



TRIOMF'S SERVICES

SIGNALLING DESIGN

ENGINEERING
MANAGEMENT

PROJECT MANAGEMENT

MICROLOK II MISS SIMULATOR

DETAILED SURVEY SITES

SITE CORRELATION

PROTECTION OFFICERS

CONDITION REPORTS

DOCUMENT MANAGEMENT

SIGNAL SIGHTING & LEVEL
CROSSING FOCUSING
ASSESSMENTS



CAPABILITY STATEMENT



'Railway Signalling Specialists'
enquiries@triomf.com.au
07 3205 3236
www.triomf.com.au
Suite 18/328 Gympie Road, Strathpine
4500, QLD Australia

ABOUT TRIOMF

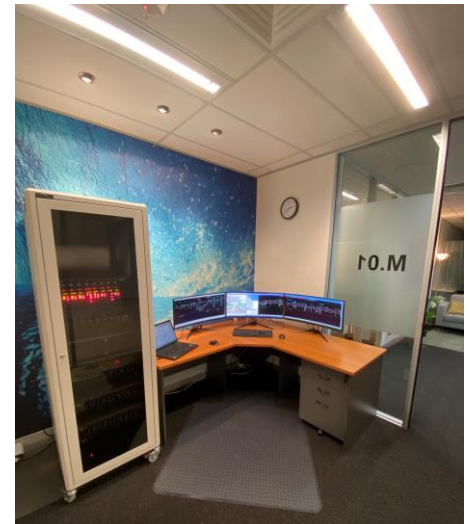
Triomf Pty Ltd is a 100% Australian owned and based signalling design house that was formed in January 2011 to service the railway signalling industry in Australia and has since undertaken signalling design services, project management, project engineering, engineering management and more. Our company has offices in North Brisbane (Queensland) and Newcastle (New South Wales).

At its core, Triomf is a railway signalling design engineering company handling heavy rail, light rail and passenger rail signalling design, as well as providing engineering professionals to the rail industry. Our signalling design team comprises highly qualified individuals who have achieved competencies levels with ARTC, CRN and QR, and are experienced in delivering the detailed signalling design for both new works and maintenance projects.

OUR SERVICES

MICROLOK II MISS SIMULATOR

Triomf owns a fully operational remote access Microlok II MISS simulator workstation held in its Strathpine office which enables all Microlok II data designs inclusive of Factory Acceptance Tested (FAT). Our testing facility provides efficient evaluation of the performance of the interlocking logic and further Design Integrity.



SIGNALLING DESIGN

Triomf designs railway signalling systems including:

- Microlok II
- Route Relay Interlocking (RRI)
- Train Order Working (TOW)
- GCP
- Frauscher Axle Counter Systems
- All types of Points Machines
- Trimble GPS Detailed Site Surveys

Triomf is fully equipped with Bentley Promis*e (Microstation) and AutoCAD workstations and cover all major signalling disciplines.

Includes signalling packages which have comprised of the following design deliverables:

- Microlok & Microtax Data Design
- Microlok II MISS & Simulation Testing
- Control Tables
- Circuit Books (Level Crossing Huts, PER, SER, Location Cases)
- Design Management Plan
- Signalling Plans
- Strike-in Calculations
- Bonding & Cable Plans
- Power Calculations
- Safety in Design (SiD)
- Drivers Diagrams
- Bill of Materials (BOM)
- As-Builts
- Document Management & Configuration
- Signalling Operational Functional Specification (SOFS)
- Signal Sighting Walkout Assessments

PROJECT PORTFOLIO

Triomf has completed many past projects, with just some below serving as examples:

- **RCSA / QR** – Cross River Rail (Dutton Park, Clapham, Mayne)
- **Hitachi / QR** – Cross River Rail (Shorncliffe)
- **QR** – North Coast Line Capacity Improvement Project (8 Loop Extensions)
- **QR** – VPI Signalling Interlocking System Upgrade. (12 Interlocking Sites)
- **BG&E / Whitehaven** – Vickery Extension Project
- **ARTC** - Breadalbane to Cullerin Resignalling (Microlok & Microtrax)
- **ARTC** - Ettamogah to Albury Signalling Upgrade (Microlok & Microtrax)
- **ARTC** - Mittagong to Aylmerton Resignalling (Microlok & Microtrax)
- **CRN** – Level Crossing and Signalling Upgrades
- **CRN** – Pinecliffe New Passing Loop Microlok Interlocking Detailed Design



Types of projects completed with design, check & approval:

- New Passing Loops & Loop extensions
- Level Crossing upgrades
- Pedestrian Crossing upgrades
- Turnout upgrade projects
- Point replacement & upgrades
- Power & UPS upgrades
- Axle counter, PSO, AC & DC track circuit replacement projects
- Microlok & Microtrax
- Motor Generator replacements & upgrades
- Signalling Rectification & upgrade projects

OUR SERVICES

ON-SITE SERVICES

Triomf's licensed signalling electricians can perform a variety of on-site tasks including:

- Site correlation & condition reports
- Protection officers
- Signal sighting & level crossing focusing assessments
- Detailed site surveys
 - Pre-construction surveys
 - De-risk project planning
 - Cost estimation
 - Detailed final as-built surveys



ENGINEERING & PROJECT MANAGEMENT

Our team has extensive knowledge in installation, project management and project engineering in multi-disciplined projects containing relay and CBI interlocking systems from concept to commissioning.

Staff are available to cover the following disciplines:

- Commercial management of projects and programmes
- Project management
- Development of project management plans
- Risk management
- Change management
- Cost estimation and scheduling
- Peer reviews
- Site supervisions

DOCUMENT MANAGEMENT

Triomf holds extensive experience in the control of signalling design records as well as document control processes for all designs, drawings, data and documentation both digital and hard copy prepared in the design office. Our team can supply the service of holding, controlling and issuing records on behalf of our clients whilst ensuring that all relevant processes and procedures are adhered to, specifically to the specific document control standards of each client and the Triomf quality and engineering systems.

OUR PEOPLE

Triomf views its team of highly trained professionals as one of its most valuable assets. We focus on the retention and development of employees by ensuring our team is appropriately supported and given the chance to progress in their roles. This includes in-house and external training where necessary.

Individually, Triomf's employees have many years of railway engineering experience primarily in signal engineering, engineering management, project management and commercial management. Triomf's team have undertaken project delivery design work from small circuit alterations to complex scheme engineering.

COMPETENCIES & ACCREDITATION

Triomf is committed to delivering the highest standards of service across all projects and continually seeks to enhance the performance and consistency of our quality system through improved processes and measures. Some of our most prevalent areas of competency include:

- Current ISO9001 accreditation.
- Statements of Competency, CVs as well as competency matrices for personnel assigned to projects are available upon request.
- For full competency matrices – additional appendix can be provided.
- For working rates – additional appendix can be provided.

Project Examples

Name of Project	Standing Offer Consultancy Services Agreement for Signalling Design and Engineering Services
Name of Client	Australian Rail Track Corporation (ARTC)
Commencement date of engagement	2011
Completion date of engagement	Ongoing
Brief description of services provided	<p>Various signalling design upgrades works in the Hunter Valley and Interstate Network including:</p> <ul style="list-style-type: none"> ➤ Major Signalling upgrades, ➤ New Passing Loops ➤ Passing Loop Extensions ➤ Level Crossing upgrade projects ➤ Pedestrian Crossing upgrade projects ➤ Turnout upgrade projects ➤ Points replacement and upgrades ➤ Power and UPS upgrades ➤ Frauscher FAdC Axle counter systems, PSO and AC & DC track circuit replacement projects ➤ Motor Generator replacement and upgrade projects ➤ Signalling Rectification and upgrade projects <p>Scope of works include the detailed design, check and verification activities:</p> <ul style="list-style-type: none"> ➤ Microtrax Design ➤ Microlok Data ➤ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ➤ Set to Works and commissioning support ➤ Circuit Book ➤ Signalling plan ➤ Control Tables ➤ Drivers Diagram ➤ Track Insulation Plan ➤ Bill of Materials ➤ Signal Sighting forms ➤ SFOS and concept plans ➤ Power Calculations and schematics ➤ Braking Calculations ➤ Headway calculations

Name of Project	Inland Rail Project from Parkes to Narromine (P2N)
Name of Client	WSP and Mott Macdonald (JV)
Commencement date of engagement	2018
Completion date of engagement	2020
Brief description of services provided	<p>The Inland Rail is a new freight rail connection infrastructure from Melbourne to Brisbane of less than 24 hours via regional New South Wales and Queensland. Key characteristics offer 1800m with future proofing for 3600m train length. Axle load 21 tonnes@ 115km/h, 25 tonnes@ 80km/h, with future proofing for 30 tonnes@ 80km/h.</p> <p>Sites completed:</p> <ul style="list-style-type: none"> ➤ Goobang JCN ➤ Goobang North ➤ Timjelly ➤ Nanardine ➤ Parkes SCT ➤ Goonumbla ➤ Peak Hill <p>Design, Check and Verification of:</p> <ul style="list-style-type: none"> ➤ Microlok Data ➤ Simulation Principle Testing ➤ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ➤ MISS Set to works ➤ Control Tables ➤ Circuit book ➤ Commissioning design support

Name of Project	ARTC - Vickery Extension Project (VEP)
Name of Client	Whitehaven Coal/ BG&E
Commencement date of engagement	2023
Completion date of engagement	2024
Brief description of services provided	<p>The Vickery Extension Project (VEP) is construction of a new rail spur comprising approximately 13.9km of single track and a 4.4km balloon loop. Connection of the rail spur to the ARTC Hunter Valley Heavy Haul Network via the ARTC Werris Creek to Narrabri railway line. Approx. 498.908km located in the single track section between Emerald Hill and Boggabri. Installation of a new signalling system on the rail spur with Frauscher R2 Axle Counters system and centralised train control (CTC). Modifications to the existing ARTC signalling system at Emerald Hill and Boggabri, including changes to the computer-based interlocking (Microlok) system and Microtrax coded track system.</p> <p>Scope of works included the detailed design, check and approval of the following deliverables:</p> <ul style="list-style-type: none"> ▶ MLK Data ▶ Simulation Principle Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ▶ Circuit Book ▶ Control Tables ▶ Signalling Plans ▶ Drivers Diagram ▶ Track Insulation Plan ▶ Detailed Site Survey ▶ Bill of Materials ▶ Signal Sighting Forms

Name of Project	Sydney to Narromine to Albury Cabling Upgrade works (SNACU) – Concept and SFOS to Detailed Design
Name of Client	Australian Rail Track Corporation (ARTC)
Commencement date of engagement	2024
Completion date of engagement	2025
Brief description of services provided	<p>The SNACU project has been nominated by ARTC as part of signalling rationalisation for the Interstate Network South and aims to improve asset reliability, reduce train delays and customer dissatisfaction, reduce temporary speed restrictions and improve worker safety sections by:</p> <ul style="list-style-type: none"> ▶ Replacing aged and exposed (aerial) infrastructure assets ▶ Introducing contemporary computer-based interlocking (CBI) Microlok II. ▶ Introducing Solar fed locations ▶ Increasing train detection visibility to Network Control <p>Key elements of signalling design works will include:</p> <ul style="list-style-type: none"> ▶ Removing 31 GIJ's ▶ Adding 8 new GIJ's ▶ 7 new signals (Down Direction), 7 new signals (Up Direction). ▶ 3 signals in Down direction and 3 signals in Up direction to be renamed. ▶ All new track circuits are Microtrax coded track circuits except 2AT, 2BT & 11CT. ▶ 4 new Solar locations & 4 new Battery locations. ▶ Only 2AT Location will be re-used for signalling, all other signalling locations will be new. ▶ 3 x LX huts will not be altered. ▶ 2 MG huts reticulating 120V to new locations 236.8, 247.0 & 255.8 ▶ New 40 core multicore from existing 2AT location to new G2 location. ▶ Updating naming to 3 existing locations. ▶ No change to LX operation other than replacing WBS with NBS as detailed in appendix B. ▶ Removing approximately 20 kilometres of life expired and non-compliant line wire. ▶ Introducing CBI logging of signal indications. ▶ Alignment to latest ARTC standards as of July 2024. <p>Scope of works includes the concept design, detailed design, check and approval of the following deliverables:</p>

Name of Project	Sydney to Narromine to Albury Cabling Upgrade works (SNACU) – Concept and SFOS to Detailed Design
	<ul style="list-style-type: none">▶ SFOS and associated documents▶ MLK Data▶ Simulation Principle Testing▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator)▶ Circuit Book▶ Control Tables▶ Signalling Plans▶ Drivers Diagram▶ Track Insulation Plan▶ Bill of Materials▶ Signal Sighting Forms

Name of Project	Breadalbane to Cullerin Upgrade works – Concept and SFOS to Detailed Design
Name of Client	Australian Rail Track Corporation (ARTC)
Commencement date of engagement	2021
Completion date of engagement	2022
Brief description of services provided	<p>Breadalbane to Cullerin Resignalling scope is the removal of 22 GIJ's, and upgraded to Microlok Interlocking with both controlled and auto signals with Microtrax coded track and train detection. Indications are sent from Microlok to NCCS (ARTC TCS) to remove a portion of dark territory.</p> <p>Scope of works includes the concept design, detailed design, check and approval of the following deliverables:</p> <ul style="list-style-type: none"> ▶ SFOS and associated documents ▶ MLK Data ▶ Simulation Principle Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ▶ Circuit Book ▶ Control Tables ▶ Signalling Plans ▶ Drivers Diagram ▶ Track Insulation Plan ▶ Bill of Materials ▶ Signal Sighting Forms ▶ Risk assessments

Name of Project	Mittagong to Aylmerton Resignalling – Detailed Design IFC
Name of Client	Australian Rail Track Corporation (ARTC)
Commencement date of engagement	2022
Completion date of engagement	2022
Brief description of services provided	<p>Decommission the mechanical lever frame at Mittagong whilst maintaining the functionality of the yard and to rationalise superfluous infrastructure. Replacing the life expired mechanical lever frame and relay-based controls with a modern CBI system that will provide a more robust and futureproof system. These works included Phoenix TCS, Kingfisher MTU, new interlocking location and Microtrax track circuits.</p> <p>Scope of works includes detailed design, check and approval of the following deliverables:</p> <ul style="list-style-type: none"> ▶ MLK Data ▶ Simulation Principle Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ▶ Circuit Book ▶ Control Tables ▶ Signalling Plans ▶ Drivers Diagram ▶ Track Insulation Plan ▶ Bill of Materials ▶ Signal Sighting Forms ▶ Risk assessments

Name of Project	Ettamogah-Albury Upgrade works
Name of Client	Australian Rail Track Corporation (ARTC)
Commencement date of engagement	2021
Completion date of engagement	2022
Brief description of services provided	<p>The scope of Ettamogah and northern end of Albury located on the ARTC-Sydney-Narromine-Ivanhoe corridor are removed superfluous signals, train detection arrangement, remove life expired aerial line and pole route, remove iMAC system, and upgrade the existing relay-based signalling system to Microlok signalling system and with Microtrax block section. The existing Block Section between Ettamogan and Albury is complicated with cooperative slot signals and required extensive analysing to maintain the existing site-specific operations.</p> <p>Scope of works includes detailed design, check and approval of the following deliverables:</p> <ul style="list-style-type: none"> ▶ MLK Data ▶ Simulation Principle Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ▶ Circuit Book ▶ Control Tables ▶ Signalling Plans ▶ Drivers Diagram ▶ Track Insulation Plan ▶ Bill of Materials ▶ Signal Sighting Forms ▶ Risk assessments

Name of Project	Cross River Rail – Clapham Dual Gauge Stage 2 Dutton Park Sailsbury Yeerongpilly Mayne
Name of Client	RCSA, Queensland Rail
Commencement date of engagement	2021
Completion date of engagement	Ongoing
Brief description of services provided	<p>The Cross River Rail is a new 10.2-kilometre rail line from Dutton Park to Bowen Hills, which includes 5.9 kilometres of tunnels under the Brisbane River and CBD. By unlocking the bottleneck at the core of the transport network, Cross River Rail will allow more trains to run more often to enable a turn-up-and-go transport system for the whole of Southeast Queensland. The Dutton Park Signalling component of the Cross River Rail project includes the design of two turnouts north of Dutton Park Station, four crossovers south of Dutton Park Station and the design of new tracks, signals, and infrastructure in between. Five signalling stages will be required to be commissioned in preparation of the ETCS tunnels for trains entering and exiting at Dutton Park in the Southern Area of Brisbane. Clapham Yard is the key southern stabling yard solution required to support Cross River Rail's ultimate requirement of running up to 24 trains per hour in each direction of the network. The project includes decommissioning of existing yard and construction of new yard to increase capacity to support additional trains. Seven signalling stages will be required to be commissioned.</p> <p>Triomf's involvement on this project includes detailed design, check, pass and RPEQ reviews for signalling design packages including the following:</p> <ul style="list-style-type: none"> ➤ Development of specification documentation ➤ MLK data ➤ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ➤ Set to work and data debugging ➤ Control tables ➤ As Plans ➤ Circuit Books ➤ PERs and SERs ➤ Cable Plans ➤ Power Schematics and calculations ➤ FLI calculation ➤ As-built works

Name of Project	North Coast Line Capacity Improvement Project
Name of Client	Queensland Rail
Commencement date of engagement	2020
Completion date of engagement	2023
Brief description of services provided	<p>The scope of works applies to the signalling design package for the North Coast Line Capacity Improvement Project incorporating several sites for the extension of eight passing loops from Rockhampton to Townsville. The interlocking type's for four sites were VPI (Alstom) Interlocked and four sites were Relay Interlocked. All sites utilise axle counters, four sites to replace the existing Siemens Axle Counter with the new Frauscher FAdC units and new local reset controls and four sites re-using Thales. One new Type F Level Crossing.</p> <p>The scope of works included detailed design, check, pass and RPEQ reviews and approval of the following:</p> <ul style="list-style-type: none"> ▶ Circuit Books for SERs, PERs and New Location Cases. ▶ Bonding Plans. ▶ Index and Station Layouts ▶ Main and Local Cable Layouts. ▶ Power Calculations. ▶ Bill of Long Lead Materials. ▶ Power Schematics and calculations ▶ FLI calculations ▶ As-built works ▶ SA2 forms ▶ Risk assessments and assurance (Safety case reporting)

Name of Project	VPI Upgrade works (10 sites)
Name of Client	Queensland Rail
Commencement date of engagement	2015
Completion date of engagement	2017
Brief description of services provided	<p>Due to frequency of component failures on Cleveland and Beenleigh lines (10 sites), the vital processor Interlocking (VPI) along with other components, are required to be upgrade to improve the reliability of the signalling system. Deliverables included the detailed design, check, pass and approval of the following:</p> <ul style="list-style-type: none"> ▶ New SERs and PERs ▶ New and existing locations ▶ level crossings designs ▶ VPI Application Data ▶ As Plans ▶ Control Tables ▶ Train Notice Diagram ▶ SA2 Forms ▶ Cable Plans ▶ Commissioning support ▶ As-Built works <p>Scope of works included:</p> <ul style="list-style-type: none"> ▶ New SERs, New PERs, replacing all aged signalling equipment ▶ All new components for VPI ▶ NVO cards & the maintenance panel removals ▶ Upgrade Power Equipment Room (PER) ▶ New DC track added at Beenleigh ▶ Point detection splitting at Beenleigh ▶ Signal Push Buttons removals ▶ Telemetry Override removals ▶ Auto Signal Features removals ▶ Rearrange Direct Input (DI) cards ▶ Preferred Overlap, swinging overlap updated ▶ Time of Operation update for points ▶ Level Crossing & PED Crossing upgraded. ▶ Simplified Bi-Directional Signalling removals ▶ ACO Boards replaced by DBO & Relay Circuits

Name of Project	VPI Upgrade works (10 sites)
	<ul style="list-style-type: none"><li data-bbox="715 320 1461 383">▶ Re-evaluate LX, PED approach & control sections for wrong road movement<li data-bbox="715 398 1426 432">▶ VPI Application Data upgraded to latest QR requirements

Name of Project	Services Contract - Design Services
Name of Client	UGL Regional Linx
Commencement date of engagement	2022
Completion date of engagement	On-going
Brief description of services provided	<p>Design, Check and Verification of:</p> <ul style="list-style-type: none"> ▶ Level Crossing upgrade projects (GCP) ▶ Turnout upgrade projects ▶ Points replacement and upgrades ▶ Power and UPS upgrades ▶ Frauscher FAdC Axle counter systems, replacement projects ▶ Motor Generator replacement and upgrade projects ▶ Microtrax Design & Testing ▶ Microlok Data Design & Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator)

Name of Project	Level Crossing and Signalling Upgrades Supply Signalling Design Services Agreement
Name of Client	John Holland CRN
Commencement date of engagement	2018
Completion date of engagement	2022
Brief description of services provided	<p>Design, Check and Verification of:</p> <ul style="list-style-type: none"> ▶ Major Signalling upgrades, ▶ New Passing Loops ▶ Passing Loop Extensions ▶ Level Crossing upgrade projects ▶ Pedestrian Crossing upgrade projects ▶ Turnout upgrade projects ▶ Points replacement and upgrades ▶ Power and UPS upgrades ▶ Frauscher FAdC Axle counter systems, PSO and AC & DC track circuit replacement projects ▶ Motor Generator replacement and upgrade projects ▶ Microtrax Design & Testing ▶ Microlok Data Design & Testing ▶ Microlok MISS Design and Simulation (Using Triomf's Microlok Simulator) ▶ Signalling Rectification and upgrade projects.

Name of Project	Pinecliffe New Crossing Loop
Name of Client	CRN John Holland
Commencement date of engagement	2019
Completion date of engagement	2021
Brief description of services provided	<p>Pinecliffe is a new crossing loop located between Molong and Manildra at 367.977km – 369.911km on the Main Western Line to accommodate 1800m long trains to reduce constrain on CRN Network. This section uses Train Order Working (TOW). A Train Management and Control System (TMaCS) is used to maintain the integrity of the TOW. Sandy Creek Rd located 371.1 upgraded to active level crossing with 3-DC track system. Works included:</p> <ul style="list-style-type: none"> ▶ The new turnouts 'A' and 'B' points motorised. ▶ The movements through the Pinecliffe Loop operated locally using pushbuttons and remotely via a Microlok & TMaCS interface. ▶ The new walk-in locations at 'A' and 'B' points to house the signalling equipment. ▶ Signalling Interlocking controlled by Microlok II System at 'A' and 'B' locations, connected via a fibre optic cable. <p>Scope of works includes detailed design, check and approval of the following deliverables:</p> <ul style="list-style-type: none"> ▶ MLK Data ▶ Design RS400 Configuration for peer-to-peer protocol communication ▶ Simulation Principle Testing support ▶ Microlok MISS Design and set to works ▶ Circuit Book ▶ Control Tables ▶ Signalling Plan ▶ Drivers Diagram ▶ Track Insulation Plan ▶ Bill of Materials ▶ Signal Sighting Forms ▶ Commissioning support