

**National Statement of Competence for a – Please Select a Role**

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| **Testing & Commissioning**  | **Proficiency** |
| Test & Commissioning Strategy | Proficiency Level |
| Preparation of Testing Management Plan | Proficiency Level |
| Preparation of Commissioning Work Packages | Proficiency Level |
| Tester in Charge (Major Works) | Proficiency Level |
| Tester in Charge (Minor Works) | Proficiency Level |
| **Principles Testing** | **Proficiency** |
| Testing to Control Tables | Proficiency Level |
| Principle Testing (Simulator) | Proficiency Level |
| Principle Tester (Interface, Cross Boundary and Relay) | Proficiency Level |
| Axle Counter Data | Proficiency Level |
| Aspect Sequence Test | Proficiency Level |
| **Function Testing** | **Proficiency** |
| Circuit Function Test (Strap and Function Test) | Proficiency Level |
| Through Circuit Function Test (Correspondence Testing) | Proficiency Level |
| **Verification Testing** | **Proficiency** |
| Correlation Check | Proficiency Level |
| Apparatus Inspection | Proficiency Level |
| Wire Count, Insulation Test & Continuity Test | Proficiency Level |
| Wire Count & Null count | Proficiency Level |
| **Proficiency Definitions** |
| **P1** – A RIW Cardholder has limited knowledge obtained through either formal training or experience. The RIW Cardholder requires supervision in more complex tasks and activities to allow that person to gain relevant experience. May perform simple tasks unsupervised where previous experience can be demonstrated. |
| **P2** – A RIW Cardholder who has sufficient knowledge through either formal training and/or experience allowing to work unsupervised in tasks and activities within the relevant experience.  |
| **RIW Cardholder** |
| Name: | RIW Number: |
| Signature:  | Date: |
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| **Certification by Assessor:** |
| Name: | RIW Number: |
| Signature: | RIW Role: |
| Date: |

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| **Tester in Charge** |
| **Activity**  | **Task Definition** |
| **T&C Strategy** | System wide view of the delivery disciplines related to the Signalling System and an understanding of the interdependencies. The T&C Strategy (or part of a Delivery Methodology) should inform Signalling Design of how the system will be commissioned into service. This would include identifying significant interfaces and defining staged delivery boundaries. |
| **Preparation of Testing Management Plan** | A testing or Testing & Commissioning plan is required for all aspects of the Signalling System sub-systems and assets to ensure that the design requirements have been met, all equipment is installed and operational (to RTO specification), all sub-systems are integrated, and the system is safe to operate within the Railway System. The Preparation of the Testing Management Plans is detailed planning of a Testing or Testing & Commissioning Event with an understanding of:* Identify defined tasks and what V&V activities are required,
* Identify interdependencies on the task for internal and external interfaces,
* Resources require, competency requirements and tools required of each defined task, and
* Contingency planning in the event of foreseeable over run.

The creator of the Testing Management Plan should be the person responsible for managing the day to day running of Testing activities and Commissioning events. |
| **Preparation of Commissioning Work Packages** | A Commissioning Works Package is required for every Commissioning Event. This contains all the required information to Prepare, Implement and Evaluate the Signalling System readiness before being signed into service.This competence includes:* Understanding and decomposing technical information from the Testing Management Plan and creating packages of work for each V&V activity.
* Programming tasks and time that consider all interdependencies that require to be completed prior to other tasks commencing.
* Creating logs and registers required to track testing issues, design changes, progress, and issues.
* Identifying key procedures required for the commissioning, key resource contact details, emergency management etc.
* Allocation of tasks to teams and identify team resources.

The creator of the Testing Management Plan should be the person responsible for managing the day to day running of Testing activities and Commissioning events.  |
| **Tester in Charge (Major Works)** | The Major Works TiC shall be responsible for Organisation, control and completion of a commissioning event consisting of complex work usually over a longer period of time and can involve many departments and disciplines. A major works project may involve multiple staging and enabling works and a Major Works TiC is assigned to this role.Major works can also involve staging the signalling system back into operational use.Examples of major works may include:* An interlocking renewal,
* A resignalling scheme,
* Grade separation, or
* A level crossing or active pedestrian crossing.
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| **Tester in Charge (Minor Works)** | The Minor Works TiC shall be responsible for Organisation, control and completion of a commissioning event consisting of minor works with limited complexity and interfaces. Minor works can vary in content from asset commissioning to small system commissioning. Work is generally carried out with minimal liaison with other departments, in minimal shifts and with one handback to the network.Examples of minor works may include:* Upgrades to existing infrastructure,
* Additional equipment that does not require interlocking changes i.e., monitoring equipment and surge protection,
* Enabling work for a major project,
* Track support work,
* A level crossing isolation, and
* Disconnections/reconnections.
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| **Principles Tester** |
| **Signalling Tests** | **Task Definition** |
| **Test to Control Tables** | Testing will be conducted to ensure that the installation conforms to the interlocking requirements detailed in the control tables.Detailed testing to control tables' verification procedures shall be based on local standards, guidelines and procedures of individual rail organisations.**Note.** This is not a principles test.  |
| **Principle Testing (Simulator)(AS 7716:2017)** | To facilitate testing, a simulator or a test rig may be used to emulate the expected responses from external apparatus. Simulator testing may be used to assure the adequacy of the design for at all stages of testing including control table testing, principles testing, stress testing and testing computer-based systems. The benefits of this type of testing are that hardware and software can be interfaced with test inputs and outputs, but it does not allow for equipment reaction times, propagation times and the time for operation of points etc, in the external environment. These timing issues should be rechecked once the system is connected to the actual apparatus, to ensure there are no adverse timing effects. Simulator testing is often used where new interlockings or signal boxes are being installed. Function testing can be done in advance of final external inputs being available, using a simulation process. This process is used to simulate the operation of the external signalling equipment. Temporary inputs are used, usually via a test panel, to simulate field inputs. These simulated inputs provide correspondence of track indications, point indications, signal and route indications, trainstop indications, etc. The simulated inputs can be used to validate the new designs to ensure they will operate as per the approved design documents.The configuration and arrangement of the inputs should be approved by the design engineer and the Rail Infrastructure Manager.Field inputs and indications should be used, when possible, to limit the amount of re-testing required when the final configuration change is made.The use of any temporary wiring shall be fully detailed on the approved design documents as stage work wiring. The installation, testing and removal shall be documented in testing copies of the stage work design provided for the site-specific requirements. Any function testing carried out by simulating the operation of the trackside apparatus shall be retested using the actual field equipment, including correspondence testing, to complete testing prior to commissioning. |
| **Principle Tester (Interface, Cross Boundary and Relay)(AS 7716:2017)** | Principles testing is undertaken independently of the issued control table details. Principles testing shall be carried out to validate that the controls embodied in the system conform to Signalling Principles, performance specifications and site-specific operating requirements and the railway layout signalling plan. Principles testing shall be planned and shall be developed based on the design intent.Principles testing shall include the following:* Inspection/Set to Work and Factory Acceptance Testing of Signalling Control System Panels and Screens, etc,
* Validation of Signalling Scheme Plans, (SAPs, Hand Sketches etc.), including checking of signal spacing, clearance points etc,
* Verification of Train Control Systems (diagrams, screens etc.) against the issued Signalling Scheme Plan, and
* Testing of Axle Counter Resets and Failure Mode Protection (Aspect restrictions etc.).
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| **Axle Counter data** | Axle Counter data testing is undertaken on modern Axle Counter system where there are detailed configuration settings all interlinked into a subsystem independently of the Signalling Interlocking. The Axle Counter systems are generally SIL4 allowing creation and transfer of safety critical information i.e., block controls.The Axle Counter data testing shall:* Verify the Axle Counter configuration data as per design,
* Verify the local configuration interaction between Axle Counter sections as per design,
* Verify the Axle Counter communication between subsystem and between subsystem to Interlocking, and
* Validate all Axle Counter resets scenarios i.e., supervisory, sweep, counting head control as part of the subsystem and Signalling System.
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| **Aspect Sequence Test(AS 7716:2017)** | Aspect sequence testing shall:* Verify that only the correct aspect and route indication are displayed to the driver of the train,
* Be performed in accordance with the relevant signalling plans which provide details of potential routes through the area of track under test, and with any special aspect sequence charts drawn up specifically for the test, and
* Ensure the complete aspect sequence is simultaneously observed in its entirety.
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| **Function Tester** |
| **Signalling Tests** | **Task Definition** |
| **Circuit Function Test (AS 7716:2017)***(The same skill is applied to Strap and Function Tests and therefore Strap and Function does not require a separate SoC line item)* | Each individual circuit will be tested from its power supply fuse to its final controlled function. At every intermediate location, each link and relay function, will be verified as effective and circuit polarities are correct. Individual circuit functions, previously tested in the strap and function test, need not be repeated.After circuits, internal to locations and the external interconnecting cables, have been separately tested, tests will be carried out on the complete circuits.These tests will operate and verify the apparatus and the complete circuit from end to end, in a functional manner and will be carried out for both control and indication circuits:* Energise the circuit, to pick up the final controlled function and any intermediate relays connected to the same circuit,
* At all the locations involved, disconnect and replace in turn, the feed fuse and every link in the circuit, including at the power supply busbar, observing that all relays in the circuit and all indications respond in each case, by correctly changing status,
* For polarised circuits the test shall be carried out for each polarity,
* Place a meter across the relay coils and verify correct working voltages,
* Investigate any voltage when the circuit is opened,
* For control and indication circuits, prove that each output corresponds with its relevant input. A function test of the system shall ensure that when there is a control operated at the control centre, it is correctly relayed throughout the system and operates the trackside apparatus, and when there is an indication from the trackside apparatus, that it is correctly relayed throughout the system to the control centre. Each indication shall be observed to change status in correct correspondence, and
* Ensure contacts are in the correct configuration i.e., front or back, as per the design documentation.
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| **Through Circuit Function Test(AS 7716:2017)** | This is a circuit function test of a circuit or series of related circuits running between locations, e.g., signal boxes, relay room, etc., to ensure the fuses, links and control devices effectively control the final function. It includes through function testing from a signaller's control at the operator interface to the operation of the trackside signalling apparatus, and to its change-of-state indication back to the signaller's indicator diagram.Through circuit function testing will be carried out on circuits that operate between housing/locations to prove:* The end function operates as intended through the complete circuit when the correct voltage and the correct polarity is applied to the originating part of the circuit,
* The circuit internal wiring has been correctly connected to the respective external cables where both have been separately continuity tested, wire counted, and insulation tested,
* De-energisation of, and zero residual voltage across the circuit function, when the circuit is opened, in turn, at, the fuse, each link and at each intermediate relay. The test is performed with as many other circuits energised as practical to provide a high probability of detecting the presence of any false voltages in the circuit, and
* All repeat, indicating and intermediate relays correspond and operate correctly, and train controllers panel indications respond correctly.

The processes used for through function testing should include the following:* Energise the circuit to pick up the final control relay and any intermediate relays,
* At all the locations involved, disconnect and replace in turn the feed fuse and every link in the circuit, including at the power supply busbar, observing that all relays in the circuit and all indications respond in each case by correctly changing status,
* Verify the wire count at the fuse and on each side of disconnection links and record on the circuit diagrams,
* For polarised circuits the test shall be carried out for each polarity,
* Place a meter across the relay coils and observe correct working voltages. Investigate any non-zero voltage when the circuit is opened,
* Where circuits are in cascade (such as cut sections for AC traction immunisation or for volt-drop purposes) the intermediate relay circuits shall also be similarly tested, the final relay under test being observed to respond, and
* Where possible and relevant, carry out tests for each through circuit as a single operation from the point of control to the point of operation and from the point of operation to the point of indication.
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| **Verification Tester** |
| **Signalling Tests** | **Task Definition** |
| **Correlation Check(AS 7716:2017)** | A Correlation Check is the manual process for physically checking to confirm that a circuit or part of it is wired in accordance with the available documentation. This must be done by hand tracing the wiring and wire-counting each termination point within the affected area. This check is to extend to one unaltered ‘clean’ relay contact or terminal on each side of the alteration. The correlation shall include a comprehensive check of all control equipment and it’s labelling including equipment racks, cable terminations and apparatus cases. The check shall include all trackside equipment including signals, points and track circuit bonding likely to be affected by the proposed alterations.Correlation checking shall include the following:* Verify that each conductor runs directly between two wire termination points,
* Wire count existing portions of the altered circuit/s sufficiently to verify that the design is a true representation of the actual circuits, and
* Verify that there are no unused contacts/fuses/terminals shown to be in use in the circuit book analysis sheets that are without connected wires.
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| **Apparatus Inspection (AS 7716:2017)** | An apparatus inspection is a visual inspection to verify the signalling apparatus conforms to the approved and issued design documents, plans and standards specifications. Application specific requirements define the expected outcome based on local and site, RIM and manufacturer specifications and requirements.The inspection of signalling apparatus shall include the following:* Verify that configuration and positioning of trackside apparatus conforms to the latest approved design documentations, plans and standard specification,
* Verify that installed apparatus items and cables are the correct type, quantity, rating, colour, labelling, with no loose wires and appropriate quality workmanship,
* Verify that the apparatus mounting layout conforms to the profile drawings,
* Verify that labelling is in accordance with plans and documentation,
* Verify that signalling apparatus physically conforms to approved plans and signal sighting forms,
* If the signalling apparatus is fitted with a security lock, verify that the correct security lock is fitted, and
* Verify that extraneous items/apparatus are removed, that any loose wires are secured with ends insulated, that temporary wiring is removed, and that stage work is removed.
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| **Wire Count(AS 7716:2017)** | The wire count shall be undertaken to ensure the installation wiring conforms to the approved design detail. Wire count is a visual inspection that examines the apparatus termination points to confirm that the number of wires on each termination point corresponds with the number of wires shown on the wiring diagram and/or design detail.Wire count inspection shall include the following:* Verify the number of conductors terminated at a particular point is as shown on the approved wiring diagram and/or design detail,
* The wire count shall include identification of all conductors connecting to terminals, busbars, links or other strapping. Rail mounted fuses should be closely checked to verify the presence or absence of common connections,
* Verify the wiring identification labels correctly identify the termination point of the wire,
* Check terminations and crimps are correctly made. Wires are not trapped under adjacent terminals, and crimps are correctly locked into plug boards or terminal blocks, and
* The tester on verifying that the correct number of wires is attached to each termination point shall mark the individual ends of each wire on the circuit plan and/or design detail in accordance with application specific approved standards.
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| **Insulation Test(AS 7716:2017)** | The insulation testing of all wiring and apparatus associated with signalling installation shall be carried out prior to bringing into use in any new work with an approved insulation testing instrument with a voltage output in accordance with the requirements of AS 3000, Insulation resistance.The test plan shall specify the minimum acceptance values of insulation resistance. Insulation tests shall be made on all lineside signalling cables, including local and power cables.The test earth connection shall be tested immediately prior to performing this series of tests and immediately after the last test to ensure it provides a low resistance to earth.Cable insulation tests shall be carried out with a proven effective reference earth. The integrity of the earth is essential for insulation resistance tests to be valid and earth leakage detectors to be effective. Insulation testing is performed to determine the following:* Insulation resistance to earth of electrical apparatus, wire conductors, cable cores and cable sheaths,
* Insulation resistance between cable cores, and
* Insulation resistance between each cable core and the cable sheath.

Insulation testing for individual wires will include the following:* All individual wires run will be insulated resistance tested to the frame of the housing or rack,
* It is desirable to test the complete circuit as a single test. Testing of a complete circuit, with all other circuits connected and working, has the added advantage of possibly detecting an insulation breakdown between circuits and not via earth, and

Prior to testing, all lightning protection devices and electronic devices will be disconnected or removed to prevent incorrect readings and/or damage. |
| **Continuity Test(AS 7716:2017)** | Continuity testing is used to confirm that a wire is connected, as per the design documentation. As part of the installation, a continuity test will be performed.A continuity test is a method to support assurance that the wire runs from point to point, forming part of an overall circuit and is terminated as per the circuit and/or design detail.A continuity test will be carried out before termination or with all links, fuses and apparatus removed, using an approved device that is capable of detecting a resistance greater than the cable resistance of the wire under test.The continuity tester will be a low voltage, preferably with an audible indicator, that shall sound when the test leads are connected across a continuous electrical path between termination points.The continuity tester will have its own independent power supply. A high resistance or open circuit between the terminated ends of the wire under test, shall prevent the alarm sounding.Where the wire cannot be terminated immediately it shall be checked as being present and ready for termination, suitably insulated and identified by a permanent label. Its subsequent termination will then be overseen by a tester who shall recheck to ensure that the number of wires terminated is in accordance with the circuit and/or wiring diagram. Continuity testing will include:* Ensure wiring is compliant with approved design detail and electrical continuity is verified,
* A check will be made to ensure that all loose wire ends are suitably insulated, and
* A check to verify that all labelling is correct as per the design detail.
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| **Null Count(AS 7716:2017)** | This is a visual inspection of all termination points against the documentation sheets to ensure there is no wiring surplus to that specified.The null count should be carried out after the continuity test and wire count has verified the wiring connecting to the respective terminals and marked up on the test copies.The documentation to be used will be the relevant completed analysis sheets that were checked / marked up from the documentation check.Null count inspection will include the following:* Verify that there is no conductor connecting to terminals shown as spare in the contact/fuse/terminal analysis sheets in the circuit book, and
* On the analysis sheets, mark the spare contact, fuse or terminal, with a tick to indicate the test is successfully completed.
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