Engineering Procedure
Signalling and Control Systems

PR S 47116

Inspection and Testing of Signalling: Interface Requirements and Procedures for Alterations

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Procedure

Transport Sydney Trains

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1.0	8 March 2019	E Pace	New document based on old RailCorp document SPG 0711.6

Summary of changes from previous version

Summary of change	Section

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1 General Requirements for Alterations

1.1 General

Inspection, testing, certification and documentation of alterations to existing vital signalling shall be based on the inspection, testing and certification principles and procedures applying to New and Altered Works as nominated in these Sydney Trains Infrastructure Engineering Specifications – Signalling.

1.2 References

This specification shall be read in conjunction with PR S 47110 Inspection and Testing of Signalling: Introduction.

1.3 Alterations and New Interfaces

Where vital signalling equipment and/or circuits are altered or renewed there may be a risk that the functionality or availability of the signalling could be affected. It is therefore necessary to ensure that all changes are inspected, tested and certified to function correctly and to conform to the approved designs.

The testing necessary shall mitigate any risk involved by detailed planning and adherence to these alteration procedures and practices.

Refer to PR S 40011, Renewals Work, for the requirements related to like for like renewals or repairs.

The Regional signal representative shall nominate details of any other signal works at the location for which the submission of “Certified Office Copies” (COC) is outstanding in the Site Integrity Agreement portion of the Interface Coordination Plan.

When more than one signalling alteration is being performed in a location, the Regional signal representative is to ensure that the accountability for all the work in that location is clearly allocated to one Commissioning Engineer. The nominated Commissioning Engineer is to ensure that clear separation exists between the signalling jobs. Should a clear interface not exist (i.e. one job is affecting the same circuits as the other) then the process for changeover is to be confirmed with the Professional Head Signalling and Control Systems to determine any staging arrangements required. New design may be necessary if the sequence of work envisaged by the design is altered.

The Regional signal representative and the Commissioning Engineer are to ensure that any changes are managed and accountabilities remain clear for all alterations.

Where an analysis of the work identifies the presence of overlaps or interfaces and prior to a construction team with a different Commissioning Engineer being given access to the location;

a) The Regional signal representative shall ensure that the preceding work has reached completion and,

b) The C.O.C has been returned to and considered by the design office before the new design was issued.

Alternatively, initiate a joint investigation with the design office and the new Commissioning Engineer to determine all overlaps, interfaces and risks. Document the agreed risk mitigation strategies in the Site Integrity Agreement.

Where previously unplanned stagework is necessary to implement a portion of design issued as a complete job e.g. a sequence of signal conversions from incandescent to LED, the Professional Head Signalling and Control Systems shall be consulted and the work shall not proceed unless (there is agreement or) new design is issued to include any previously unplanned stagework.

As for all removals and new works, alterations that result in a change to any physical or operational interface with signallers or train drivers shall be published in the Weekly Notice published at least one-week prior to the implementation of the changes.

1.4 Authority for Alterations to Existing Installation

The Engineering Authority for Signals and Control Systems design for new and altered signalling installations is delegated to the Professional Head Signalling and Control Systems. Engineering site design authority shall be as delegated by the Professional Head Signalling and Control Systems. Unless otherwise approved, the authority for changes shall be in the form of approved design documentation.

Alterations include the following:

a) Alterations to electrical or mechanical configuration e.g. Circuit wiring; mechanical locking; mechanical points or airlines.

b) Changing items of equipment to a different type, make or model e.g. converting an incandescent signal to LED, point control valve or motor.

Field personnel shall ensure that version control of issued design are promptly updated and they shall keep each copy properly bound, secure and in good condition. Certified Office Copies (C.O.C's) shall be checked, updated, signed and returned to the Professional Head Signalling and Control Systems no later than 28 days following the bringing into use of the alteration.

Personnel performing alterations shall be appropriately licensed and hold a valid Permit to Work.

1.5 Approval to Commence Alterations

Authorised new and altered signalling works shall proceed pursuant to a Project Work Notification and Interface Coordination Plan, Inspection and Testing Plan, Installation, Commissioning and Handover Documentation Work Packages or Minor Works Package.

1.6 Interface Coordination Plan

The Regional signal representative shall ensure that an Interface Coordination Plan and a Project Work Notification are agreed with all Regional stakeholders prior to authorising site work to commence. PR S 47117, Inspection and Testing of Signalling: Standard Forms contains a template for a standard Interface Coordination Plan. The agreement shall detail and document the following:

a) Nomination of personnel and roles

b) Schedule of notification, witness and hold points

c) Interface identification

d) Site Integrity Agreement and site assessment

e) Planned stage work

f) Signalling access arrangements

g) Operational issues arising from the works

h) Regional representative responsibility

i) Training requirements

j) Configuration control

k) Type approvals, trials and waivers,

l) Commissioning the works – requirements

m) Pre – existing safety issues

n) Signalling Maintenance responsibility

o) Maintenance documentation

p) Documentation and handover schedule

q) Checklist of requirements from inspection and testing specifications

r) Interface management plan - signalling and train control systems

s) Interface management plan – others

t) Interface Coordination Plan Agreement.

Where the new and altered signalling work is associated with scope included in a Project Work Notification agreed between the Region and another project manager e.g. Track, civil, electrical or other 3rd party, the agreement shall include development and implementation of a signalling specific Interface Coordination Plan.

The Regional signal representative and the Commissioning Engineer are responsible for updating the Interface Coordination Plan during the project lifecycle.

1.6.1 Site Integrity Agreement

Prior to any alteration, addition, renewal of wiring, or a relay change program commencing, a detailed site assessment of the condition of the location and the ability of the existing wiring and equipment to withstand disturbance is be carried out. Further, any existing signalling infrastructure proposed to be used as part of the works (e.g. equipment / cable route to be reused, existing cable cores to be utilised) shall be documented by the Commissioning Engineer, condition assessed and agreed by the Regional signal representative and the Signalling Maintenance Engineer.

The assessment may also include requirements for track, civil or electrical infrastructure particularly associated with access, reliability and or maintainability of the new or altered signalling infrastructure.

This agreement is documented in the Site Integrity Agreement section of the Interface Coordination Plan.

The Commissioning Engineer shall document the site conditions by digital photography and produce text files associated with each file describing the location, equipment and relevant details. Photographs shall also be taken showing the status of any infrastructure that may be affected by the new work, particularly the level of dilapidation of fencing and structures. The photographs and text files shall be organised into descriptive sub folders,

loaded onto suitable storage media and stored on site. At the completion of the project the image files and all other photographs taken shall be included in the archived records for the project.

1.6.2 Precautions to be Agreed

All precautions to minimise disturbance to the existing equipment and damage to buried cables are to be agreed between the Regional signal representative, the Signal Maintenance Engineer and the Commissioning Engineer and documented in the Site Integrity Agreement. The agreement shall also clearly define any transfer of responsibilities from the region associated with authority to excavate, supervision, provision and maintenance of signalling, communications and services search information.

The parties are to assess the condition of all interface locations and signalling equipment in the vicinity of the work including an “electrical work” risk assessment. They are to agree on preparatory work needed, precautions to be adopted, and the systems of work that will ensure that the integrity of the existing signalling system is not compromised by the project works, particularly where the wire insulation or equipment may be old or fragile, where labelling is not adequate, where the accuracy of the circuit book is not certain or any other vulnerable situation. Details of insulation records are to be advised by the region, particularly known defects.

Where the work is to alter signals (e.g. incandescent signals to LED) the joint inspection of the work is to review any sighting or read-through issues that may result from the works or staged introduction of the works. Any requirements for focussing or sighting screens are to be documented and incorporated into the scope and inspection and testing plan for the works. Stage or temporary work shall be arranged as nominated in Section 2.2.

Prior to work commencing they are to ensure that any employee safety issues, risks and mitigation strategies used by maintenance personnel are communicated and incorporated in the planning and site safety management system utilised by the construction group. The location is in a clean and tidy condition, that there are no loose wires or connections, that any unterminated wires are cut back and insulated, and that there are no pieces of wire, bits of metal, loose washers or other extraneous objects etc, in the location. The parties shall agree on who will carry out the preparatory work required to remove any potential hazards.

The Regional signal representative authorises work to commence in the location.

Once project work starts in a location the project team becomes accountable for conditions that arise resulting partly or wholly from their work; from that time, maintenance personnel are not to carry out any work in the location that interferes with the equipment or wiring, except in emergency or as agreed between the Regional signal representative, Commissioning Engineer and the Signalling Maintenance Engineer. Details of such work are to be recorded or updated in the Site Integrity Agreement by the Regional signal representative

Project personnel shall work within the agreements and will be accountable for ensuring that the existing signalling system is not endangered by work in the location.

1.6.3 Alterations of Signal Indication Conversions from Incandescent to LED

Plan the work to provide the required possession configuration and coordination with “other work” to provide the necessary opportunities to enable final aspect testing.

The certification of alterations involving the replacement of incandescent lamps with Light Emitting Diode (LED) arrays shall include the following:

a) Completion of the Inspection and Testing Checklist for LED Colour Light signal from PR S 47117, Inspection and Testing of Signalling: Standard Forms 13.1 (B)) and Test Certificate – TC1 (b) or TC1(c).

b) Insulation testing of the completed operating circuit shall be conducted to certify that the work has not introduced any insulation defects also the absence of any pre-existing insulation defects.

c) Where LED's are fitted with surge protection an Insulation Resistance Test of the operating circuit and cables with the aspects in circuit is required. Core to core tests across each connected LED will result in a low reading however, the surge protection should ensure that the LED will not be damaged.

When the work occurs during periods where normal rail traffic is excluded (track possession) and the persistent presence of “other work” interferes with the normal operation of the signalling i.e. delayed completions, unplanned possession rail traffic, possession configuration interfaces or restrictions imposed by the Safe Notice and it is not possible to complete a full aspect sequence test:

d) Implement the provisions of Section 2.12.1 of this Specification and conduct a simulation test of the signal operation using controlled bridges to manipulate the control relays to simulate all aspects. Each aspect combination shall be observed with emphasis on checking that any incorrect LED’s are not lit or partially lit,

For lamp proving and filament failure circuits - Circuit Function Test the controls to the signal in the rear and any alarm/warning indications at the signal box.

To ensure the absence of induced voltages in the cabling where existing signals wired with non-twisted pair cables are being converted to LED, conduct and record the results of a no-volts test on unlit aspects. The results of these tests shall be recorded on Test & Certification Form TC 1(b) or TC 1(c) from Specification PR S 47117, Inspection and Testing of Signalling: Standard Forms.

Test the function of the operating circuit fuse for each signal aspect by checking for loss of voltage at the LED.

Special care shall be taken to ensure that co-acting signals are converted concurrently.

Prior to booking into use, field check for optimal focussing whilst ensuring the work has not introduced any potential “read-through” between new and existing signals. Check the signal for situations that may give rise to complaints of excessive brightness (particularly where the signal is viewed for long periods at close range e.g. stations at night) some possible remedies include:

a) Tilting the signal head downward by 5 degrees, by aiming the signal at a point 50 metres from the signal, at sleeper level, and 2 metres out from the running rail

b) Fitting a reducing filter inside the LED module, between the outer lens cover and the internal lens unit. The filter is a disk of Shinkolite neutral grey, 80% transmission

c) In either case the visibility of the signals should be rechecked in full daylight, to ensure that the medium-range sighting (at 200 to 400 metres) is still acceptable.

As soon as practically possible following the booking back into use:

a) Check the operation and aspects displayed for each signal route simulation tested as above

b) Conduct an on-board train inspection of the altered work and any existing signals to check the adequacy of focussing and any sighting screens. Further, check that the work has not created any unforeseen “read-through” situations that may become prominent at other times of the day.

1.6.4 Alterations to Signalling Apparatus Involving New Mechanical Arrangements

The certification of alterations involving the replacement of mechanical arrangements to Standard Drawings shall be conducted in accordance with the Sydney Trains Engineering Specifications – Signalling.

Additionally, if the alteration involves the replacement of mechanical arrangements to non-standard equipment e.g. New points rodding for a non- standard layout the certification shall include:

a) Approved design for the fabrication of the components

b) Approved design for the new configuration

c) Type approval to Specification –T MU MD 00005 GU Type Approval of Products

d) Delivery inspection & testing of the new components and spares by a mechanical engineer with relevant engineering authority

e) Approval by a person with specific delegated engineering authority to drill any new holes required in rails, switches or bearers

f) Certification of the as-built layout and adjustment of the new arrangements prior to bringing into use

g) Provision of adjustment and maintenance instructions to Regional signal personnel from the Professional Head Signalling and Control Systems or delegate.

Where the alteration involves changes to the mechanical arrangements as shown on any Signalling Plan or Working Sketch/ Locking diagram the work shall be certified by the Commissioning engineer. Form PR S 40022 FM01 – Mechanical/Relay/Route Control Locking Test Certificate shall be issued to the Signalling Maintenance Engineer. For these alterations the Commissioning Engineer (or delegate) shall be in possession of a (full or restricted) Interlocking Certificate issued by the Professional Head Signalling and Control Systems.

1.6.5 Alterations to Signalling Apparatus Involving New Airline Arrangements

Alterations to the air reticulation system shall be designed, installed and performance tested in accordance with Specification SPG 0714 Compressed Air Systems including:

a) Approved design for the fabrication of the components

b) Approved design for the new configuration including stagework arrangements

c) Documentation as set out in SPG 0703 Signalling Documentation and Drawings

d) Type approval of system components to Specification – T MU MD 00005 GU Type Approval of Products

e) Delivery inspection & testing of the new components and spares by a mechanical engineer with delegated engineering authority

f) Certification of the construction of the as-built layout and testing of the arrangements prior to bringing into use.

Detailed Site Survey drawings shall be created or amended to include details of the Compressed Air System.

1.7 Off Site Work – Inspection and Testing Requirements

Equipment cabinets, location cases, signals, relay racks or equipment racks that are wholly or partly pre-wired off site - shall be inspected and Pre-site tested prior to delivery following the completion of the fitting out and wiring.

The inspection and testing shall include Documentation Check, General Apparatus Inspection; Bell Continuity Test; Insulation Test; Wire Count and Null Count.

Due to the various risks associated with transportation, interference by unauthorised persons and on-site installation e.g. Water damage, vibration, physical damage to rack mounted equipment - wiring, terminations and insulation. Pre–site inspection and testing shall only be done as a quality control check, not a certification inspection and test.

Pre–site testing shall be carried out, recorded, inspected and tested in the standard manner but using the “approved for construction” design drawings. The drawings used to conduct the testing shall be clearly marked as “Pre–site Test Copy”.

Once all Pre-site testing has been completed and all the drawing sheets have been signed as an indication that all testing has been completed hand over the marked-up design drawings to the Commissioning Engineer as a record of work completed prior to on-site installation and testing.

Also complete a copy of the respective standard Pre-Site Test Certificate (PR S 47117, Inspection and Testing of Signalling: Standard Forms TC5) and submit the Pre-Site Test Certificate to the Commissioning Engineer prior to dispatch of the equipment to site. A copy of this Pre-Site Test Certificate is to be attached to the equipment.

If any part of the certificate cannot be completed (e.g. due to incomplete equipment or wiring) then these deficiencies must be listed on the respective drawing and on the Pre-Site Test Certificate. Agreement with the Commissioning Engineer is required where Pre-site testing is proposed on incomplete work.

In exceptional cases, where risk mitigation strategies are agreed with the Commissioning Engineer the Pre-site inspection and testing may be accepted as the certification inspection and testing. A licensed Test Engineer shall conduct and mark-up the testing on “Approved for Testing” copies of the design drawings. In such cases the equipment and circuits shall be wholly completed without defects or omissions, adequately secured and protected (until commissioned) from the possibility of alteration by installation crews or persons not fully aware of the certified conditions. In addition, the equipment and circuits shall be protected from the possibility of damage, degradation or other condition that could impair their certified integrity. In these cases, mark the Pre-Site Test Certificate as the “Certification Test Certificate”.

2 Interface Requirements

Interfaces between new and altered work and the existing Signalling system require careful planning from the concept stage of the project. A major issue for interface planning is to minimise work in and around existing operational Signalling apparatus thus reducing access requirements and risks affecting reliability, accidental damage or interference.

The design, program, work practices and inspection and testing shall be arranged to maximise compliance with this requirement.

2.1 Requirements for Assurance of Safety

In order to ensure the safety of the new and the existing Signalling system the Commissioning Engineer shall ensure that there is a clear definition and understanding of the work and the division of responsibilities at interfaces. These requirements are documented in an Interface Coordination Plan, Inspection and Testing Plan and Work Package for the work and stagework.

Temporary work and stagework shall be carried out to standards that will not compromise the safety of any operating part of the Signalling system. Where the minimum standards for temporary or stageworks are not laid down in this or any other Specification, the minimum standards to be employed shall be to “as new” Specifications or otherwise only as agreed in the Site Integrity Agreement.

Alterations (including stagework and temporary work) shall be implemented in accordance with this Specification.

2.2 Temporary Work, Stagework and Interfaces

The Works Program, Inspection and Testing Plan and installation methodologies shall consider requirements associated with the scope of work at interfaces, stagework and temporary work including:

a) Collaboration with the Regional signal representative and Professional Head Signalling and Control Systems as to the scope, timing, maintenance and design requirements

b) Collaboration with the Regional signal representative regarding possession requirements

c) Minimising the scope that requires track possession to commission by completing all possible construction and inspection and testing prior to the track possession

d) Ensuring that details of the required inspection and testing activities at interfaces are nominated. Also details of the changeover strategy are included in the Inspection and Testing Plan

e) The Inspection and Testing Plan, Work Program, Design, materials for, and implementation of stagework, temporary work or interfacing work, and the production of documentation shall clearly identify the scope of the works to be carried out, new equipment to be commissioned and old equipment to be removed or placed out of use

f) Incorporating equipment that will form part of the works, and is installed by others, but is required to be inoperative and by-passed until commissioning to allow the existing system to operate and making provision for such works by others.

g) Arranging for the removal of any temporary bridging during commissioning

h) Where necessary for the progress of the works, carry out any alteration, relocation, adjustment, re-configuration or protection of existing infrastructure

i) Inspecting and testing, any alteration, relocation, adjustment or re -configuration to existing equipment before certifying its suitability to be restored to use

j) Coordinating stage work and interface designs so that there is a minimum of interference to existing equipment or wiring, in particular within relay rooms, huts or locations

k) For temporary work and interfaces, minimising the amount of equipment temporarily mounted within, and work carried out within an existing location using, where practicable provide temporary enclosures mounted adjacent to the existing location

l) Arranging positive identification between commissioned items of equipment, circuits situated in housings with other items of equipment, or circuits that have not yet been commissioned

m) Arranging positive identification of trackside equipment installed and not yet “bought into use” or removed by the provision of secure covers and retro-reflective “X” on signals and trainstop cases

n) Identifying all temporary work in such a manner that is immediately clear and obvious

o) As soon as temporary work is no longer required, restoring the situation to the condition applying before the temporary work was carried out, or to the satisfaction of the Regional signal representative.

At final interfaces between the works and the existing installation providing:

a) All of the materials, equipment and work, including inspection and testing, necessary to complete the interface irrespective of the percentage of work outside the defined renewal area

b) All track circuit equipment necessary for alteration to any existing track circuit adjacent to the renewal area to ensure compatibility of track feeds/relays, power mains phasing, traction tie-ins, etc. at and over the interface

c) Control of stagework design

d) Handover to the Region.

2.3 Connections at Interfaces

Existing Signalling equipment or circuits shall only be interfered with, disconnected or connected in accordance with the provisions of MN S 40000 Signalling Safeworking Procedures.

Existing signalling equipment and circuits shall be taken to mean any installed and commissioned equipment and circuits whether “in use” or “booked out of use”.

Any new wiring that is run within or into an existing location or item of Signalling apparatus shall be:

a) Only connected into or disconnected from vital signalling circuits when the affected signalling apparatus is disconnected and formally booked out of use

   EXCEPTION: Work planned, and implemented in accordance with the provisions for Modifications on a Large Scale, Section 6 of this document

b) Effectively secured to ensure there is no possibility (under any circumstances) that physical movement can cause an electrical connection between the new wiring and the existing working wiring or terminals and also no possibility of mistaken connection

c) Fitted with suitable insulating devices to securely insulate the exposed ends of loose wiring by the application of secured insulation tubes over “Q” crimps or blind pre insulated crimp connectors. However, where practical and permissible the wiring should be terminated on terminals allocated for the purpose.

All such new wiring shall be fully tested, results recorded, and be clearly and distinctly identified and labelled as being new work yet to be commissioned.

Any existing spare terminals shall be confirmed to be voltage free and isolated from the working Signalling system before being used to terminate new wiring.

New wiring shall not be connected to spare terminals of existing items of Signalling operating or processing equipment unless the item and all connected circuits are disconnected and booked out of use. The existing item may be restored to use after the connection to the spare terminal is securely made and prior to commissioning the new wiring, but only provided each new wire is properly insulated and clearly and reliably isolated at its other end until the new circuit is commissioned.

Where applicable, existing items of Signalling equipment must also be mechanically disconnected by suitably licensed personnel to prevent its movement before any electrical connections are made.

New wiring may be connected to spare terminals of link terminations for cable or wiring runs provided the terminals are proved spare and are clearly and reliably isolated with the link securely disconnected or removed entirely.

Existing traction bonding shall not be disconnected unless or until:

a) The new traction bonding is installed ready for changeover and is a direct like for like replacement of the old and/or approved stagework or final bonding design is installed, ready for changeover and it is safe to do so, and,

b) The track circuits concerned have been disconnected and booked out of use, and if required, the traction overhead power has been isolated and an Electrical “Permit to Work” has been issued.

2.4 Security of Signalling Apparatus and Locations

All precautions shall be taken to ensure that working circuits cannot be mistakenly interfered with, accidentally damaged, or shorted out by loose unterminated wiring, tools, metal drilling swarf, bunches of keys, loose relay nuts, washers, bits of wire, etc. Special care shall be taken to protect from the lodgement of any metal filings, chips and slithers of metal drilling swarf on or near Signalling equipment. Further, all necessary precautions to ensure that all such material is cleaned up and disposed of, such that none remains on either the floor or any surface where it could possibly transfer to a working Signalling circuit. Of particular concern is the placement of new or removed plug-in relays on these surfaces and the risk of picking up foreign material on its contacts. Prior to insertion of

any plug-in relay it and its base should be closely examined for and cleaned of any contamination. All vital equipment and locations shall be fitted with locks and be locked when unattended.

Before closing up equipment or locations, persons shall check that everything is in order and properly connected and that nothing has been left loose, foul of standard clearances, or in a potentially unsafe condition.

Only persons who are suitably licensed, instructed and authorised by the Commissioning Engineer are permitted to work without close supervision by suitably licensed and authorised personnel in equipment locations and relay rooms.

Only persons who are suitably licensed, or closely supervised by a suitably licensed person are permitted to interfere with working Signalling circuits or equipment.

2.5 Interface Environment and Cleanliness

Signalling equipment buildings, relay rooms and signal control centres shall be considered clean areas. The following precautions shall be observed.

a) These areas shall be maintained free of rubbish and debris at all times.

b) Processes that may potentially activate fire detection systems (i.e. smoke or dust) shall not be used.

2.6 Tagging of Vital Wiring at Termination Points

At stud termination points (shelf relays and trackside equipment) where new wiring is to be connected to working circuits, or where old wiring is to be disconnected from working circuits;

a) The wire shall be fitted with a tag clearly identifying the circuit and terminal to that it applies and the terminal to which it runs; the other end of any such wire it is to be similarly tagged.

b) For plug-in relay bases and screw terminals in relay rooms the new wire shall be insulated and secured in or near to its final position and be fitted with the wiring beads to designate the terminal / fuse number or relay base position.

2.7 Labelling of Stagework

Wiring to be commissioned or de-commissioned in stages shall be clearly labelled as to what stage it is to be commissioned or de-commissioned. On changeover, the stage labelling shall be removed, the correct labelling applied, and the arrangements made permanent. To clearly designate and identify stagework in progress at a location document the work team responsible and distinguishing colours used for wiring and display this information at each location affected.

2.8 Temporary Wiring

2.8.1 Temporary Stagework Wiring

Temporary stagework wiring shall be of a distinctive colouring (usually yellow). Where there are a number of different stagework wiring stages at the same location then the stagework wire for each stage is to be of a different colour for ease of identification. The Commissioning Engineer shall approve all subsequent colours.

2.8.2 Temporary Testing Wiring

Temporary wiring for testing purposes is to be of a distinctive type and colour.

2.8.3 Display Colour Code at Locations

To clearly designate and identify work in progress at a location. Document the work team responsible and distinguishing colours for temporary wiring and display this information at each location affected.

2.8.4 Control and Removal of Temporary Wiring

The use of temporary wiring must be strictly controlled; it must be disconnected/removed as soon as it has served its purpose.

2.9 Termination or Securing of Spare Wires

Spare wires in equipment locations shall be terminated on spare terminals on termination racks. Spare wire within trackside apparatus shall be effectively secured for its whole length and be fitted to a spare terminal if available, otherwise its ends must be securely insulated.

2.10 Out of Use Equipment

Equipment not in use and disconnected from the interlocking shall be securely open circuited and labelled accordingly.

It is not sufficient to only remove a fuse or open a link or remove a signal lamp, etc. as these are situations where someone could mistakenly insert a fuse or connect a link or insert a lamp etc and cause a potentially unsafe situation. The equipment shall be securely open-circuited in two places where practical, and measures applied to prevent accidental or mistaken connection at both places.

2.10.1 Use of Adhesive Insulation Tape

Insulating tape or adhesive devices shall not be reused; new insulating materials are required on each occasion.

Adhesive insulating tape should not be used directly on prepared conductor ends or on terminal lugs or pins etc. that are intended to be brought into use subsequently, as the adhesive may cause unreliable contact resistance.

Check that the insulation method and application is effective.

2.10.2 Trackside Equipment Isolation

Ensure that installed trackside equipment is not connected to the power source except at commissioning and when required during testing.

Busbar fuses and links in circuits to external equipment shall be removed and cable links to external equipment shall be opened immediately testing is completed for the day.

Institute measures to ensure new external equipment cannot be inadvertently or mistakenly operated.

Secure all equipment enclosures with unique locks when unattended.

2.11 Use of Spares or Re-use of Existing Equipment

Any use of pre-existing spares shall be as documented in the Signal Design and/or Interface Coordination Plan. Redundant or existing wires, cable cores, contacts, or other items of equipment in new circuits, or in altered parts of existing circuits, must first be inspected and tested to ensure that:

a) They are spare without any connection at any point with other conductors, contacts, power supplies, or other equipment.

b) Their condition complies with the required standard.

c) They are properly insulated without any leak or potential leak of current to or from frame, sheath, other cores, earth or other circuits.

Special attention must be paid to ensure that terminals are not connected together by jumper bars or other bridging.

The results of the Wire Count, Bell Continuity Test and Insulation Tests of the new circuit or altered parts of existing circuits, inclusive of the spare or reused items and apparatus, shall be recorded and certified in the test copy circuit book.

2.12 Test Wiring and Pre-Commissioning Modifications

2.12.1 Non Commissioned Work, False Feeds, Test Straps and Test Equipment

Connection of false feeds to existing working circuits must be in accordance with the provisions set out in PR S 40002 Temporary Bridging of Signalling Circuits.

For testing purposes on non-commissioned work, The Commissioning Engineer shall authorise the type of contents, length, wire colour and specific use of registered test straps. The straps and register shall be secured in a locked box with access limited to those responsible for the use of the box contents. Keep a record of any false feeds applied - preferably with the use of a work instruction.

The record shall indicate where the false feed is applied and shall be endorsed when the false feed has been removed. A check, after set to work testing has been completed, shall then be made to ensure that all such false feeds have in fact been removed.

Test straps used for verifying individual correctness of contacts, etc., shall be limited in number, be brightly coloured, and tagged for ease of identification. They shall be approximately 450mm long, individually numbered in sets and kept under lock and key.

Collect and count test straps where used to carry out testing at the end of each individual circuit test. In addition for each day's testing count out and log in and sign in and out all test straps except as follows:

a) Test straps used for turn around of control functions to create indications, or for test panel frig wiring or for timer straps, may be left in position until testing is complete.

b) Timer straps shall be logged separately and colour coded in a different colour; ensure that these straps are removed during timer relay set up procedures.

Ensure all instruments and apparatus used to carry out inspections and tests are fit for purpose, in good order, calibrated and where appropriate bear the certificate of a recognised authority as to their accuracy.

2.12.2 Modifications to Installed Non-Commissioned Wiring

Where corrective vital or non-vital modifications or stagework wiring alterations are to be undertaken and are to cut into newly installed non-commissioned vital circuits during any phase of the testing or commissioning the following installation practice must be adhered to at all times:

a) Undertake modifications only upon receipt of the duly completed and signed copies of the respective Design drawing or Modification Instruction Form.

   EXCEPTION: New wiring for modifications can be commenced prior to receipt of the approved drawings and / or signed modification where:

   - no wires are terminated.
   - all ends of wires are suitably insulated.

b) Upon receipt of the design drawing or modification instruction form, carry out a Documentation Check and Wire Count for each relay contact, fuse, and termination point utilised to generate the new modified circuit against the pink / yellow testing copy of the circuit diagrams and the contact analysis/documentation sheets.

c) This Wire Count checks that where contacts, fuses, and termination points have already been utilised to generate other circuits, the wiring at these points has been installed in accordance with the pink / yellow circuit diagrams (excluding the modification). If any error in the installed wiring is found then do not implement the modification until such time as the Commissioning Engineer has been advised of the error and that the error has been rectified to the satisfaction of the Commissioning Engineer.

d) Once the installed wiring has been verified the modification wiring can be connected into the circuit.

e) Identify the modification wire that has to be connected into the circuit against the relevant circuit book diagram and check the wire bead against the circuit book contact allocation.

f) Remove the installed crimp from the relay base, fuse, or termination point and check its wire beading before cutting the installed crimp from the wiring. Where two connections are in the installed crimp identify the wire that has to be reconnected with the new wire by Hand Tracing or Bell Continuity Testing. Label with a tag the installed wire that is to remain. Bell Continuity Test the wire that is no longer required, disconnect and cut off both ends, and cover them with an insulating marker for subsequent removal. After checking the labelling beads crimp and insert the new and the installed wires into the correct position in the existing relay base. When inserting the new wire (or new and previously installed wires) carry out another Wire Count against the modification as drawn on the circuit diagram.

g) Test the circuit alterations to one “clean” termination point - contact, fuse or terminal on each side of the alteration.

h) Indicate that the changeover has been completed by highlighting the cut-in wires on the modification circuit diagram with the designated test colour and record all tests.

i) Remove the wires that are no longer required. If a wire was connected to a fuse point, also remove the fuse and if connected to a link, disconnect the link.

   Wires that do not constitute a part of the working system shall not remain connected to any terminals and, unless impractical, shall be removed. Advise

the Commissioning Engineer immediately if circumstances occur that prevent removal.

j) Complete the testing (Bell Continuity Test, Wire Count, Insulation Test, Null Count and Function Test) for the modification and sign the design drawings / modification instruction forms accordingly.

2.13 Testing / Crimping Equipment

Approved test equipment only shall be connected to Signalling circuits and equipment.

Test lamps shall not be used as they may provide a significant leakage path for circuit currents.

Test equipment / crimpers shall be subject to calibration checks taken and recorded at the specified intervals.

Electrical test instruments shall have insulated leads, etc.

3 Renewal of Switches, Stockrails or Turnout

A joint inspection by Track & Signals is required on any turnout where a renewal of the switches, stockrails or turnout is proposed.

A checklist is to be completed and retained by the Signals representative. This checklist is to be attached to documentation forming the scope of work for the project.

3.1 Checklist

The checklist for Signals requirements for switch, stockrail or whole of turnout renewal works must be completed for each instance where renewal is carried out affecting switches or stockrails with Signals equipment attached. The checklist is to be signed by the responsible Track and Signal staff and will be held by the Signals representative.

For checklist see the track standard TMC 251 Turnouts, chapter 2-1 Signals requirements for track work affecting points and appendix 1 C*hecklist for turnout work*.

4 Modifications to Non-Vital Applications, System Software or Site Specific Data

In non-vital applications, should modifications to software be required due to errors or changes of scope then the following procedures shall be observed.

a) Locate the master copy of the source code of the system software or site specific data software, as applicable, and confirm that it is the current version of the source code or site specific data. This should be by comparing the identification of the master copy and the installed copy. If there is any doubt, a byte for byte comparison shall be performed to confirm that the correct master copy has been located.

b) Ensure that an archive copy of the current master copy is kept.

c) Identify the changes required. Define and document a process that will ensure that only the intended changes are made and all such changes are tested. If this is not possible then a complete re-test of the system shall be performed. In the case of changes to the system software, additionally perform an investigation to determine those areas of the system operation that may be affected and produce a reasoned justification as to why the testing should be limited to the affected areas.

d) Perform alterations in accordance with the documented process and generate a new executable version of the system software or site-specific data software.

e) Install and test the alterations only, provided that there is confirmation that only the intended alterations were made, otherwise re-test the whole system.

f) Perform a system confidence test by checking that each system function is operating correctly and observe the system operation looking for any errors or anomalies. Observation period shall be at least 30 minutes in the case of changes to the system software or for at least 15 minutes in the case of changes to the site-specific data software.

g) Update the identification of the new master copy, and installed copy. Then make the back-up copy of the master.

5 Procedures for Alterations

When modifications to circuits are carried out the utmost care is necessary to ensure that the altered circuit is in accordance with the design. Taking particular care to ensure / verify that:

a) Separate circuits are not wrongly interconnected.

b) Existing terminals or contacts in the circuit are not wrongly removed.

c) Existing terminals or contacts in the circuit are not wrongly bridged.

The risk of introducing functional discrepancies is increased if the existing circuit is not in accordance with the circuit design diagrams, e.g. contacts not in the circuit order shown; contacts connected with the point and armature opposite to that shown; different contacts, fuses or links to the numbers shown; etc. Discrepancies could have come about because of original wiring errors, wiring transfers from defective contacts or cable cores, drawing errors in the design office, certified copies not forwarded or not received, or maintenance copies not updated, etc.

The risk of not identifying circuit discrepancies is increased if persons involved do not identify the contacts or terminals correctly. Persons involved must be suitably licensed and experienced and if considered appropriate able to demonstrate their competence in this regard prior to starting the work. Identification risks are reduced significantly when a “No Bell” check is conducted as follows:

Following a successful Bell Continuity Test and Wire Count of a wire, the person on the probe goes to the other side of the contact and tests to ensure a “no bell” then calls back “No Bell on relay / contact and Wire Count…”. This provides a double check of Wire Counts and also checks for any parallel paths. Investigate the reason for each situation where the test bells to both sides of a contact – terminal or open circuited link terminal, etc.

A completely new circuit would be fully Bell Continuity Tested, Insulation Tested, Wire / Null Counted and operationally Function Tested to Control Tables (or Design Integrity Tested) prior to Commissioning. In comparison, an altered circuit could be fully Bell Continuity Tested only if it were practical to remove all relays and equipment items and open all links in the location; additionally a Wire Count to one “clean” termination point (contact, terminal, fuse) from the alteration and operational Function Test to Control Tables (or a Design Integrity Test) would be required.

Alternatively, the complete circuit could be Strap and Function Tested throughout after the alterations, in conjunction with the Wire Count and operational Function Tested to Control Tables (or Design Integrity Tested) . This alternative may also be impracticable and the following procedures are to be followed as a minimum.

5.1 Existing Circuit to be Correlation Checked Before Alteration

Correlation check is defined as a Hand Trace of wiring including a Wire Count of all termination points of a circuit. To avoid the risk of physical damage to wiring Hand Tracing must not be attempted at locations where the condition of the wiring is poor or difficult, such as wiring in overloaded trays or where the wiring is tight and restricted at pinch points or bends.

Inspection and Testing Planning must ensure that all possible preparatory work is completed in sufficient time to allow the prior resolution of any design issues, apparatus or insulation defects prior to any change over work commencing. If for any reason this

cannot occur then the appropriate contingencies shall be planned for and available for the duration of the bringing into use the new and altered work. Typical procedure as follows:

a) Correlation check or Bell Continuity Test / Wire Count to verify the altered portion of the circuit to one “clean” termination point - contact, fuse or terminal on each side of the alteration to ensure that it is wired exactly in accordance with the circuit diagrams.

b) If there are any functional discrepancies found then conduct a Correlation Check on the whole of the circuit. Alternatively, a Bell Continuity Test / Wire Count shall be conducted prior to advising the design office. Additionally, the Regional signal representative is to be advised of the details. To enable an assessment and possible rectification of the issued design refer the details of any verified functional discrepancies to the Professional Head Signalling and Control Systems before the modifications are made.

c) Schematic circuits such as signal operating circuits sometimes lack full detail of the “as constructed” termination details for signal heads, junction boxes and common side jumpering. Alterations to these circuits must be planned and carried out using site-verified detail added to the testing copy of the approved wiring diagram. Where possible details including the planning of the required changes are to be checked on site prior to the alteration proceeding. The site investigation to determine actual details may require Apparatus Inspection, Correlation Checking, Wire / Null Counts, Bell Continuity Testing, Insulation Testing and Apparatus Function Testing. Using this detailed wiring diagram, plan the requirements and preparation of the particular changeovers including:

   - Any amendments required to existing wiring diagrams required i.e., Signal base or head diagrams affixed to the apparatus.
   - Methodology for the changeover showing wires to be removed and wires to be connected.
   - Ensure availability of all necessary equipment i.e. cable, wire marker beads, lugs and terminal bridges.
   - New apparatus is the correct model, type, size, configuration, colour.
   - Physical arrangements such as mounting centres and aspect spacing on signals.
   - That a safe system of work has been planned and communicated for the required processes.

5.2 Precautions When Modifying Portion of a Circuit - Documentation and Null Count Check

5.2.1 Documentation Check

The purpose of a Documentation Check is to ensure that any approved design analysis sheets affected by the alteration are verified and updated during the progress of the work (including modifications) and therefore suitable for checking / updating the COC. Further, it provides a check that the equipment (i.e. relay names and types) as shown in the circuit design match the types shown in the rack layout and as installed on the racks (e.g. 8F / 8B in the circuits verses 12F / 4B on the rack layout).

Documentation Checked analysis sheets are necessary to verify their status for use as the reference source for the Null Count. Typical procedure as follows:

a) Prior to commencing Apparatus Inspection, conduct a Documentation Check between the relay contact / fuse / termination analysis and the rack layout drawings to confirm equipment and relay names and types.

b) Following completion or during the progress of the Bell Test and Wire Count, conduct Documentation Checks from the as tested circuit to the contact, fuse and terminal analysis including details of spare contacts, terminals and fuses.

c) If the design for an alteration is found to include double allocations, the as-built status of the pre-existing installation is not reflected in the approved circuit design / analysis sheets e.g. wires pre-exist in positions that were presumed to be spare and have been included for use in the alteration design. To enable an assessment and rectification of the issued design refer the details of any verified functional discrepancies to the Professional Head Signalling and Control Systems before the modifications are made. Update all circuits and analysis sheets to reflect any altered design issued.

If the undocumented wiring is not involved with the alteration the analysis sheet/s (for the purpose of Null Counting) shall highlight the presence of the wiring as “Status Unknown” and each of these discrepancies shall be immediately advised to the Regional signal representative for his investigation and dealing. Where the design does not include all of the required analysis sheets or when the design for the alteration includes schematic circuits for which no analysis is provided (e.g. signal operating circuits) produce an analysis check sheet for each contact/fuse/terminal involved in the alteration.

5.2.2 Null Count

Following the completion of the Bell Continuity and Wire Count Testing, and prior to booking into use, conduct a Null Count of the particular apparatus involved in the alteration.

The purpose of a Null Count is to:

a) Verify that there is no conductors connecting to terminals shown as spare in the contact/fuse/terminal analysis in the circuit book;

b) Verify that there are no contacts/fuses/terminals shown in use in the circuit book analysis sheets that are spare and without connected wires. Typical procedure as follows:

- Using the prepared or design analysis sheets that have been checked to “as-built” and updated to include any modifications examine relay bases, other operating equipment terminal assemblies, and fuse and terminal racks and check the status of the spare and used contacts/fuses/terminals following the alteration. This is conducted by the calling back the spare contact/fuse/terminals positions. All discrepancies are investigated and dealt with.
- On large alterations where it is not possible due to time constraints to complete disconnection of all redundant wiring and where it has been agreed and documented in the Site Integrity Agreement to complete a portion of the wire disconnections following the booking into use, the check is to ensure that any wires remaining in future spare positions have been identified previously during the Correlation Check and are marked for removal.
- Every effort is to be made to disconnect, secure and insulate all redundant wiring from any connection prior to Null Counting and booking into use.

5.3 Label Points of Disconnection, Redundant Wiring and Connection

For shelf relay installations identify each and every wire that will become redundant in the altered circuit (Hand Trace where practical otherwise Bell Continuity Test) and fit each end with a secure label (paper tag) clearly identifying the terminal to that it is connected, the terminal to which it runs, the circuit concerned and clearly marked as to its future status. Paper tagging in all other cases is not necessary provided that the new wiring is secured unambiguously into its final wiring tree position, and securely fitted with the correct wiring beads to designate its final termination point.

For plug-in relay or computer based Interlockings affix on each wire red (or other agreed colour) insulation tape to distinguish the wires that will become redundant and subsequently removed during the changeover.

5.4 Build-up of New Circuitry

Continuity Test / Wire Count / Insulation Test all the new wiring, checking wiring beads are correct for the final termination point and secured against interference.

Following development of the Null Count analysis sheets, insert and wire count any new wires into the bases of relays where the new contact is available. Connections to power supply fuses and busbars shall only occur at changeover or secured against insertion of fuses / pins.

5.5 Changeover

Changeovers may be conducted and Bell Continuity Tested and Wire Counted progressively from the circuit book or by prepared and checked wire changeover lists followed by a Bell Test and Wire Count from the circuit book. Alternatively, the Test Engineer may conduct the changeover of pre-tested wiring from the circuit book and directly observe each wire being correctly removed from and/or connected to its terminal. Where assistance is required to observe each wire changeover, select a suitably qualified, competent person who can identify contacts / terminals correctly but not persons who did the actual preparation work they are required to verify.

Where assistance is not available to observe and the person verifying the changeover activities cannot directly observe the changeover, the person doing the changeover will verify the changeover to be conducted by calling out the relay name contact or terminal number, the number of existing wires to be removed and new wires to go on. Following the changeovers a wire count is then independently completed on the terminal by a person who is not the person who carried out the changeover.

5.6 Redundant Wiring and Relays to be Removed

On changeover, disconnect each and every redundant wire at both ends, cut cleanly off and collect the terminal lugs/exposed wires and blind crimp or securely turn back and tape the ends (with labels still intact).

Remove redundant wiring from the wire runways etc., where practical before commissioning; removal of internal redundant wiring provides a further check that there are no intermediate terminations or contacts (not shown in that circuit order in the circuit diagrams) that might otherwise be inadvertently removed from circuit.

For large alterations when it is not possible to disconnect / remove all wiring for circuits that become totally redundant during the Commissioning Period the minimum requirement is to disconnect and insulate the wiring of the redundant circuit at all fuses

and negative / common busbars. Also all redundant relays are to be removed from racks prior to integrity testing commencing.

Where alterations occur within a circuit that otherwise would be totally removed (i.e. part reuse of an otherwise redundant circuit) then the redundant wiring at all interfaces of the reuse to one clear contact shall be removed prior to booking into use.

All vital circuit redundant wire removals shall be completed within two weeks of the commissioning. Waivers are required from the Professional Head Signalling and Control Systems to extend this period.

5.7 Inspection and Testing Circuit Alterations

Each alteration shall be inspected, tested and certified in accordance with the Specifications for Inspection and Testing of new and altered work, the Signalling construction Specifications and as approved in the Inspection and Testing Plan for the works.

A controlled “Bell Test” copy of the approved design including any detailed wiring diagrams developed for the implementation of alterations where they occur on schematic design shall be utilised for the testing of the alteration.

Any detailed wiring diagrams developed for the work where the circuits were shown schematically in the circuit book shall be included in the COC for the job. Where practicable, Signal Design may consider providing detailed wiring diagrams in the Maintenance Copy issue of the circuit book

The altered circuit comprises the new work, the contact, fuse or link at the point of connection and all parallel paths to the new work. Typical procedure as follows:

When alterations to the circuit are complete, perform the following:

a) A Bell Test / Wire Count and Null Count over the circuit alterations and on the top or base of all relays and equipment items that were to have wires connected or disconnected. (Compare against the alteration circuit diagrams and against the Wire and Null Count record);

b) A Circuit Strap and Function Test over the alterations inclusive of the “clean” termination point - contact, fuse or terminal adjacent to each side of the alteration, however;

   - The Circuit Strap and Function Test (intended to verify that internal contacts in apparatus are the correct configuration - back or front, and are not internally shorted / welded) may be deleted where the alteration is confined within “Q” relay circuits provided that:
   - A separate contact proving test of all new and existing relays in a relay test panel is conducted.
   - A documentation check (see 4.2.1) is completed and checked prior to bringing into use.
   - A Design Integrity Test is conducted that proves the functionality of the alteration.

     Circuit Strap and Function Testing however shall be retained on all other alterations including shelf relays.

c) A Circuit Function Test to check trackside apparatus operation, adjustment and correspondence to indications and controls, of all apparatus included in the alterations including where the contacts in a double-switched circuit are within a

sealed unit, (i.e. point detection contacts) each contact shall be proved separately with the other contact temporarily bridged.

d) A Function Test to Control Tables or Design Integrity Test of vital interlocking or controls, if these are altered by the modifications;

e) A System Function Test of the principal functions affected by the alteration.

The Commissioning Engineer may in the planning stage investigate any proposed variations to these requirements. After analysing the particular situation to ensure that all testing requirements to prove safety are included, the Commissioning Engineer may draft a proposal for a Signal Engineering Deviation in accordance with PR S 40049 Signal Engineering Deviations.

The Inspection and Testing Plan shall clearly document all risk assessments and any approved deviations / waivers from Standards as approved by the Professional Head Signalling & Control Systems. All testing copies of approved design utilised for any inspection and testing activity or task shall be attested to and retained for archiving.

6 Modifications on a Large Scale

Where there are many and/or complex modifications to existing circuits the Commissioning Engineer shall analyse the potential for error using risk analysis techniques. The probability of human error in performing multiple tasks increases with the number of repetitions and is influenced by the rigour and application of the testing methods, by the testing personnel's experience, alertness, awareness of the potential sources or error, sense of accountability, state of fitness, and whether the environment is favourable or adverse to the chances of an error free process.

The Commissioning Engineer shall consult with the Regional signal representative and with the Professional Head Signalling & Control Systems on the breadth, depth and detail of the inspection and testing required to ensure the integrity of the modified installation and these determinations and any resultant waivers / procedures shall be fully documented. Step by step procedures (Work Instructions) for critical activities shall be fully documented and communicated to all personnel concerned in the testing. These detailed procedures are to be included in an Inspection and Testing Plan Installation and Commissioning Work Packages.

The following procedure may be utilised in complex large-scale projects where it is necessary due to time restraints to commence controlled circuit changeovers in the Pre-commissioning Period. The Commissioning Engineer shall for each project or stage where it is proposed to use of this procedure obtain written approval from the Professional Head Signalling & Control Systems.

6.1 Procedures for Planning and Implementation of Staged Circuit Change-Over and Testing During Pre-Commissioning Phases in Working Installations

6.1.1 Introduction

Where specifically approved by the Professional Head Signalling & Control Systems, the principles included in the following procedures that were developed to address particular issues and restrictions during large alterations may be included in the Inspection and Testing Planning by the Commissioning Engineer and utilised as follows.

The time required for completion of circuit alterations and testing in a working signalling environment often exceeds the time allocated for the Commissioning Period.

This is particularly the case in large complex interlockings where a large percentage of the time allowed is required for the Signal Design Engineers to conduct their Design Integrity Testing.

Commissioning of new and/or altered Signalling projects at existing Signalling locations are planned to accommodate the following activities: -

a) Circuit changeovers

b) External trackside alterations

c) Circuit testing

d) Design Integrity Testing.

In planning the work, enough time must be allowed for each activity within the allotted time for the Commissioning Period.

It is desirable that the bulk of the circuit changeover work and testing activities be completed prior to the Commissioning Period, so as to allow maximum time for the signal design personnel to carry out their testing. This must take into account the consequences of possible design modifications and general fault finding and corrections. This will also allow signal design the opportunity of carrying out some testing during the Pre-Commissioning phase should it be possible.

6.1.2 General

These procedures are developed to address the following:

a) Main aim is to safely achieve maximum wire changeover and testing of circuits in a working Signalling environment, prior to the Commissioning Period.

b) A staged Commissioning Plan (Appendix A) to be prepared by a suitably competent and experienced Design Engineer accredited by the Professional Head Signalling and Control Systems. The engineer must also be capable of acquiring a good understanding of train movements and operational requirements in the affected area, so that the impact of circuit alteration work on train running can properly be assessed and controlled.

c) Provide the responsible Signal Engineer for the area relevant documentation for staged changeover works and final commissioning for review and comment.

   The staged commissioning plan and changeover list must be approved by the appropriate delegated engineering authority.

d) The staged Commissioning Plan is to be coordinated with the Commissioning Engineer for inclusion in the Inspection and Testing Planning.

6.1.3 Staged Commissioning Planning

The Design Engineer will carry out the following activities: -

a) Review and become familiar with the signalling plan of the affected area, taking into account the Signalling infrastructure changes and train movements in the area.

b) Review the circuit changes to become familiar with the size and complexity of the work, in order to prepare the staged Commissioning Plan within the constraints of the project time-scale and in accordance with these procedures.

c) Identify circuits and portions of circuits, that cannot be changed over until the final Commissioning Period. This will apply mainly to changes, that would impact on safety and operational integrity, or infrastructure changes that require advertising in a weekly notice.

d) Identify circuits that can be changed over prior to the Commissioning Period. These circuits would then be further sub-categorised as follows:

   - Circuits that can be changed over at any time and will not affect train operation. These circuits will be classified as “DAY”.
   - Circuits that can be changed over during a normal day shift but will impact on train operations. This will be carried “as traffic permits” (ATP) and will require equipment to be booked in and out of use in accordance with the Network Rules and Procedures (see exception below). These circuits will be classified as “ATP DAY”.
   - Circuits that can only be changed over at a time of minimum traffic density. (Midnight to Dawn or track possession). This will also require equipment to be

booked in and out of use in accordance with the Network Rules and Procedures (see exception below). These circuits will be classified as “ATP MIDNIGHT – DAWN”.

- EXCEPTION: In exception to the above, where the work is of a duration that may be performed between trains, an IBA Form may not be used for ‘ATP DAY’ and ‘ATP MIDNIGHT – DAWN’ changeovers where the route integrity of the signal indications and/or points detection are maintained throughout the procedure. The Design Engineer must be at the affected control panel and ensure that blocking facilities are applied correctly to prevent trains approaching the affected signalling until the changeover, circuit testing and operational testing is completed, and the blocking removed. Train movements may only be permitted following circuit changeover and testing but prior to the completion of the operational test in circumstances where the route integrity is not compromised, and it is deemed safe by the Design Engineer. For added protection any points affected are keyed and locked in the correct position and blocking facilities applied. This blocking shall to remain in place for the passage of any train/s until the operational test/s are completed.

6.1.4 Pre-Changeover Preparation

An approved “Commissioning Yellow” copy of the final circuit book(s) (signal design office copy or dedicated staged Commissioning copy) will be used by the Design Engineer to produce the staged Commissioning Plan. After the circuits for the Pre-commissioning changeover are identified, they will be further analysed to determine any required preparatory work.

It is essential that this work be sequenced in the correct order, to ensure circuit operational integrity, prior to the commencement of the changeover work.

Preparation work will therefore identify the following:

a) New relays required to be inserted and energised (by provision of false feeding) or de-energised.

b) Existing relays required to be energised (by provision of false feeding) or de-energised.

c) New circuits required to be made operational.

d) Temporary stage wiring required to maintain circuit operational integrity.

The Design Engineer will prepare the staged Commissioning Plan utilising the approved forms included in Appendix A. The Design Engineer will prepare circuit modification sheets for each instance where relays are to be temporarily false fed or circuits stage-wired. All modification sheets shall reference the “item number” applicable from the staged Commissioning Plan.

The Design Engineer will submit the final verified and approved staged Commissioning Plan and prepared modification sheets to the Commissioning Engineer. The Commissioning Engineer prepares the Detailed Inspection and Testing Plan for the implementation. The required number of Commissioning copy circuit book/s are to locally designated “Staged Commissioning Copy” and “Interim Maintenance Copy” as agreed with the Regional signal representative.

The Commissioning Engineer shall ensure that correlation checking is completed prior to the changeovers.

6.1.5 Pre Commissioning Changeover Implementation.

Reliable communications shall be established and the Design Engineer shall be kept informed as to the progress of the changeover

Changeovers shall only be conducted to the circuit book and /or modification sheets under the explicit direction of the Design Engineer.

The Commissioning Engineer marks up and signs the staged Commissioning circuit book for the change overs and testing, progressively updates the Interim Maintenance Copy circuit book to show which portions of the circuits have been changed over. The mark up includes drawing in any modified circuits including the modification number or attaching a copy of the completed modification sheet whilst highlighting the affected area and nominating the modification sheet applicable following advice of completion of each modification the Design Engineer will ensure that the circuit is operationally correct and sign off accordingly on the staged Commissioning Plan.

(**Note**: In most cases this is not a Design Integrity Test as normally, no changes to the interlocking have taken place)

If for any reason temporary bridging is required a new modification sheet would preferably be issued, however if required the Commissioning Engineer shall control the process in accordance with PR S 40002 Temporary Bridging of Signalling Circuits.

The procedures for alterations shall be in accordance with this Specification. Inspection and testing procedures shall be conducted in accordance with the relevant Standard Specification/s.

6.1.6 Pre-Commissioning Changeover Information for Maintenance Personnel

During the Pre-commissioning Changeover phase, an Interim Maintenance Copy of the staged commissioning circuit book indicating clearly which part of the circuits have been brought into use will be left for the information of the maintenance personnel. This will also include all temporary yellow stage wire false feeds and strapping.

6.1.7 Commissioning Phase

During the Commissioning Period, all remaining circuits identified for changeover will be changed over and tested and all temporary relay false feeds / circuit modifications / stagework removed. All Removals shall be marked up in the “Staged Commissioning Circuit Book”.

Appendix A Staged Commissioning Plan

Cover Sheet

New Relays Required

Stage Wiring Details for Relays or Circuits

Staged Commissioning Changeover Sheets

JOB TITLE HERE

STAGED COMMISSIONING PLAN

JOB NUMBER _____

CB NUMBER _____

No of BOOKS _____

?? SHEETS FOLLOW

NOTES:

PREPARED BY _____ DATE _____

VERIFIED BY _____ DATE _____

FIELD REVIEW BY _____ DATE _____

APPROVED BY

PROFESSIONAL HEAD
SIGNALLING AND CONTROL SYSTEMS

ITEM No	BOOK	SHEET NUMBER	RELAY NAME	RELAY TYPE	NOTES/REMARKS	INSTALLED BY	DATE

ITEM No	BOOK	SHEET NUMBER	RELAY/CIRCUIT REQUIRING STAGEWIRING	MODIFICATION NUMBER	STAGE WIRING INSTALLED BY	DATE	STAGE WIRING REMOVED BY	DATE

ITEM No	BOOK	SHEET NUMBER	CIRCUIT	PERIOD TO BE DONE	RELAYS BE TO ENERGISED	RELAYS TO BE DE-ENERGISED	OTHER CIRCUITS OR CONTACTS TO BE DONE	OTHER CIRCUITS OR CONTACTS TO REMAIN	AFFECTS	NOTES	CHANGED OVER & TESTED BY