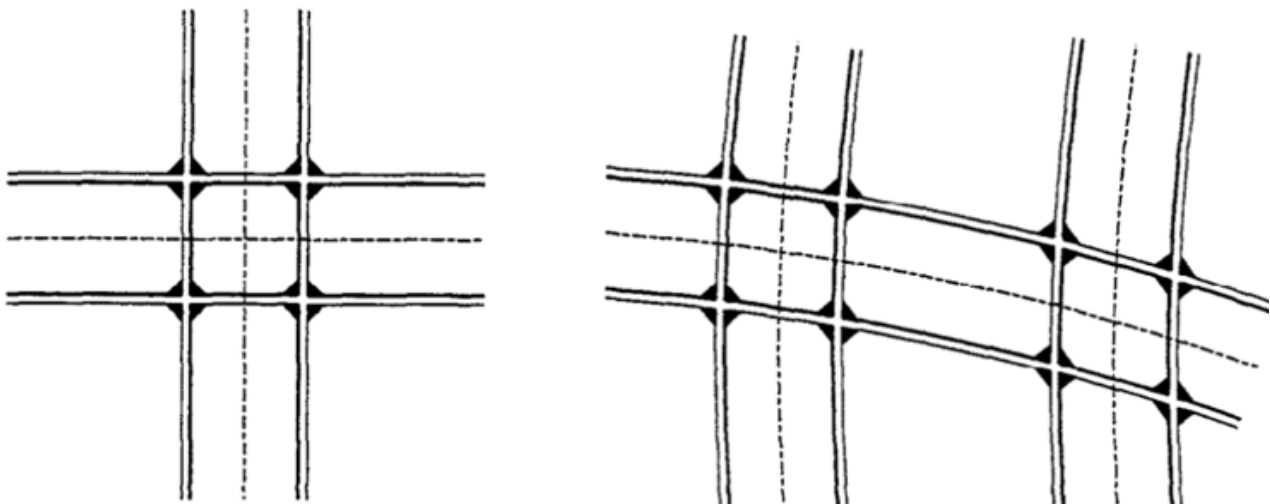
Double Slip

A double slip —sometimes called a scissors crossover—consists of two crossovers of opposite hand orientation superimposed upon each other. In addition to the four turnouts involved, a track crossing diamond is needed between the two main tracks. A double crossover is typically used only when it is necessary to be able to switch from both tracks to the other in either direction, but there is insufficient space to install a universal crossover as described above.



Track Crossing

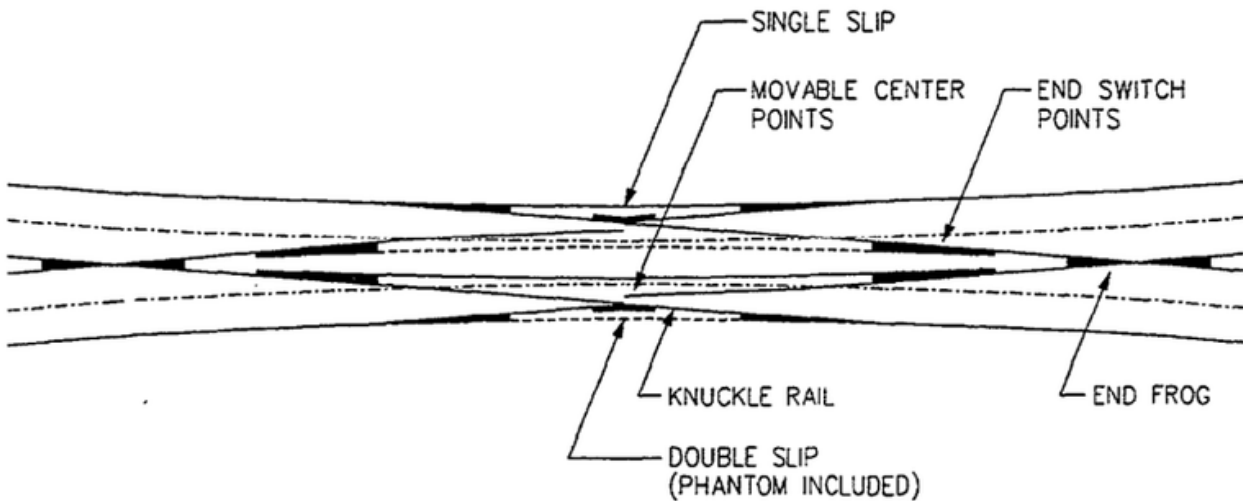
Track crossings, as the name implies, permit two tracks to cross each other. Track crossings are often called either crossing diamonds or simply diamonds, due to their plan view shape.



Turnout Types

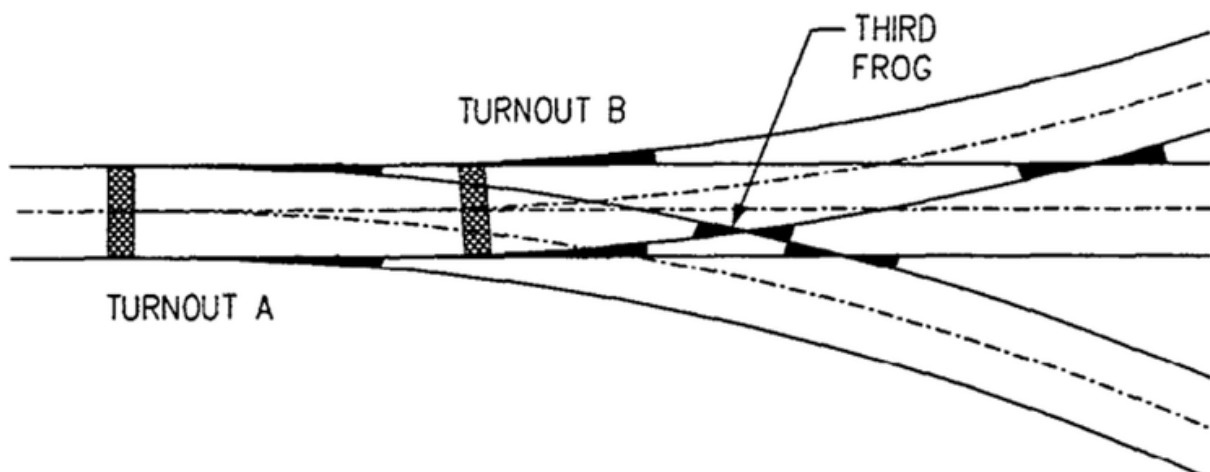
Slip Switch

- A single slip switch works on the same principle as a double slip but provides for only one switching possibility. Trains approaching one of the two crossing tracks can either continue over the crossing, or switch tracks to the other line. However, trains from the other track can only continue over the crossing and cannot switch tracks. This is normally used to allow access to sidings and improve safety by avoiding having switch blades facing the usual direction of traffic. To reach the sidings from what would be a facing direction, trains must continue over the crossing, then reverse along the curved route (usually onto the other line of a double track) and then move forward over the crossing into the siding.
- A double slip switch (double slip) is a narrow-angled diagonal flat crossing of two lines combined with four pairs of points in such a way as to allow vehicles to change from one straight track to the other, as well as going straight across. A train approaching the arrangement may leave by either of the two tracks on the opposite side of the crossing. To reach the third possible exit, the train must change tracks on the slip and then reverse.



Equal split Turnouts

Lapped turnouts can be used to achieve a more compact track layout in constrained locations. In a lapped turnout, as seen in following picture, the switch rails for a second turnout will be placed between the switch and the frog of the initial turnout. This introduces a third frog where a closure rail of the first turnout crosses a closure rail of the second turnout.

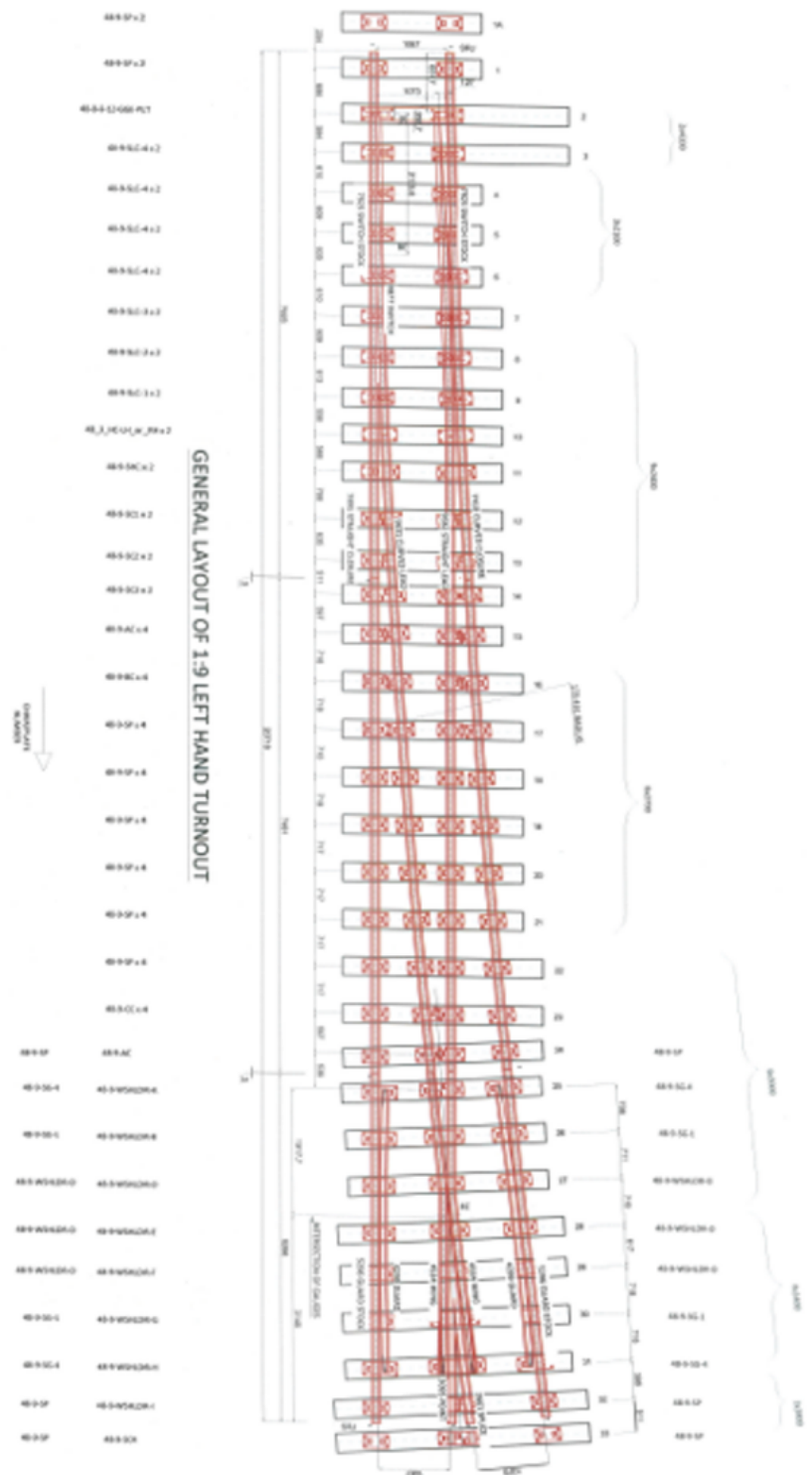


Technical Drawing: SAR48kg/m 1:9 and 1:12 Secant Designs:

SAR48kg/m 1:12 illustration



SAR48kg/m 1:9 illustration



KEY FEATURES

Compliance & Engineering Excellence

- **European Standard Alignment:** Fully compliant with BS EN 13232 standards for railway applications, track, switches, and crossings.
- **Precision Manufacturing:** Engineered explicitly for high durability and precision alignment.
- **Low Maintenance:** Specifically designed to reduce maintenance intervention over their operational lifespan.

Technical Specifications & Componentry

- **Versatile Rail Profiles:** Compatible with a wide range of rail sizes, from 40 kg/m to 60 kg/m profiles.
- **Premium Componentry:** Features high-quality rail manufacturing and integrated rail-bound frogs.
- **Standard Geometries:** Available in standard crossing configurations of 1:6, 1:8, 1:9, and 1:12.

Application & Customization Versatility

- **Operational Adaptability:** Configured for both low-speed sidings and high-demand mainline applications.
- **Bespoke Engineering:** Tailored to accommodate custom track gauges.
- **Specialised Deployment:** Adaptable to diverse and specialised surface rail applications.

Maintenance Replacement Components

The Switch Panel (The Movable Entry Zone)

This section is highly susceptible to wear due to the lateral forces of diverting trains.

- **Switch Blades:** The tapered, machined rails that physically pivot to change the train's direction. They suffer severe wheel-flange wear and side-chipping.
- **Stock Rails:** The fixed, standard outer rails against which the switch blades lock.
- **Slide Chairs:** The specialised plates supporting the switch blades. They require clean, smooth surfaces and are replaced if cracked or heavily grooved.
- **Switch Rods:** The mechanical bars connecting the two switch blades to maintain synchronised movement and gauge spacing.

The Crossing Panel (The Intersection Zone)

This zone endures heavy vertical impact loads as wheels bridge the gaps in the track.

- **The Frog (Common Crossing / Core):** The rigid V-shaped piece where the rails physically intersect. Even "rail-bound frogs" will eventually suffer deformation on the crossing nose and must be unbolted and swapped out.
- **Wing Rails:** The outer formed rails flanking the frog that support the wheel tread during the gap transition.
- **Check Rails (Guard Rails):** Paralleling the opposite running rails, these guide the wheel flange to ensure the train cannot climb or strike the nose of the frog. They wear down from constant flange contact.

The Closure & Intermediate Panel (The Linking Rails)

- **Closure Rails (Lead Rails):** The standard lengths of curved and straight rails positioned between the switch blades and the frog assembly.
- **Insulated Rail Joints (IRJs):** Specialised block joints that isolate electrical signalling track circuits, which degrade rapidly under heavy axle loads.

Fasteners, Bearers & Support Insulation

- **Specialised Fasteners:** Resilient rail clips, elastic pads, gauge plates, uncoupling bolts, and screw spikes.
- **Turnout Bearers (Sleepers):** Long wooden, concrete, or composite sleepers that support the entire turnout geometry. Individual rotten timber or cracked concrete bearers can be spot-replaced.
- **Roller Systems:** Mechanical or spring-loaded roller assemblies that lift the switch blades off the slide chairs during movement to reduce friction.

Technical Standards & Quality Compliance

Global & International Standards

- **Geometric Layout & System Design:** Compliant with BS EN 13232 (Parts 1–9) for railway track switches and crossings [BS EN 13232].
- **Rail Profile Manufacturing:** Raw steel rolling and fabrication conform to EN 13674-1 (Vignole rails) and EN 13674-2 (Switch and crossing rails) [EN 13674-1, EN 13674-2].
- **Steel Material Grades:** Standard supply includes R260 and R350LHT (Head-Hardened) heat-treated steel for heavy-haul profiles.
- **Ultrasonic & Weld Testing:** Non-Destructive Testing (NDT) performed in accordance with EN 14730-1 and ISO 9712 for internal flaw detection.

SADC Regional Standards & Track Integration

- **Track Gauge Configurations:** Built to standard Cape Gauge (1067 mm) and international Standard Gauge (1435 mm) parameters.
- **South African Core Network (Transnet/PRASA):** Engineered to surpass Transnet Freight Rail Specification BBF9104 (v2) for turnout component durability [Specification BBF9104].
- **Regulatory Safety Approval:** Technical parameters aligned with the South African Railway Safety Regulator (RSR) guidelines and SANS 3000-2-2 civil infrastructure benchmarks [Railway Safety Regulator (RSR)].

Corporate Quality Management Systems

- **Quality Management System:** Manufacturing facilities certified under ISO 9001.
- **Traceability Assurance:** Material mill certificates provided per EN 10204 Type 3.1 or Type 3.2 upon project execution.