Sydney Trains

Engineering System Integrity

Engineering Procedure
Signalling and Control Systems

PR S 47118

Inspection and Testing of Signalling Signal Support Work

Version 2.1

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Document control

Version	Date	Author	Summary of change
1.0	8 March 2019	E Pace	New document based on RailCorp document SPG 0711.8. Inclusion of ATP requirements
1.1	10 October 2019	J Neeve, E Pace	Removed sample forms. Minor updates
2.0	21 September 2021	Ian Maydew/B Howell/C Darmenia	Major review addressing audit recommendations, axle counters, check of clearance points, EI S 20-08 & EI A 21-01
2.1	7 February 2024	C De Sousa	Minor modification to section 8.4

Summary of changes from previous version

Summary of change	Section
Improvement in the information provided in the second paragraph	8.4

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1 Introduction

The signalling system facilitates the safe and efficient movement of rail traffic. It provides safety benefits including separation between trains, protection at third party interfaces (e.g. level crossings) and continuity of the on-track portion of the traction return system. It also includes new systems like ETCS (ATP) that provide train over-speed protection and Automatic Selective Door Operation (ASDO).

The risk of interference or damage to the signalling system arising from other discipline works and any associated signal support activities need to be managed for the ongoing safety and reliability of the signalling system.

It is imperative that when planning to conduct works in the rail corridor to consult with the Signals discipline to ascertain whether any of the work could impact signalling equipment in order that the appropriate actions, protections and assurances can be planned prepared and implemented for the specific conditions and requirements for the works. This impact could be direct or indirect including at interfaces with adjacent networks (e.g. ARTC or CRN).

2 Scope

The scope includes all other discipline works that may impact or potentially affect any signalling infrastructure, and its safe or reliable operation. Representatives of works are to consult with the Signal Support Manager to determine requirements.

Works during an operational incident are excluded and are to be managed through the *MN S 40000 Signalling Safeworking Procedures*.

2.1 Purpose

The purpose of this procedure is to give directions for the planning, preparation and execution of Signal Support Work activities to facilitate works by other disciplines. This procedure covers the steps to be taken during the Planning, Implementation, Evaluation and Handover phases of the Signal Support Work Package.

2.2 Application

This procedure applies to staff from Sydney Trains, Technically Assured Organisations (TAOs) or contractors performing Signal Support Works on the Sydney Trains maintained network.

3 Reference documents

The following documents have been referenced within this procedure:

- *AS 4292 Railway Safety Management*
- *NWT 318 Work that affects traction return currents or track circuits*
- *MN S 40000 Signalling Safeworking Procedures*
- *PR S 40002 Temporary Bridging of Signalling Circuits*
- *PR S 40004 Failures*
- *PR S 40005 Damage to Signalling Equipment Including Cables*
- *PR S 40009 Disconnection of Signalling Apparatus*
- *PR S 40010 Risks and Controls Associated with Testing and Certifying Equipment*
- *PR S 40011 Renewals Work*
- *PR S 40012 Repair/Replacement of Signalling Wires*
- *PR S 40017 Maintenance Responsibilities and Frequencies*
- *PR S 40025 Track Circuits*
- *PR S 40026 Rerailing – Precautions to be taken*
- *PR S 40027 Traction Return (1500 v D.C.)*
- *PR S 40028 ETCS L1 – Alstom Trackside Equipment*
- *PR S 40029 Point Lock Testing – Mechanical*
- *PR S 40030 Point Lock and Detection Testing on Power Operated Points*
- *PR S 40051 Axle Counters*
- *PR S 41419 Authority to Work on Sydney Trains Signalling Infrastructure – Permit to Work*
- *PR S 47110 Inspection and Testing of Signalling: Introduction*
- *MN S 41418 Signalling Safeworking Incident Investigation*
- *MN S 41604 Alstom ETCS Trackside Maintenance Manual*
- *MN T 20203 Track Inspection*
- *MN T 20251 Turnout Installation and Repair*
- *T HR SC 10017 Signalling Design Principle – Train Detection Systems*
- *SPG 0709 Traction Return, Track Circuits and Bonding*

4 Terms and definitions

The following definitions apply in this document:

Term	Definition
Ballast Cleaning	Process for removing fines from in-track ballast by removing the ballast from the track, sieving it and returning graded ballast to the track in a continuous operation. Often includes addition of new ballast
Electrical Representative	The nominated person with appropriate authority to provide information and guidance in relation to interfaces between the electrical discipline and other disciplines
Grinding, Rail	Rail grinding re-profiles the surface of the rail so there is an even interface between the rail and wheel of the train, which helps make for a smoother ride for trains and removes flaws in the rail surface which can contribute to the creation of track geometry defects
Grinding, Turnout	Turnout grinding re-profiles the surface of the turnout components to remove minor rail defects usually associated with wear
Other Discipline Representative	The nominated person from any other (non-signalling) discipline with the responsibility to plan and complete works within the Sydney Trains network which require signal support
Package Holder	An optional delegate of the Package Lead who is suitably licensed and qualified, required for the delivery of signalling works. Signal Support Works may have multiple Package Holders, with one rostered to cover each shift
Package Lead	The nominated licensed signalling person who leads the Signal Support works. The Package Lead prepares the Signal Support Work Package and can perform the delivery of the works
Points Refurbishment	Points Refurbishment generally involves the ‘like for like” renewal of signalling and track components
Resleepering	Resleepering is defined as the renewal/upgrade of sleepers (e.g. timber for FFU type)
Regional Signal Representative	The Regional Signal Representative is a licenced Signal Engineer within the Network Maintenance Division responsible for the safety and integrity of the signalling system within a Region. This can include the Signal Engineering Manager, Regional Signal Engineer or Senior Signal Engineer
Resurfacing	Resurfacing is the process of lifting and lining the track with special machines to restore the correct track geometry. A ballast tamper, or track resurfacing machine, picks up and resurfaces the track by packing the ballast around the sleepers. This ensures the track is aligned correctly, providing a more solid foundation for the track and a smoother ride
Rerailing	Rerailing is the replacement of one or both rails usually due to wear or multiple rail head defects. The scope may in include change of rail size (e.g. 53 kg to 60 kg rail)

Term	Definition
Signal Support Engineer	A licensed signal engineer who is responsible for approving the completed Signal Support Work Package and who also provides technical support to the Package Lead during the planning and implementation phases of the works. The Signal Support Engineer may not delegate their allocated tasks unless provided for within Section 8.4
Signal Support Manager	The nominated representative of the Signal Support Service Provider who is a suitably licensed Signalling person (whether Sydney Trains employee or contractor) with appropriate authority to manage the delegated Signalling responsibilities associated with the provision of Signal Support Works. The Package Lead and the Signal Support Manager may be the same person
Signal Support Service Provider	The organisation or division performing Signal Support Works within the Sydney Trains rail corridor. E.g. Major Works Division, Network Maintenance Division, Master Services Agreement contractor, etc.
Signal Support Representative	An optional role that may assist in the scoping and planning of a Signal Support project and for the production of any required documentation needed to complete the works including the Signal Support Work Package
Signal Support Works	Signalling works undertaken by any engineering function or service provider (e.g. Major Works, Network Maintenance, Master Services Agreement contractor, etc.) for the purpose of facilitating works by other disciplines and which requires any of the following activities: • temporary disconnection and reconnection of signalling equipment tail cables and track leads • temporary removal and replacement of signalling equipment (including like for like replacement) • certification of the same or like Signalling infrastructure • placement and removal of protective devices by Signalling personnel • supervision of other discipline works • the provision and installation of mounting plates for trainstops where the sleepers are changed from timber to concrete • upgrading of track connections (e.g. hypalons), potheads and traction return bonding cables to meet current standards done in association with other signal support works Signal Support Works does not include the following: • work with the primary purpose which is to renew, replace, alter, relocate or modify Signalling infrastructure • any work which involves the placement of temporary rail bonds by track staff (i.e. does not require signal design or the certification/instruction by a signal engineer)

Term	Definition
Tamping, Production	Production Tamping typically involves mechanised track machines tamping non-conformances/defects along a line. Production Tamping typically includes a Ballast Regulator (Ballast Sweeper) which follows the tamper to correct the ballast profile

5 Signal support work timeframes

The Signal Support Manager is responsible for ensuring sufficient time is allocated to successfully plan the signal support works and develop the associated Signal Support Work Package. This is to take into account asset management possession planning requirements, consultation with other adjoining works and teams, consultation with the Regional Signal Representative and Signal Support Engineer and other requirements outlined within this procedure.

The below provided timeframes are subject to any individual business unit requirements, for example Asset Management and Network Maintenance.

The Signal Support Manager will decide to accept or reject any further changes of scope that will affect the Signal Support Work Package in accordance with Section 6.2.

The Signal Support Work Package shall be prepared with sufficient time for the Package Lead and any Package Holders to review and familiarise themselves with the scope, material requirements, site conditions and perform the necessary prior inspection, checks and testing.

The nominal period for such review is two weeks, however complex works and areas will generally require more preparation time than the nominal period.

Where the Signal Support Work Package is prepared, delivered and lead by the Package Lead, following approval by the assigned Signal Support Engineer, the works may immediately be implemented.

The approved Signal Support Work Package is to be emailed to the Regional Signal Representative with a nominal period of 2 weeks prior to works.

Handover documentation is to be forwarded to the Regional Signalling Representative by the Package Lead/Package Holder on completion of works and no later than 48 hours of booking into use. Refer to Section 10.

6 Responsibility assignment/RACI matrix

The matrix below assigns responsibilities to the key roles in the provision of Signal Support Work for a typical other discipline project.

Responsible: Is responsible for the execution of the task. This person may also decide if the task is not required or needs to be altered.

Accountable: Is accountable for the tasks, signs off and is answerable for the outcome of the work. They ensure responsibilities are correctly assigned and all tasks have been addressed.

Consulted: Are the subject matter experts who are to be consulted for review or provide input.

Informed: People who need to be kept informed on progress or decisions, but do not need to be formally consulted. The flow of information is typically in one direction. However, all licenced Signalling personnel have an obligation to feedback any concerns should they arise.

Table 1 – RACI matrix

	Other Discipline Representative	Signal Support Manager	Signal Support Engineer	Package Lead	Regional Signal Representative
Planning/Preparation					
Determine other discipline scope of works	RA	-	-	-	-
Request other discipline scope change	RA	C	I	I	-
Engage Signal Support Manager	RA	I			
Request Signal Support determination	RA	C	-	-	-
Determine if Signal Support is required	I	RA	-	-	-
Agree to provide Signal Support to requested scope of works or scope change	I	RA	-	C	-
Arrange joint site inspection to determine signalling scope	RA	R	-	C	-
Project coordination with other planned works including impacts on traction return	RA	C	I	I	-
Signalling Safeworking coordination with other planned works	C	A	-	R	-
Arrange project plant and materials	RA	C	-	C	-
Arrange Signalling specific materials, tools and equipment	-	A	-	R	-
Coordinate with Electrical Discipline Rep. (e.g. permits or Elec staff required)	RA	I	C	C	-
Collating relevant signalling documentation. i.e. Circuit Books, IMC's, Sig Plan, TIP, Air System Schematics	-	-	AC	R	C
Identify specific maintenance and site integrity issues	-	-	AI	R	C
Nominate Signal Support Team (e.g. Sig Support Engineer, Package Lead/Package Holders)	-	RA	C	I	-
Provide Technical support for the works all phases	-	A	R	C	-

	Other Discipline Representative	Signal Support Manager	Signal Support Engineer	Package Lead	Regional Signal Representative
Produce Signal Support Work Package	-	A	-	R	-
- Define detailed signalling scope of works	-	A	-	R	-
- Develop I&T plan	-	-	A	R	-
- Prepare Disconnection List	-	-	A	R	-
- Prepare IBA's	-	-	A	R	-
- Assign competent and accredited staff to tasks	-	RA	C	I	-
- Develop Rosters	C	RA	C	I	-
- Prepare Temporary Bonding plans	C	-	AC	R	-
- Assess requirement for Rail Gap bonds	C	-	RA	C	-
- Prepare Bridging Authorities	-	-	A	R	C
- Permits to Work	-	-	RA	C	-
- Prepare work instructions	-	-	A	R	-
Arrange for review of Signal Support Work Package	-	A	-	R	-
Approve Signal Support Work Package	-	-	RA	-	-
Email Approved Signal Support Work Package to Region prior to works	-	AI	R	I	I
Detailed site investigation (with Approved Signal Support Work Package)	-	A	-	R	-
- Correlation of Disconnections	-	A	-	R	-
- Review Track/Point/Wheel Sensor History Cards	-	A	-	R	-
- Confirm Bonding/Polarity to TIP	-	A	-	R	-
- Zero Feed prior to GIJ replacement	-	A	-	R	-
- Identify concerns to Signalling scope SFAIRP (e.g. defects, temp repairs, disconnected assets)	-	A	C	R	I
Implementation					
Manage Signal Support Work Package including scope changes	-	A	-	R	-

	Other Discipline Representative	Signal Support Manager	Signal Support Engineer	Package Lead	Regional Signal Representative
Lead Signalling works and interface with other works	-	A	-	R	-
Ensure compliance with Signalling Safeworking Procedures	-	-	A	R	-
Evaluate Signal Support Work Package after completion of works including the completion of Signal Support Status Certificate	-	A	-	R	-
Completion/Handover					
Collate and email handover documentation	-	A	I	R	I
Conduct post review of finalised Signal Support Work Package on completion	C	RA	C	C	-
Archival storage of finalised Signal Support Work Package	-	A	-	R	-
Arrange conduct follow up inspection, required adjustments and repairs	-	RA	I	C	I
Arrange for follow up removal of any defects left by works	A	R	I	C	I
Provide reports in accordance with PR S 40004 and MN S 41418	C	C	RA	C	C

6.1 Other discipline representative

Signal Support Works are initiated by a request from an Other Discipline Representative. The Other Discipline Representative provides the scope of work for each possession/closedown in order to identify the actions, responsibilities and the required signalling support is provided.

Functions include:

a. Engage a suitably licensed Signal Support Manager.

b. Giving timely advice for requesting signal support by submission on form *PR S 47118 FM001 Request for Signal Support* (or approved equivalent) to the Signal Support Manager of the relevant scope of works in order to determine signal support requirements.

c. Ensuring project coordination planning with other planned works in the area. The forum for this is typically through Possessions management meetings.

d. Obtain and provide timely advice on adjacent project scopes and contact details from pre-possession co-ordination meetings, possession notes or similar to enable detailed assessment by the Package Lead and Signal Support Engineer in regard to planned works affecting traction return for example works cutting rails, Electrical discipline isolations and disconnection of traction bonding.

e. Arranging for a joint inspection of the site in consultation with the Signal Support Manager where required. Further, arranging a follow up site inspection for any proposed scope changes that will affect the signalling scope of works.

f. Obtain agreement from the Signal Support Manager for any proposed changes to scope. Major changes to the track work scope may only be considered by the Signal Support Manager prior to the detailed planning phase. Scope change details are to be recorded on form PR S 47118 FM001 (or approved equivalent) and will include sufficient detail to identify changes e.g. activity type, extent of the work area, location or times of the work.

g. Arrange for plant and materials such as test engines, excavators, hi-rail machines, rail grinders etc. in consultation with the Signal Support Manager (**Note** excludes signalling specific minor plant – see Section 6.4)

Special provisions are required when the work involves the removal of connections at substations and section huts to rail. This includes situations where the removal of rails may potentially isolate such connections. In these situations the Other Discipline Representative shall ensure that the Electrical Representative and assigned Signal Support Engineer is consulted and advised.

6.2 Signal Support Manager

The Signal Support Manager is the representative of the Signal Support Service Provider who is accountable for the coordination and planning of the Signal Support Works to the agreed scope of works of the Other Discipline Representative. The Signal Support Manager shall be a suitably experienced licensed and qualified signalling person for the complexity of works to be undertaken.

Functions include:

a. Determine if signal support is required, inform other Discipline Representative and archive *PR S 47118 FM001 Request for Signal Support* (or approved equivalent).

b. Coordinating, planning, monitoring and evaluating the signalling scope of works and all associated Signal Support resources, Signal Support Work Packages and signalling interfaces including adjacent networks. Signalling resources are to be suitably experience and accredited to the complexity of the works to be undertaken including the ability to undertake corrective work as necessary.

c. Arranging suitably experienced qualified staff to attend the joint site inspection of the work and documenting the signalling scope of work. The joint site inspection may be substituted by a desktop review in plain track areas where it is clearly evident that signalling apparatus will not be affected.

d. Managing the registration, development, review, approval, implementation, follow up and archiving of the Signal Support Work Packages.

e. Notifying the Other Discipline Representative of the Signal Support Work program requirements including activity descriptions, durations, hold points and notification requirements.

f. Engage a suitably experienced and licensed Signal Support Engineer to be responsible for review and approval of the Signal Support Work Package and provide technical support.

g. Nominating a suitably experienced and licensed Package Lead to be responsible for the planning and delivery of the Signal Support work.

h. Where the signalling scope requires, nominating suitably experienced and licensed Package Holder(s) to be responsible for the delivery of the Signal Support Work.

i. Post review of Signal Support Work Packages and arranging for storage and retention (archiving) when completed.

j. Arranging for appropriate follow up maintenance inspection and/or adjustment of the Signal Support work e.g. checking for settlement of the track under normal traffic following the track/points work, where the Signal Support Work was carried out under adverse weather conditions.

k. Consult with Regional Signal Representative regarding rectification of any existing defect of concern identified during scoping.

l. Arrange for the rectification of defects arising from the works within in a timeframe agreed with the Regional Signal Representative.

The Signal Support Manager shall not commit to support additional scopes or proposals to alter scopes where:

i. Insufficient detailed scope definition is provided by the Other Discipline Representative.

ii. Signalling integrity or reliability risks may result from the change that cannot be properly assessed and controlled within the remaining timescale.

iii. Insufficient restoration time will be available following the completion of work by other disciplines, taking into consideration safety issues such as Signalling personnel to working within, adjacent to, or below other work activities or machinery e.g. rail welding – overhead wiring work – trains - track machines.

iv. Contingency planning for other works fails to address Signals access, restoration and testing requirements.

v. The timescale would be compressed to the extent that proper review and approval of the Signal Support Work Package may be incomplete, or where processes involved in temporary works, temporary traction plans, bridging authorities and any required approvals are incomplete.

vi. Team availability or excessive workload affects contingency management or availability of work teams to conduct surveillance during the work to check and repair damage, e.g. travel time between work locations.

vii. There is a lack of availability of licensed signalling personnel to assess the scope of work and site conditions.

viii. Signalling material requirements are special or exceed the procurement lead time.

ix. Detailed planning and preparation has progressed to a stage that would require major rework affecting the planning activities of future work.

The Signal Support Manager shall advise the Other Discipline Representative each time commitment to support is not possible or withdrawn.

6.3 Signal Support Engineer

The Signal Support Engineer shall be a licenced signal engineer holding the appropriate permit to work to implement the support works.

Functions of the role include:

a. Providing technical support and advice for all phases of the works.
b. Consult and clarify with the Regional Signal Representative in cases where field documentation is in doubt.
c. Assess requirement for Rail Gap bonds.
d. Review and approved Temporary bonding plan.
e. Provision of Permits to Work.
f. Email approved Signal Support Work Package to Region prior to works.
g. Review and approval of the Signal Support Work Package.
h. Provide reports in accordance with *PR S 40004 Failures* and *MN S 41418 Signalling Safeworking Incident Investigation* arising from the works.

When reviewing the Signal Support Work Package the Signal Support Engineer shall ensure that:

i. Track work scope is clearly defined.
ii. Signal support work scope is clearly defined.
iii. Works program has sufficient time available.
iv. Input documentation is up to date (e.g. including interim maintenance copies).
v. Material requirements have been properly scoped and sourced.
vi. Inspection and test plan and typical work instructions have been tailored to the scope, are detailed and complete.
vii. Temporary bonding plan is correct and approved.
viii. Authorise through risk assessment when Rail Gap bonds are not intended in accordance with Signalling Safeworking Procedures.
ix. Bridging authorities are correct and approved.
x. IBA details are correct.
xi. Disconnection lists are correct and complete.
xii. Site specific factors that may affect operational signalling or Local Instructions are addressed.
xiii. Staff resources are adequate for the works.
xiv. Staff competencies are checked against work allocation and issue Signalling Permits to Work.
xv. The Signal Support Work Package is complete.
xvi. The Signal Support Work Package is updated to include any changes or advice prior to providing approval.

If the Signal Support Work Package is incomplete or inadequate it shall be returned to the Package Lead for rework as required.

Once the Signal Support Work Package is complete and acceptable the Signal Support Engineer shall sign off the Signal Support Work Package Checklist and approve the Signal Support Work Package.

6.4 Package Lead

The Package Lead is the role responsible for planning and implementation of the Signal Support scope of work and its documentation in the Signal Support Work Package. The Package Lead shall be a suitably licensed and qualified Signals person.

Signal Support Works shall have one assigned Package Lead to lead the delivery of Signal Support Works. They may be assisted by a Signal Support Representative (refer to Section 6.4.2) or a Package Holder (refer to Section 6.4.1) to perform their duties, however accountability and responsibility remains with the Package Lead.

Where required, multiple Package Holders may be assigned. All Package Holders shall require sufficient time to review and familiarise themselves with the scope, material requirements, and site conditions.

The Package Lead is responsible for the following:

a. Conducting a detailed site investigation and developing of the Signal Support Work and Signalling interface scope.

   This includes but not limited to a correlation check, polarity checks, and a check of the number and size of cables, etc. between the maintenance copy and the as-installed arrangements and current practice. Any discrepancies are to be raised with the Signal Support Engineer for resolution prior to commencing the work.

b. Through consultation with Regional Signal Representative, identifying any specific maintenance and site integrity issues regarding the particular Signalling apparatus affected by the work such as existing defects, reliability issues, set-up and adjustment requirements, insulation defects, temporary repairs, equipment booked out of use, existing bridging authorities, deviations or concessions.

c. Carry out a correlation check of circuit disconnections where the accuracy of the existing documentation is in doubt. Any discrepancies are to be raised with the Signal Support Engineer and Regional Signal Representative for resolution prior to commencing the work.

d. Taking (and storing) photographs of site conditions during the preparation, implementation and evaluation phases. A text file index describing the photographs and any issues related to the job should be included with the completed Signal Support Work Package. The link to the location of the photographs is included in Section 9 of the Signal Support Work Package.

e. Coordination of Signalling Safeworking with adjacent work groups in consultation with the Other Discipline Representative.

f. Preparing a Signal Support Work Package including tailored work instructions for the required work including the following activities:

   i. Use of IBA's including the equipment disconnection lists.

      In addition to circuit disconnections, the equipment disconnection list shall also include Signalling apparatus temporarily removed (e.g. ATP balise, signage, axle counter head, bonding), isolated (e.g. air main, air hose), secured (e.g. point clip + lock) or suppressed (e.g. trainstop).

      The disconnection list (see Section 7.3.5) shall include the method of identification of disconnection (e.g. coloured isolation pin with tags, isolation tags for air valves/circuit breakers).

      The disconnection list must define where signalling apparatus will be stored after removal (e.g. trainstop spring stored in location, pins + fuses kept in bag at each location, location of stored balises etc.).

ii. Applying and removal of bridging authorities.

iii. Testing and certification of signalling apparatus.

iv. Clear and unambiguous delegation to the person to be issued a Work Instruction listing all required activities and tasks including documentation to be certified. (The person who is issued with a work instruction is delegated responsibility for the completion and documentation of the required activities/tasks).

v. Advising of staff resource requirements including the required competencies and Permits to Work's, including any requirements for testing assistants or signal electricians located at the signal box/control centre.

vi. Including staff names and roster details at the time of submission for review of the Signal Support Work Package to enable issuing of Permits to Work by the Signal Support Engineer.

g. Arranging signalling specific minor plant and materials, as required.

h. Ensuring the availability of spare and emergency equipment. Where arrangements have been made with Network Maintenance for the use of its inventory stock, the Package Lead shall notify the Regional Signal Representative in the handover of the consumption for entry into the inventory management system.

i. Provide a handover brief to the Package Holder where required.

The following tasks may be undertaken by the Package Lead or a Package Holder:

j. Ensuring compliance with the Network Rules and Procedures and Network Local Appendices including the provisions for Worksite Protection and notifying ICON Infrastructure and the Possession Protection Officer (PPO) of planned works and any incidents.

k. Ensuring copies of IBA's are provided to the Possession Protection Officer (PPO) immediately following Booking Out and Booking In.

l. Coordinating with track works, other work groups, and maintenance staff during works.

m. Complying with the requirements of the Sydney Trains Signalling Safeworking Procedures, Equipment Manuals, and any Engineering Instructions and Advices.

n. Ensuring compliance with the Sydney Trains Safety Management System and the Workplace Health and Safety Regulations.

o. Implementation of the Signal Support Work including:

i. Issuing and registration of work instructions.

ii. Entering records of events in the Signal Support Log.

iii. Overseeing the work and managing scope change during the work.

iv. Seeking technical advice and support from the Signal Support Engineer during the works, as required.

p. Evaluating the Signal Support Work including:

i. Reviewing and certifying the Signal Support Works Status Certificate.

ii. Completing the Signal Support Work Package prior to booking the Signalling infrastructure back into use.

q. Completing handover of the Signal Support Work including:

   i. Promptly emailing the handover documentation to the relevant Regional Signalling Representatives and Signal Support Engineer. Refer to Section 10.

   ii. Immediately advising the Regional Signalling Representative, Signal Support Engineer, Signal Support Manager of details of any signal support carry over work or outstanding defects.

   iii. Promptly returning the completed Signal Support Work Package to the Signals Support Manager.

6.4.1 Package Holder

Where required, the Package Holder is a suitably licensed and qualified Signals role who is a delegate of the Package Lead for the delivery/supervision function of the signalling works. This role leads the works and manages the Signal Support Work Package while the Package Lead is not on site or duty (e.g. overnight shift or assigned elsewhere).

6.4.2 Signal Support Representative

The Signal Support Representative is an optional role that may assist in the scoping and planning a Signal Support project and for the production of any required documentation needed to complete the works, including the Signal Support Work Package.

The Signal Support Representative need not be a licenced signal person, but shall have the relevant knowledge and experience to enable them to properly scope the signalling works and produce the Signal Support Work Package.

The Signals Support Representative being an assisting role has no accountability or responsibility, this remains with the Signal Support Manager and the Package Lead.

6.5 Regional Signalling Representative

For the purposes of Signal Support Works the Regional Signalling Representative is a licenced Signal Engineer within Network Maintenance responsible for the safety and integrity of the signalling system within a Region. This can include the Signals Engineering Manager, Regional Signals Engineer or Senior Signals Engineer. These roles may provide site specific signalling requirements and guidance to Signal Support Engineer and Package Lead for the Signal Support Work Package.

When consulted, the Regional Signalling Representative should provide comment on any specific maintenance and site integrity issues regarding the particular Signalling apparatus affected by the work. They should also note any known environmental or WH&S matters. This may include known defects, reliability issues, set-up and adjustment requirements, insulation defects, temporary repairs, equipment booked out of use, deviations or concessions granted and any provisions required related to future planned work. Any additional requests for documentation or reporting requirements for inclusion in the handover is also to be stipulated.

The Regional Signalling Representative for each affected region shall be informed of the works.

Induction & Permit to Work Induction Pack may be obtained from the following site: http://intranet.sydneytrains.nsw.gov.au/branches/engineering-and-maintenance/network-maintenance/divisional-documents. If intranet access is not available a copy may be obtained from the respective Region using the below contact email addresses.

The respective Regional Signal Representative is to be contacted by the following group email addresses: (**note** areas of responsibility shown are approximates).

Central Region (inclusive of Waverton-Erskineville-Clyde-Sefton-Marrickville)
MaintenanceEngineering-Signals-CentralRegion@transport.nsw.gov.au

Illawarra Region (inclusive of St Peters-Turrella-Green Square-Bomaderry)
MaintenanceEngineering-Signals-IllawarraRegion@transport.nsw.gov.au

North Region (inclusive of North Strathfield-Hamilton-Wollstonecraft)
MaintenanceEngineering-SignalsNorthRegion@transport.nsw.gov.au

West Region (inclusive of Granville-Lithgow-Chester Hill-Bardwell Park-Macarthur)
MaintenanceEngineering-Signals-WestRegion@transport.nsw.gov.au

7 Signal Support Work Package

A Signal Support Work Package shall be based on the template forms found in Section 13 and shall typically be comprised of the sections detailed below.

The *PR S 47118 FM002 Signal Support Work Package* is a template that may have sections added or omitted based on the complexity of the signalling scope of works and co-ordination required. The Signal Support Work Package should be concise and contain only the necessary information required to maintain the integrity of the signalling system such as, but not limited to authorisation, delivery and certification.

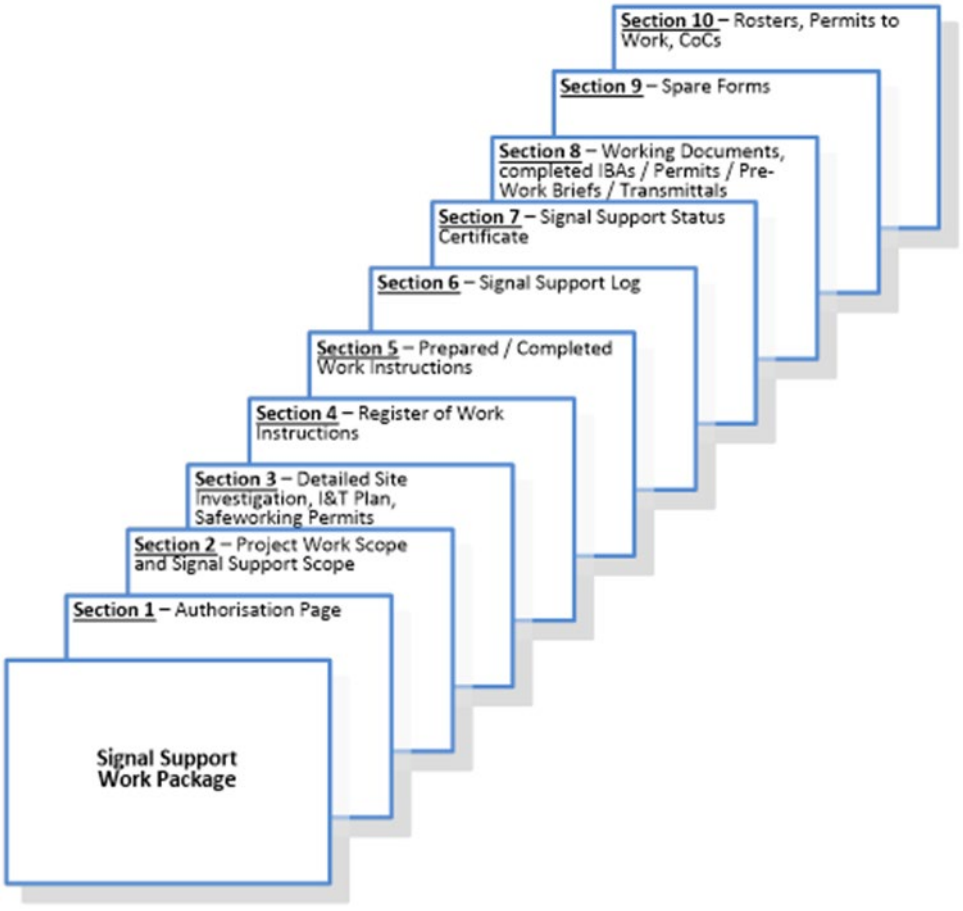

Figure 1 – Signal Support Work Package outline

7.1 Section 1: Authorisation

The Signal Support Work Package Authorisation is prepared using the template form *PR S 47118 FM002 Signal Support Work Package*.

The following details are to be provided on the Signal Support Work Package Authorisation Form:

a. Project Name – This is the description of the track works that requires Signal Support.

b. Location – Location of the works.

c. Registration Number – This is the registration number given to the Signal Support Work Package (the registration number is provided by the Signal Support Service Provider).

d. Package Lead – The name, contact and classification of the responsible person.

e. Package Holder(s) – The name, contact and classification of the responsible person(s).

f. Track Scope of Works – Shown with sufficient detail to adequately describe the what, where and when of the works which the Signal Support Work Package has been developed to support.

g. Regional Signalling Representative/s – The name(s) of the nominated Regional Signalling Representative(s).

h. Site Integrity or Reliability Issues – Enter relevant details or attach where there is insufficient space.

i. Prepared By – The name and classification of the Package Lead who prepared the Signal Support Work Package.

j. Reviewed By – The name and classification of the other licensed person who reviewed the Signal Support Work Package.

k. Package Approved by – The name and contact of the approving Signal Support Engineer.

l. Signal Support Work Package Post Review – The name of the licensed person who post reviewed the completed Signal Support Work Package.

The Authorisation sheet is inserted into Section 1 of the Signal Support Work Package. Other documents are inserted into the Signal Support Work Package as they are prepared.

7.2 Section 2: Project Work Scope

This section details the other discipline scope of works. It must also list key site contacts for the other discipline scope works, including role and shift times.

7.3 Section 3: Detailed Signalling Scope

Section 3 is comprised of a number of subsections as detailed below.

7.3.1 Signal Support Scope of Work

This section identifies the general details of the signal support including but not limited to:

- location, lines affected
- signalling equipment effected
- equipment types (makes and models)
- traction return provisions
- interface requirements with third parties (both internal and external)
- protection requirements

7.3.2 Detailed Site Investigation

The Other Discipline Representative uses the approved scope of works and arranges for a joint site inspection prior to the execution of the works to enable preparation of the detailed signal support scope. The information is captured using the Detailed Site Inspection Form and the Turnout Refurbishment Scoping Form as applicable, located within PR S 47118 FM002. Photos are to be taken during the inspection of all affected signalling equipment and work area.

The inspection shall include but not limited to a correlation check of the as–installed arrangements to the Track Insulation Plan, cabling, polarities, axle counter wheel sensor positions etc., refer to Section 6.4 for Package Lead requirements.

7.3.3 Inspection and Testing Plan – Signal Support Works

The Package Lead uses the information received from the approved scope of works and the detailed site investigation to compile an Inspection and Testing Plan. This is a job specific, version controlled document listing the following details:

a. Names and types of removed/refitted or affected Signalling assets.
b. Names and types of renewed or repaired Signalling assets.
c. A list of all Signalling Safeworking requirements, e.g. Bridging Authorities, equipment to be “Booked Out of Use” and disconnected or suppressed, testing of Interlocking’s, rerailing/traction return provisions including requirements for temporary design, concessions and deviations, electrical, mechanical and pneumatic risk assessments.
d. Other requirements e.g. possession requirements to perform the works including, test locomotive, electrical permits, "wheels free" requirements for certification testing, worksite protection requirements and level crossings affected.
e. Listing of other disciplines and parties involved with the works.
f. Personnel requirements.
g. Special training/competency/access requirements.
h. Special considerations.

7.3.4 Disarranging/rearranging and Signalling safeworking requirements

This form is used to plan the work instructions required to implement the nominated activities for each piece of apparatus and the Signalling safeworking requirements. Activities to be planned include the detailed operational function testing required prior to bringing signalling back into use.

7.3.5 Equipment disconnection lists

After verifying that the latest signal design documentation including any relevant interim maintenance copies is at hand, a detailed and logically organised list of disconnections is developed. This list will be attached to the related work instruction during implementation of the works.

The equipment disconnection list is to include equipment:

- circuit disconnections (pins, fuses, links, wires etc.)
- temporarily removed (e.g. ETCS balise, bonding, signage, axle counter wheel sensors)
- isolated (e.g. air valves, mains, hoses, manifolds etc.)
- secured (e.g. point clip and lock), or
- suppressed (e.g. trainstop).

The disconnection list shall include the method of identification of disconnection (e.g. coloured isolation pins with tags, isolation tags for air valves/circuit breakers).

To clearly capture disconnections for equipment such as signage or traction bonding, supplementary documentation (e.g. signal plans, track insulation plans etc.) shall additionally be marked up to capture temporary removals and attached to the disconnection list. The supplementary documentation shall be referenced against the equipment on the disconnection list.

The disconnection list shall define where signalling apparatus will be stored for safe keeping after removal (e.g. trainstop spring stored in location, pins and fuses kept in bag in each location, ETCS balise in location etc.).

Disconnections, including isolations for Bridging Authorities are to be listed on a separate page and clearly identified with the associated Bridging Authority number so that there is no possibility of unintentional restoration as part of the works.

7.3.6 Register of safeworking forms, certificates and permits

During the planning phase consideration shall be given regarding what safeworking forms and other certificates and permits are required to support the works. A register of such documents shall be kept in Section 3 of the Signal Support Work Package.

7.4 Section 4: Register of Work Instructions

An itemised register of work instructions is maintained in Section 4 of the Signal Support Work Package. The register includes provision to record the issue and return of each work instruction.

Work Instructions for Signal Support activities shall include but are not limited to the following:

a. Booking Signalling infrastructure out of use
b. Disconnecting and removing Signalling infrastructure
c. Application and removal and testing of temporary bridging
d. Supervising and protecting of Signalling infrastructure
e. Like for Like replacement of Signalling infrastructure
f. Booking Signalling infrastructure back into use.

Work Instructions shall include but are not limited to the following typical Inspections and Tests:

a. Trainstops - apparatus inspection, adjust, test, certify
b. Track circuits - apparatus inspection, adjust, test, certify
c. Axle counter wheel sensors – apparatus inspection, adjust, test, certify
d. Points electric - apparatus inspection, adjust, test, certify
e. Points electro pneumatic - apparatus inspection, adjust, test, certify
f. Points mechanical - apparatus inspection, adjust, test, certify
g. Level Crossings - apparatus inspection, adjust, test, certify
h. ETCS balise - apparatus inspection, test (as applicable), certify.

7.5 Section 5: Prepared and completed Work Instructions

Completed work instructions provide a traceable record of its implementation and evaluation of the works.

Work instructions shall be produced detailing the relevant signalling safeworking activities required by MN S 40000 and shall be developed based on the typical Signal Support procedures found in Section 12 and typical work instructions included in Section 14.

The provided typical work instructions are intended as a template and are be tailored to suit the specific works. Work instructions are not intended to limit the scope of the adjustment, inspection, testing and certification activities. Where a template is not provided then a work instruction is to be developed utilising the *PR S 47118 FM030 Spare Work Instruction* template as a base.

Where authorised non signalling discipline personnel are utilised for the removal or reinstatement of balises, specific work instructions are to be included in the Signal Support Work Package for:

- Authorised persons removing, reinstating and on-site certification of affected balises.
- Certification of reinstated balises.

The detailed site investigation documents are used to prepare possession/closedown specific work instructions for the implementation phase of the works. Typical work instructions are reviewed and if the particular requirements differ they are amended to include the possession/closedown site-specific requirements.

Each work instruction is set out so that each critical task can be individually checked off. Work instructions are created to match the planned program of activities. The number of activities on a work instruction shall be limited to what can reasonably be expected to be completed within each shift.

Where they are found not to be fully inclusive, compliant with standards and procedures, or if a particular situation arises that requires new activities to be added or new work instructions to be produced then it is the responsibility of the Package Lead to make those amendments.

Each Work Instruction is entered on the Register of Work Instructions (Section 4 of the Signal Support Work Package) and allocated a unique number.

The prepared work instructions are inserted into Section 5 of the Signal Support Work Package.

7.6 Section 6: Signal support log

The Signal Support Log is an activity log that shall be used to formally record any queries, discrepancies or deficiencies arising during the works. The Signal Support Log shall also include all activities, tasks and events not covered by work instructions. The Signal Support Log shall provide a traceable record to detail to resolution usually minor issues. Where the resolution of the issue requires inspection and testing, detailed activities, or tasks to be undertaken, a work instruction shall be created and registered. The Signal Support Log shall be updated to include the number of the particular work instruction created to action the issue. Traceability shall be possible for all matters included in the Signal Support Log.

The Signal Support Log shall include the following:

a. All reports made by persons issued with work instructions.
b. All activities or events that require further action are entered into the Signal Support Log and the "Action" column completed.
c. Entry of information and the control and signing off the Signal Support Log.
d. Incomplete work instructions.
e. Details of any equipment damage.
f. Details of incidents including delays to the works cause by weather.
g. The reasons for and details of any additional scope.
h. Details of who and when the management of the Signal Support Work Package is handed over between shifts/between Package Holders.

7.7 Section 7: Signal Support Status Certificate

When satisfied that all required rectification, inspection, testing and certification is complete and meets all rail safety requirements, the Package Lead/Package Holder shall complete and sign the Signal Support Status Certificate and then proceed to book the affected signalling back into use in accordance with the provisions of the Network Rules and Procedures.

7.8 Section 8: Working and completed documents

This section is a convenient place to store active documents during the works such as Infrastructure Booking Authorities, permits, pre-work briefs, and transmittals.

7.9 Section 9: Spare forms

Considering the relatively short duration of a signal support job (typically hours or a day or two) it may be expeditious to have a selection of spare forms available on site within the Signal Support Work Package. Examples of useful forms include:

a. Blank work instruction(s)
b. Spare Signal Support Log Sheets
c. *PR S 40002 FM01 Authority for Temporary Bridging of Contacts*
d. *PR S 40005 Appendix A – Damage to signalling and safeworking equipment checklist*
e. *PR S 40017 FM01 Monthly Return for Signalling Maintenance Tests and Inspections*
f. *PR S 41515 FM01 Notification of Rail Bonding*
g. Spare work instructions for “Like for Like Replacement” - for emergency repairs
h. Spare Track Circuit/Point History Cards

i. MN T 20203 FM26 Combined Signal and Track Inspection Form – Baseline Monitoring

7.10 Section 10: Rosters and Competency

The last section of the Signal Support Work Package contains a copy of staff rosters along with copies of the signal support team members Certificate of Competencies, Permits to Work or the Permit to Work register in accordance with *PR S 41419 Authority to Work on Sydney Trains Signalling Infrastructure – Permit to Work*.

7.11 Review and Approval of the Signal Support Work Package

The Signal Support Work Package shall be reviewed by another suitably qualified and licenced Signal person (which may be the Signal Support Manager, Signal Support Engineer, a Package Holder or other signal licenced person) to determine that the Signal Support Work Package is complete and the scope of works fully addressed. The Signal Support Work Package is reworked as required until the licenced person is satisfied that it is accurate and complete. The reviewer shall complete the review areas of the Signal Support Work Package Checklist and, if satisfied that the Signal Support Work Package is complete and fully supports the scope of works, sign as the Signal Support Work Package reviewer on the Authorisation Sheet in Section 1 of the package.

The reviewed Signal Support Work Package is submitted to the assigned Signal Support Engineer for their approval.

The Signal Support Engineer is responsible for approval of any temporary bonding plan and bridging authorities. The Signal Support Engineer may further consult with others for any clarification, site specific information, special requests or concerns about the works planned. This may include the interaction between this specific job and any other works occurring at the same time, i.e. traction return interaction across multiple worksites.

The Signal Support Engineer shall complete the approval areas of the Signal Support Work Package Checklist and, if satisfied that the Signal Support Work Package is complete and fully supports the scope of works, approve the Signal Support Work Package on the Authorisation Sheet in Section 1 of the Signal Support Work Package.

Once the Signal Support Work Package is approved the Signal Support Engineer shall forward the Signal Support Work Package to the Signal Support Manager, Package Lead and Regional Signal Representatives by email correspondence prior to works.

Refer to Figure 2: Signal Support Work Package Development Workflow.

Signal Support Work Packages prepared by Network Maintenance to repair urgent defects (for example an operational incident is initially managed with the rectification occurring later that night) may be approved by the Signal Support Engineer post works. In this scenario, the Regional Signal Representative will also perform the role of the Signal Support Engineer. The review and approval is to occur as soon as practicable.

8 Implementation phase

8.1 Work instructions

The implementation phase of the works is controlled by the use of prepared work instructions issued to the nominated licensed personnel. The issue and return of work instructions is recorded in the Register of Work Instructions.

The person to whom the work instruction is issued shall:

a. Complete all of the tasks shown on the Work Instruction.

b. Complete and sign any checklists, inspection and test certificates.

c. **Note** any uncompleted activities or tasks in the “Work Not Completed” section of the Work Instruction.

d. Sign the Work Status Statement.

If required new work instructions may be prepared by the Package Lead/Package Holder during the works and entered in the work instruction register. New work instructions are registered by entering the date and time in the work instruction register.

When all tasks on a work instruction have been completed, the Package Lead/Package Holder reviews the instruction and completes the register in the “Complete” columns.

Completed work instructions are stored in Section 5 of the Signal Support Work Package.

8.2 Signal Support Log

All activities, tasks and events not covered by work instructions are to be entered into the Signal Support Log by the Package Lead/Package Holder.

8.3 Additional Scope

During the implementation phase changes to the scope of works should not occur, however damage, equipment breakdown or other similar unforeseen events that impacts the signalling scope of works will need to be accommodated. This additional scope of works is to be assessed by the Package Lead/Package Holder considering the factors in Section 6.2 i to ix and where necessary consult with the Signal Support Engineer.

Any additional scope is to be recorded in detail on the Signal Support Log. New work instruction/s are to be prepared, registered and issued to accommodate the changes. When a new work instruction has been prepared and registered the Signal Support Log item can be shown as completed in the status column i.e. “Transferred to WI No’s”.

Where reduced scope removes the requirement to implement planned work instructions the register of work instructions shall be marked to show “not issued – reduced scope”. An entry is to be made in the Signal Support Log detailing the reasons or causes of reduced scope.

All scope changes are to be advised to the Signal Support Manager and copies of the relevant parts of the Signal Support Log included with the handover documentation.

8.4 Engineering Support

The Signal Support Engineer who approved the Signal Support Work Package shall be available during the works to provide technical support to the Signal Support Team (e.g. approve a bridging authority, authorise a not exactly identical like-for-like replacement, approve a significant adjustment of a track circuit, etc.).

Typically, this support may be provided remotely such as over the phone advice but in certain circumstances may require attendance on site. If the Signal Support Engineer will not be available to provide such support the Signal Support Manager shall arrange an alternate signal engineer/s to provide support and details noted on the Signal Support Work Package or by other form of communication.

ICON Infrastructure is to be informed where potential unforeseen operational impacts may or have occurred.

9 Evaluation

9.1 Completion of Work Instructions

The Package Lead/Package Holder checks that all issued work instructions have been completed, that all of the required inspection and test records have been completed and attached, and the Work Status Statement is signed. This is confirmed by signing the “Checked” column of the Register of Work Instructions.

9.2 Completion of Signal Support Log Items

The Package Lead/Package Holder checks the Signal Support Log to ensure that all entries that require follow up action are recorded as having been completed.

The Package Lead/Package Holder follows up all activities and tasks that are not recorded as having been completed.

9.3 Review of Work Status

The Package Lead/Package Holder further checks the status of:

a. The Signal Support Log
b. Damage reports
c. The Signal Support Works Status Certificate.

Any uncompleted tasks and activities that are not essential for the restoration or reliability of the works are compiled in a list that is sent to the Regional Signal Representative and Signal Support Manager as a defect rectification list.

The Package Lead/Package Holder uses the Signal Support Works Status Certificate to check and certify the completion of all of the activities and tasks defined in the Signal Support Work Package.

The Package Lead/Package Holder authorises the booking into use of the Signalling infrastructure when the Status Certificate has been completed and signed.

The defect rectification list signed Signal Support Works Status Certificate and IBA copies are stored in the Signal Support Work Package.

10 Handover

Handover documentation is forwarded to the Regional Signalling Representative and the Signal Support Engineer by the Package Lead/Package Holder on completion of works and no later than 48 hours of booking into use.

The handover documentation shall consist of a complete electronic copy of the finalised Signal Support Work Package.

The finalised Signal Support Work Package is to include supplementary information such as defect lists with actions required, photographs of history cards, *MN T 20203 FM26 Combined Signal and Track Inspection Form – Baseline Monitoring*, forms and returns utilised as per the Signalling Safeworking Procedures.

The Regional Signalling Representative(s) shall receive this information by the designated group email, refer to Section 6.5.

The Signal Support Manager shall be responsible for the post review and accountable for archival storage of the original copy of the finalised Signal Support Work Package.

11 Signal Support Work Package Development

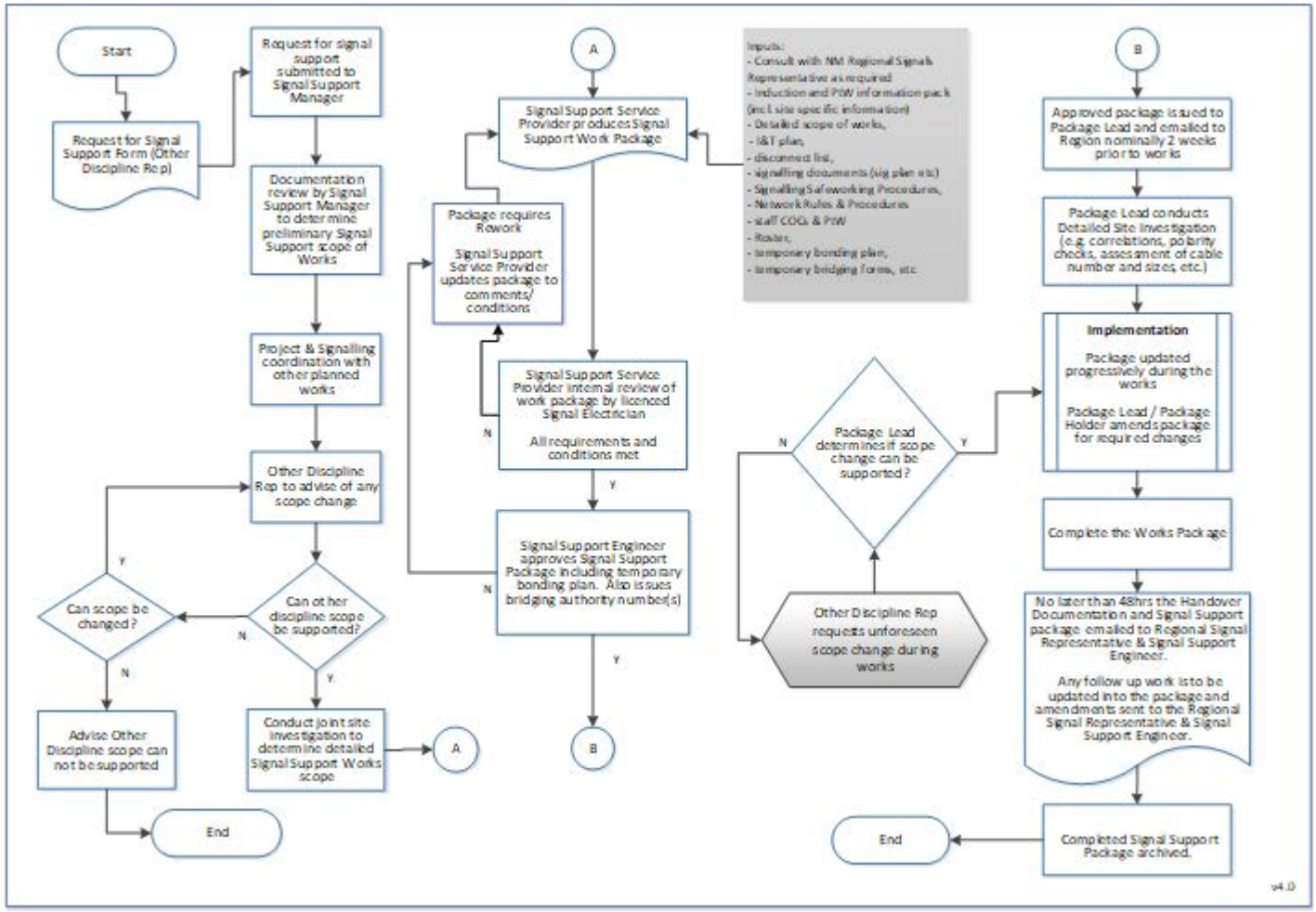

Figure 2 – Signal Support Work Package Development

12 Typical Signal Support Procedures

12.1 Preparation Activities

12.1.1 General

a. Attend a joint site inspection and assess the impact of the work including interfaces, any involvement with negative busbars at substations or section huts, access points, affected equipment, upgrade requirements etc.

b. Review condition of existing infrastructure to determine if replacement is warranted. If not already listed in the scope of works, raise concern to the Signal Support Manager to confirm limit of replacement. Any replacements to be documented.

c. Prepare a field disconnection list of affected equipment, as required.

d. If required, obtain temporary bridging authorities and bridges in accordance with *PR S 40002 Temporary Bridging of Signalling Circuits*. Work Instructions shall be prepared detailing the application, removal and testing arrangements required if the work is to extend over more than one shift or is to be applied and removed by different individuals in accordance with PR S 40002.

e. Conduct Correlation checks between the as installed arrangements and the Track Insulation Plan including cabling arrangements, polarities etc. Raise any discrepancies prior to commencing the work for resolution by the Signal Support Engineer who may consult the Regional Signal Representative.

f. Conduct Correlation checks between the installed ETCS balise and position details recorded on the signalling plan, including balise ID Plates and balise Location ID Plates. Raise any discrepancies prior to commencing the work for resolution by the Signal Support Engineer who may consult the Regional Signal Representative.

g. Conduct Correlation checks between the installed axle counter wheel sensor position recorded on the Track Insulation Plan. Raise any discrepancies prior to commencing the work for resolution by the Signal Support Engineer who may consult the Regional Signal Representative.

h. Assess the planned methodologies of the work to identify Signalling apparatus to be suppressed, temporarily removed and/or protected as well as interfaces and safeworking requirements. Prepare work instructions detailing the requirements for the book out, protection, suppression, removal, restoration, apparatus inspection, testing and certification prior to booking into use.

i. Collaborate with the other works discipline representative in the planning and implementation of the particular requirements of the work.

12.1.2 Production Tamping

Where signal support is deemed as required, all requirements for Production Tamping are covered by Section 12.1.1 above.

12.1.3 Points Refurbishments

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Prior to the job starting conduct an inspection of the track components to be installed and ensure that the mechanical interfaces are correct e.g. correct drilling for the attachment onto new switches.

b. Pursuant to *PR S 40010 Risks and Controls Associated with Testing and Certifying Equipment,* complete the MN T 20251 Appendix A Checklist for turnout work - "Checklist for Signals Requirements for Switch, Stockrail or Whole of Turnout Renewal Works" during a joint inspection with the track discipline representative.

12.1.4 Rerailing/Track reconstruction/Ballast cleaning

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Ensure the work methodology, work instructions and procedures are planned in accordance with *PR S 40027 Traction Return (1500 V D.C.)* including Power Out Permits as required.

b. Assess the track scope of the work and requirements to maintain traction return as stipulated in PR S 40027 and *PR S 40026 Rerailing – Precautions to be Taken*. Identify if approval is required by the Signal Support Engineer for the traction return current arrangements to be implemented.

c. Where required and in consultation with the Signal Support Engineer plan and prepare work instructions detailing the agreed temporary traction return bonding arrangements and if included in the scope the arrangements for the disconnection of negative busbars at substations or sectioning huts. The Signal Support Engineer is responsible to liaise with and arrange for the issue by the Professional Head Signalling and Control Systems of any temporary track bonding design required.

d. Where the scope includes the replacement of glued insulated joints (GIJs), inspect the joints on site prior and mark the location of new glue insulation joint keys on a reference point.

e. Where the scope includes re-railing past trainstops, investigate and determine requirements for the adjustment of the trainstop relative to new rail height. New mounting plates, mounts, shims or mounting bolts may be required, ensure procurement and availability of the necessary items.

f. Where the scope includes re-railing past axle counters or treadles check and adjust wheel sensor clamps due to potential change in rail height.

g. Ensure procurement items are on hand e.g. bonding materials, fixings to mount train stops on concrete sleepers, protection ramps and ballast guards.

h. Conduct services searches for any excavation area, identify any services, cables, under line crossings (ULXs) that may not be clear of the work and investigate supervision or renewal work necessary to include in the scope of work.

12.1.5 Resleepering

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Confirm with Other Discipline Representative the type of sleeper and rail securing type (e.g. fastclip, e-clip etc.) being installed and confirm that arrangement has been made for the supply of any long timbers, packing pieces, mounting plates or Vortok beams required for mounting trainstops or balises to suit the mounting method. Handover long timbers to Track discipline officer for installation in the track.

12.1.6 Plain Track Grinding

Where signal support is deemed as required, in addition to the general requirements of Section 12.1.1 above include the following actions.

a. Liaise with the Signaller and arrange to book out of use the protecting signal(s) and equipment for the works (if necessary).

b. Inspect and remove any foreign material that may ignite during the grinding process.

c. Where required, ensure an approved protective matting/cover is placed over track mounted equipment, surface-run cables and air hoses to protect them from the effects of grinding. This is normally completed by the Track/Civil Team.

12.1.7 Turnout Grinding

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Liaise with the Signaller and arrange to book out of use the protecting signal(s) and equipment for the works (if necessary).

b. Inspect and remove any foreign material that may ignite during the grinding process.

c. Where required, ensure an approved protective matting/cover is placed over track mounted equipment, surface-run cables and air hoses to protect them from the effects of grinding. This is normally completed by the Track/Civil Team.

12.1.8 Turnout Tamping

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Conduct a site inspection with a track discipline representative to agree that the points can be tamped without disconnection or removal of rodding or drives.

b. Complete the checklist for signals requirements for switch, stockrail or whole of turnout renewal works. (MN T 20251 Appendix A).

12.1.9 Supervision of Non-Track Work

In addition to the general requirements of Section 12.1.1 above include the following actions.

a. Quarantine all off track infrastructure.

12.2 Implementation activities for all work

a. Ensure that all safeworking procedures have been implemented prior to commencement. Disconnect the signals, train stops, level crossings, track circuits and axle counters in accordance with *PR S 40009 Disconnection of Signalling Apparatus* and PR S 40026. Jointly with the Other Discipline representatives – (if affected) book out the apparatus in accordance with Network Rules and Procedures.

b. Dismantle/remove any mechanical arrangements as required by the scope of the work to be completed.

c. Mark position (with high visibility paint) or remove or relocate or suppress or any combination of these actions affected impedance bonds, point motors, electrical detectors, rodding, track connections, train stops, axle counter wheel sensors (do not paint wheel sensors), ETCS balises and tail cables (avoid painting of balise ID or location plates), and any other track side equipment. Secure clear of the work without electrical disconnection.

d. When removing ETCS controlled balises: Unplug the LEU output transient protection cassette for that balise, then disconnect the balise tail cable from the junction box.

e. Where a machine needs to drive over a balise and it is not practical to remove that balise, a purpose made approved design protector cover plate shall be fitted to protect the balise and cable (where fitted), such that the machines weight is not transferred to the balise (or cable).

f. ETCS balises shall be removed where new or old rail is to be transported to the worksite by dragging along the 4 foot.

g. New or removed rail shall not be placed within the four foot within 1 m of ETCS balises.

h. Axle counter wheel sensors shall be removed where:

- A ballast plough is to be used
- Re-sleepering is immediately adjacent to the wheel sensor or may be damaged as part of works
- Ballast cleaning
- Dynamic Stabilising
- Mechanical Tamping/regulator
- Re-railing (the rail section is to be removed that the wheel sensor is attached to)
- Plant movements in the 4 foot or on the ballast shoulder
- Rail Grinding or welding
- New or old rail is to be transported to the worksite by dragging along the 4 foot.

i. When removing an axle counter wheel sensor ensure the clamp is removed with the sensor and not left connected to the rail.

j. Where works are within axle counter wheel sensor track section areas do not:

- drag a rail or any metallic object in the four foot, over or past a wheel sensor fitted on the track
- run over a wheel sensor with vehicle wheels
- leave any metal objects within 1m of a wheel sensor
- allow excess ballast to build up within 2 m of the wheel sensor

- place new or removed rail in the four foot within 2 m of axle counter wheel sensors.

k. Rail welding shall not be carried out within 1.5 m of a balise, balise cable, axle counter wheel sensor or axle counter wheel sensor cable unless appropriate mitigations (such as covers or the temporary removal of equipment at risk of damage) are put in place to prevent the ETCS equipment being damaged.

l. Where required, dig out track leads and lower below sleeper level.

m. If disconnection of wiring is required, the procedures stipulated in the PR S 40011 and PR S 40012 shall apply.

n. Arrange for all staff to familiarise themselves with the worksite and the location of Signalling infrastructure and to make themselves aware of any particular risks within the worksite.

o. Temporary bonding for traction return and rail gap bonding around breaks in traction rails precautions and safeguards shall be adhered to for traction return in accordance with PR S 40027. Where required provide an alternate path for traction current.

p. Conduct surveillance during the progress of the track work to ensure that the track personnel are aware of the presence of Signalling apparatus and utilise work methods that minimise the risks of damage and/or reliability, Watch any tamping operation to ensure that operator/s are alerted to risks and are warned of potential damage.

q. Control the Signal Support Work Package including issuing and return of work instructions, maintaining the Signal Support Log including issues, defects etc. and liaising with all stakeholders throughout the work.

r. Restore traction/track circuit bonding and rail connections, upgrading to current standards. Reattach track/traction leads to sleepers. Rebuild the points and trackside apparatus and remove temporary rail bonding as the work permits. Restore trainstops into correct position using appropriate mounting plates.

s. Reinstall axle counter wheel sensor to the location they were original positioned in. Ensure the rail clamp positioning is adjusted to the new rail height.

t. During rerailing, ensure trainstop height is adjusted if rail size has increased, e.g. 53 kg to 60 kg.

12.3 Apparatus inspection, testing and certification activities for all work

12.3.1 General

Examine signalling infrastructure within the scope area for signs of damage. For grinding activities inspect equipment, any axle counter wheel sensors, track leads and rail head-bonds, trainstop arms, insulated rail joints and other equipment within close proximity of the work, for the presence of slag, grinding dust or other signs of damage that may affect the reliability of the signalling equipment.

a. Replace, test and certify any defective or damaged Signalling equipment. Complete a damage report or record in Signal Support Log.

b. Inspect axle counter wheel sensors leads, track circuit leads, cables, conduits and airlines or hoses for any signs of damage, if there is any evidence of damage then conduct an insulation and continuity test of the cable. Replace any damaged airline/s and repair damage or replace damaged cables. If disconnection of wiring is required, the procedures stipulated in PR S 40011 and PR S 40012 shall apply. Where repairs are made a damage report (including photographs of the damage where possible) shall be completed in accordance with *PR S 40005 Damage to Signalling Equipment including Cables* and included in the handover information provided to the Regional Signalling Representative immediately following the work.

c. Check restored arrangements are in accordance with the Track Insulation Plan and Field Disconnection Lists. Include completion of *PR S 41515 FM01 Notification of Rail Bond Welding* as required.

d. Check that insulated rail joints and axle counter wheel sensors affected by the works are positioned so that no vehicle can be foul of the points without the points track section being occupied. (Refer to T HR SC 10017 and SPG 0709 for clearance requirements. Clearance point position is provided by Track discipline).

e. Following an apparatus inspection, testing and certification of the affected apparatus, arrange, in conjunction with the signaller, to visually check the operation and indications associated with the apparatus for reliable operation being mindful that trainstop operation may not be required for some proceed indications such as low speed signalling or conditional caution and pneumatic equipment may operate with residual air and that VCSR functionality will mask a trainstop that has remained in the lowered position. For dark territory automatic Signalling areas, visually check the automatic operation of the signalling including observing the operation of trainstops.

f. The booking in procedure including bridging, restoration of trainstop suppression, reconnection and testing shall be in accordance with the specific Work Instruction tailored for the requirements.

g. Prior to leaving any equipment unattended ensure the security of the apparatus and Signalling locations by the refitting of padlocks and ensuring doors are securely locked.

12.3.2 Points

In addition to the general requirements of Section 12.3.1 above include the following actions.

a. Dig out (if required), lubricate, adjust and conduct an apparatus inspection of the condition and fit of the points switches and stockrails point's fixings, rodding and insulation. Conduct a safety, security and reliability inspection of the fixings, split pins, locking tabs and keeper plates. Adjust and test the points in accordance with the applicable Signalling Equipment Manual and the Signalling Safeworking Procedures *PR S 40029 Point Lock Testing – Mechanical* and *PR S 40030 Point Lock and Detection Testing on Power Operated Points*.

b. Complete *PR S 40017 FM01 Monthly Return for Signalling Maintenance Tests and Inspections* and the Points History Card.

c. A copy of the Points History Card is to be included in the handover documentation following the work, refer to Section 10.

d. The Signal Support Manager shall arrange follow-up inspection of all points, (asymmetrical and conventional) as soon as practical after turnout refurbishment/grinding has taken place to check the point lock/detection settings and to ensure the reliable performance of the points.

e. The Track discipline *MN T 20203 FM26 Combined Signal and Track Inspection Form – Baseline Monitoring* form shall be used to capture information for all turnout and catch point renewal and refurbishment projects. The form is to be included in the handover documentation and a copy left with the Points History Card at the signalling location.

12.3.3 Track Circuits

In addition to the general requirements of Section 12.3.1 above include the following actions.

a. Following completion of track works clean all track/parallel bond connections with a wire brush whilst progressively restoring track connections, negative busbars, impedance bonds, tie-in bonds and electrolysis bonds and remove temporary bonding. Where the rail grinder has been used to profile the railhead inspect the length of track for scrap and clean around insulated rail joints (trainstops or points). Set to work the track circuits.

b. If new traction leads have been installed, ensure crimped connections are tested with a micro-ohm meter (note - one end of the lead needs to be disconnected to conduct the test). Record the readings on the lead at one end.

c. If conducting resleepering, electrical disconnection of track circuits would not normally be required (attachments only to sleepers removed and reinstated). Once complete, dig in and reattach track leads, inspect for damage. Carry out a fixed shunt check at the relay end and measure relay/receiver voltage before and during the fixed shunt check. Compare the values with the previous values, the track relay workshop test values and the normally expected values. Assess the need for readjustment.

d. Conduct certification inspection and testing in accordance with PR S 40025 and PR S 40026, e.g. train shunt check and phasing tests, a fixed shunt test of the newly installed length of rail before restoring the track circuit and if readjustment is required - additional testing in accordance with PR S 40025.

e. In accordance with PR S 40025 the results of this testing shall be recorded on the Track Circuit History Card at the location. Compare the results with previous readings and investigate and rectify the causes of any unexpected adjustments. An explanation of factors and reasons for minor readjustment is to be included on the copy of the Track Circuit History Card. Should significant adjustment or adjustment for unaccountable reasons be required, the Signal Support Signal Engineer shall be immediately contacted for instructions.

A copy of the Track Circuit History Card is to be included in the handover documentation following the work.

12.3.4 Axle Counter Wheel Sensors

In addition to the general requirements of Section 12.3.1 above include the following actions.

a. Reinstate axle counter wheel sensors. Any removed wheel sensors shall be replaced in exactly the same location. Moving a wheel sensor by even one sleeper increment may impact on clearance around points. When replacing wheel sensors it is essential for the correct operation of the signalling system that special care is taken **NOT** to place the wheel sensor on the wrong rail. Placing the wheel sensor on the wrong rail will incorrectly trigger the axle counter and cause track occupancy irregularities.

b. If the wheel sensor clamp is damaged it must be replaced and correctly fitted to the rail. Refer to the applicable axle counter Sydney Trains Equipment Manual for position tolerances.

c. Ballast shall not be placed built up against a wheel sensor. Where ballast has been built up to a wheel sensor, remove it carefully using hand tools, taking care not to damage the wheel sensor or tail cable.

d. If for any reason a removed wheel sensor is to be replaced with another unit then the replacement shall be treated as a like-for-like change and inspection and certification performed in accordance with Form No. PR S 40011 FM045.

e. Conduct certification inspection and testing in accordance with *PR S 40051 Axle Counters.*

f. The results of this testing shall be recorded on the Wheel Sensor History Card at the location. An explanation of factors and reasons for minor readjustment is to be included on the copy of the wheel sensor history card.

g. A reset of the affected track section/s will be required after completion of works.

Note:
A special provision exists in PR S 40051 to enable testing of the axle counter equipment.

h. A copy of the Wheel Sensor History Card along with any track section reset forms are to be included in the handover documentation.

12.3.5 Trainstops

In addition to the general requirements of Section 12.3.1 above include the following actions.

a. Reinstate trainstops, reinstall springs (if removed), protection ramp/s and ballast guards. Conduct Apparatus Inspection and Certification Inspections including:
   i. Equipment types, configurations and installation physically correct to specifications and drawings.
   ii. External and internal damage (including terminations).
   iii. Trainstop position and mounting correct with no case distortion.
   iv. Mounting is secure and arm adjustment nut locked into position.
   v. Oil and hydraulic fluids levels correct.
   vi. Safety latch contact adjustment correct, manual suppression prevented.
   vii. Contact adjustments and operation correct.
   viii. Gauge trainstop and adjust if necessary.
   ix. Check the operation of the trainstop and the signal for both proceed and restrictive states.
   x. Complete the PR S 40017 FM01 form and include in the handover documentation.

12.3.6 ETCS Balises

In addition to the general requirements of Section 12.3.1 above include the following actions.

a. Reinstate balises and balise tail cables. Any removed balise shall be replaced in exactly the same location. Moving a balise by even one sleeper increment may impact on its correct operation. When replacing balises it is essential for the correct operation of the signalling system that special care is taken **NOT** to invert the order of balises within a group, as the incorrect order may either trigger a train service brake reaction or suppress the balise function for the direction intended.
b. If the balise anchor or fixings are damaged and it is not practical to repair or install new anchors/fixings between train movements, the balise may be temporarily fixed in place using a Vortok Universal Spreader Beam (where practical) until such time as it is practical to re-mount the balise in the original manner. Refer to PR S 40028 for longitudinal position tolerances.
c. Ballast shall not be placed over the top of or built up against a balise. Where ballast has been laid over a balise, arrange for it to be removed to within 100 mm of the periphery of the balise (using hand tools), taking care not to damage the balise cable plug or socket.
d. If for any reason a removed ETCS balise is to be replaced with another unit then the replacement shall be treated as a like-for-like change and inspection and certification performed in accordance with PR S 40011 FM044. In all other cases conduct inspection and certification in accordance with *MN S 41604 Alstom ETCS Trackside Maintenance Manual*.
e. Where authorised non signalling discipline personnel are utilised for the removal or reinstatement of balises, the balise reinstatement shall be certified by the Package Lead using the following criteria:
   i. The *PR S 47118 FM032 ETCS Balise Remove Reinstate - Other Disciplines* work instruction(s) is signed as complete by the authorised person.

ii. All tasks are complete for all identified balises.

iii. A comparison of the balises identified on the work instruction(s) to the scope of works to ensure all balises in scope have been reinstated and no unauthorised balises have been affected.

iv. Any outstanding tasks have been transferred to another work instruction for the tasks to be completed, attested and certified by a competent person holding the correct authority.

v. Completion of the *PR S 47118 FM033 ETCS Balise Certification Post Other Disciplines* work instruction.

12.3.7 Production/turnout tamping

In addition to the general requirements of Section 12.3.1 above include the following actions.

Following brooming off:

a. Walk scope and inspect all track leads, check all rail connections for tightness and check for excessive voltage drop across all track circuit connections.

b. Record all track leads inspected on tamping log sheets.

c. Record all track leads repaired.

d. Inspect and remove suppression from all trainstops, record inspection and restoration of trainstop on the disconnection list.

e. Record all trainstops inspected on the tamping log.

f. Conduct Apparatus Inspection of the mechanical arrangements/rods/drives and fixings for fractures or damage and tightness.

g. Replace any defective/damaged components, complete damage report.

h. As point settlement may affect adjustment and reliability – if possible arrange for rail traffic to travel over the points before adjustment.

12.4 Evaluation

Perform the following tasks:

a. Complete the Evaluation Procedure as set out in Section 9 of this document.

b. Book into use and complete any Coordination requirements as required by the Possession/Closedown Management.

12.5 Handover

Complete the Handover Procedures as set out in Section 10 of this document.

13 Signal Support Work Package

The following forms may be downloaded from the following locations:

- ESI intranet page

  http://intranet.sydneytrains.nsw.gov.au/directorates/engineering-and-maintenance/engineering-system-integrity/engineering-information/signalling-and-control-systems/forms

- TfNSW Sydney Trains Signalling and Control Systems internet page

  https://www.transport.nsw.gov.au/sydneytrains/about-sydney-trains/signalling-and-control-systems.

- *PR S 47118 FM001 Request For Signal Support*
- *PR S 47118 FM002 Signal Support Work Package*

Section 1 -	Signal Support Work Package Authorisation
	Signal Support Work Package Checklist
Section 2 -	Project Scope of Work
Section 3 -	Detailed Signalling Scope and Safeworking Permits
	Detailed Site Inspection Form
	Turnout Refurbishment Scoping Form
	Inspection & Testing Plan
	Equipment Disconnection Lists
	Register of Safeworking Forms Certificates & Permits
Section 4 -	Register of Work Instructions
	Register of Work Instructions
Section 5 -	Prepared and Completed Work Instructions
	Blank Work Instruction
Section 6 -	Signal Support Log Cover Sheet
	Signal Support Log
Section 7 -	Signal Support Status Certificate
	Signal Support Status Certificate
Section 8 -	Working & Completed Documents
Section 9 -	Spare Forms
Section 10 -	Rosters

- *PR S 47118 FM003 Production Tamping/Rail Grinding Log Details*

14 Typical Work Instructions

The following forms may be downloaded from the following locations:

- ESI intranet page

  http://intranet.sydneytrains.nsw.gov.au/directorates/engineering-and-maintenance/engineering-system-integrity/engineering-information/signalling-and-control-systems/forms

- TfNSW Sydney Trains Signalling and Control Systems internet page https://www.transport.nsw.gov.au/sydneytrains/about-sydney-trains/signalling-and-control-systems.
- *PR S 47118 FM010 Book Out Signalling Equipment*
- *PR S 47118 FM011 Application of Temporary Bridging*
- *PR S 47118 FM012 Trainstop Suppression & Removal*
- *PR S 47118 FM013 Trainstop Restoration*
- *PR S 47118 FM014 Track Circuit Disconnection*
- *PR S 47118 FM015 Track Circuit Restoration*
- *PR S 47118 FM016 Points Mechanical Disconnection*
- *PR S 47118 FM017 Points Mechanical Restoration*
- *PR S 47118 FM018 Points Electrical Disconnection*
- *PR S 47118 FM019 Points Electrical Restoration*
- *PR S 47118 FM020 Level Crossing Disconnection*
- *PR S 47118 FM021 Level Crossing Restoration*
- *PR S 47118 FM022 Removal Of Temporary Bridging*
- *PR S 47118 FM023 Production Tamping*
- *PR S 47118 FM024 Turnout Tamping*
- *PR S 47118 FM025 Rail Grinding*
- *PR S 47118 FM026 Supervision Of Other Works*
- *PR S 47118 FM027 ETCS Balise Disconnection*
- *PR S 47118 FM028 ETCS Balise Restoration*
- *PR S 47118 FM029 Booking Back Into Use*
- *PR S 47118 FM030 Spare Work Instruction*
- *PR S 47118 FM031 Feedback Form*
- *PR S 47118 FM032 ETCS Balise Remove Reinstate - Other Disciplines*
- *PR S 47118 FM033 ETCS Balise Certification Post Other Disciplines*
- *PR S 47118 FM034 AXC Wheel Sensor Disconnection*
- *PR S 47118 FM035 Frauscher FAdC R2 RSR180 AXC Wheel Sensor Restoration*
- *PR S 47118 FM036 Siemens ACM250 AXC Wheel Sensor Restoration*