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NR/L3/SIG/11231

NR/SMTH/Part/01

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END

1. Background

On the morning of 12th December 1988, a crowded passenger train crashed into the rear of another train that had stopped at a signal just south of Clapham Junction railway station in London. The second train was derailed and subsequently sideswiped an empty train travelling in the opposite direction.

Figure 1 – South of Clapham Junction, 12th December 1988

A total of 35 people died in the collision, while 484 were injured.

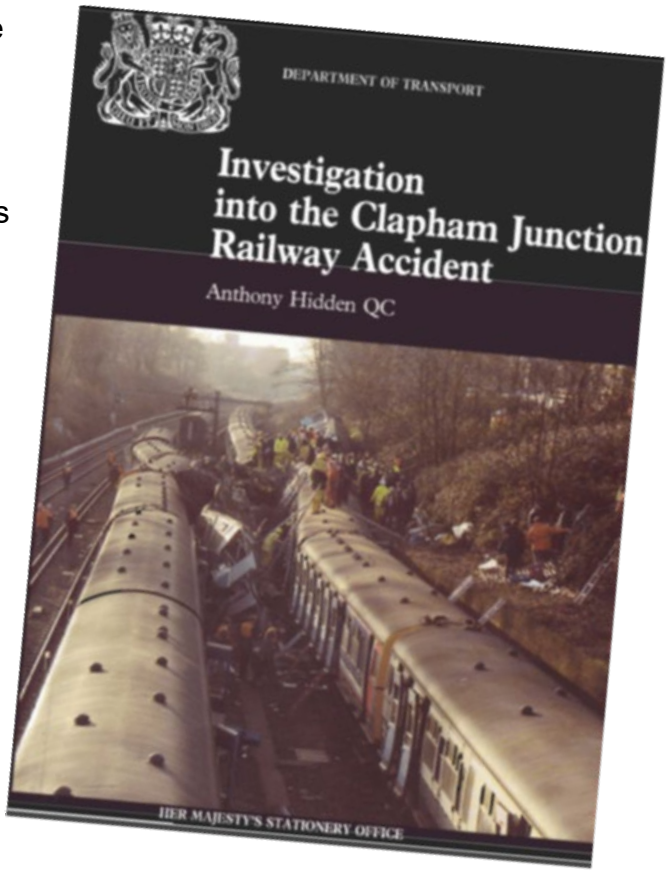
The collision was the result of a signal failure caused by a wiring fault; this fault meant that the protecting signal could not show a red danger aspect when the track circuit immediately in front of the signal was occupied.

New wiring had been installed as part of a re-signalling scheme, but the old wiring had been left in place and not adequately secured.

Following a 56-day independent public inquiry chaired by Sir Anthony Hidden QC, a report was issued which was heavily critical of working methods used during the re-signalling scheme.

The Senior Technician responsible for the flawed work had not been told that his working practices were wrong, and his work had not been inspected by an independent person.

A total of 93 recommendations were made in the report, these covered sweeping changes in installation methods, tighter control over design offices, independent testing of work, the recruitment of sufficient numbers of suitably qualified people, better training, and an end to excessive working.



British Rail's response was to gather together all the best and brightest engineers in the Signal Engineering Department, along with their local and regional practises, their goal to produce the first "National Maintenance Standard" which would lay down mandatory procedures and processes to be used in Maintenance Testing.

And so "The Signal Maintenance Testing Handbook (SMTH)" amongst other documents was born.

END

1. Changes in Ethos since the Introduction of the SMTH

1.1 When the Signal Maintenance Testing Handbook was first introduced it was not considered necessary for:

a) A Maintenance Test Plan to list every task required to perform the work or list checks purely associated with reliability.

b) Non safety critical equipment, or parts of it, to have an associated Maintenance Test Plan.

1.2 Over the years, the rationale behind these statements has changed as the number of asset types/technology has dramatically increased. When added to the increase in mean time between failures and the extended maintenance frequencies, this has led to the maintainer having reduced familiarity with the equipment on their area.

The reduced familiarity has led to “user requests” for:

a) Test plans that are related to reliability.

b) Test Plans for non-safety critical equipment.

c) Test plans for equipment that are owned by other disciplines but maintained by Signalling Technicians.

2. Principles of SMTH

2.1 A flowchart detailing which testing process (SMTH, SITH or SWTH) shall be used and can be found in NR/GI/T001 (Testing – General).

2.2 Maintenance testing allows for safe testing of equipment under varied circumstances such as:

a) Like for like equipment replacement as part of preventative and corrective maintenance where pre-planning cannot be undertaken or

b) Like for like pre-planned minor renewals.

2.3 Maintenance testing is based on the principle that the equipment was fully tested at commissioning and has been working correctly.

The design may therefore be taken to be correct and the work shall not require a change to diagrams unless permitted in the maintenance test plan required as a result of correlation.

3. Working on Equipment

3.1 Working on equipment that is "in service" is acceptable provided the correct protections are in place.

NOTE: *Rule Rook HB19 gives details of the protection arrangements.*

3.2 If disconnections are required as described in NR/GI/B002 (Disconnections), these shall be planned and designed by a Maintenance Tester and shall be checked by an independent Maintenance Tester.

Further information on disconnection, insulation, releasing, isolation, reset, restoration, diversion and monitoring is covered in NR/L3/SIG/10064 (General Instructions to Staff Working on S&T Equipment).

3.3 Signalling circuits in cables shared with telecommunications functions should be identified and tested in accordance with NR/GI/E041 (Signalling Circuits in Telecommunication Systems).

4. Objectives of Maintenance Testing

4.1 The objective of maintenance testing is to prove that the signalling equipment is safely returned to service.

4.2 The Test Plans contain all the vital steps in a logical order. This is necessary to confirm safe working of equipment and to validate that no necessary steps are overlooked.

4.3 Equipment covered by maintenance testing shall be tested in accordance with the maintenance test plans, unless an equivalent or better alternative is approved by the S&TME.

4.4 The approval process shall include a risk assessment and be required to demonstrate that the proposed alternative does not reduce the safety risk.

The requirements for a maintenance test plan are given in NR/SMTH/Part 01/Module/05 (Test Plan Requirements).

5. Independence

5.1 Maintenance testing can be used to achieve independent verification of installation work.

5.2 All Test plans require independence when testing, unless indicated as "Independence Exempt"

5.3 The Maintenance Tester shall be independent of the installer.

5.4 The Maintenance Tester is responsible for checking that the equipment is restored to use in a safe condition. The Maintenance Tester shall not carry out or direct (but can assist) the work which is to be subsequently verified by themselves.

END

1. When Testing moves between Signal Maintenance Testing and Signal Intermediate Testing

1.1 If any of the following criteria are exceeded, then the work shall be classed as extensive and simultaneous and **shall not** be undertaken as maintenance testing:

a) If the number of staff required on any one shift exceeds three teams of three people.

b) If the disconnection work exceeds one shift. Maximum of 12 hours.

c) If the reconnection work exceeds one shift. Maximum of 12 hours.

d) If there are more than thirty tail cable disconnections. In areas fitted with plug and play this number can be increased to fifty.

e) A maximum of two-point machines per team. In areas fitted with plug and play this number can be increased to four per team.

f) A maximum of two signal head replacements (all types) per team. In areas fitted with plug and play this number can be increased to six per team.

g) Excluding rapid response incident, the planned replacement of a lineside multi-core cable affecting signalling equipment on more than two lines that are in service.

1.2 The Engineer in charge of the work (typically the S&TME or Project Engineer) can apply to the Route Engineer (Signalling), Principal Route Engineer (Signalling) or equivalent, for permission to work outside of these criteria.

1.3 The dispensation shall be given in writing. Before giving permission, the Route Engineer (Signalling), Principal Route Engineer (Signalling) or equivalent, shall be assured that the associated risks are controlled.

The evaluation of risk shall take the following into account, as a minimum:

a) The exact nature and scope of the work – details.

b) Local circumstances.

c) Criticality of the affected equipment.

d) Density of service.

e) Other operational issues that are ongoing, but not related to the SMTH issue.

f) Consequences of the SMTH work not going to plan.

g) Possible operational “work arounds”.

h) Quality and competency of staff who undertake the work.

i) Quality and competency of staff who supervise the work.

1.4 If dispensation is refused the Testing process transfers to the Signal Intermediate Testing or Signal Works Testing, see NI/GI/T001 (Testing - General).

1.5 The Route Engineer (Signalling), Principal Route Engineer (Signalling) or equivalent shall be accountable for the final decision to authorise any request for permission to work outside the criteria.

END

1. Responsibilities

1.1 Signal & Telecoms Maintenance Engineer - (S&TME)

Is responsible for confirming that all staff under their control hold valid competencies and authorities to work, before undertaking maintenance testing activities.

1.2 Section Manager (Signals) – (SM(S)) or Renewals Manager

Designates the Maintenance Tester before work starts.

If more than one group of SMTH Testers are working together then the Lead Maintenance Tester shall also be designated.

Determines the extent of the work, confirms that the work can be undertaken using the SMTH and decides which maintenance test plans are required.

Shall produce Maintenance Test Plan Lists (NR/SMTH/Part02/Form/02) whenever more than one Maintenance Test Plan is required to carry out a task.

1.3 Team Leader

The Team Leader (or the Person in Charge of the Work in the absence of the Team Leader) is responsible for designating who will act as the Maintenance Tester/s, and Lead Maintenance Tester, if they not already been designated by the SM(S) or Renewals Manager.

Before any work takes place, that is likely to require any level of maintenance testing, all members of the team shall be advised who the Maintenance Tester/s is/are. There shall be no doubt who this person is before the work commences.

1.4 Lead Maintenance Tester / Maintenance Tester

Lead Maintenance Tester / Maintenance Tester shall be in overall charge of the testing.

If a Test Plan List has been produced:

a) Confirm the extent of the work and

b) Confirm that the work can be undertaken using the Maintenance Test Plans indicated.

If a Test Plan list has not been produced:

a) Determine the extent of the work.

b) Confirm that the work can be undertaken using the Maintenance Testing.

c) Decide which maintenance test plans are required to carry out the testing.

2. Roles and Responsibilities

2.1 The SMTH contains certain roles and job titles pertaining to maintenance within Network Rail. For other functions within Network Rail and Contractors/Suppliers who carried out SMTH work, the roles and responsibilities contained within the SMTH shall be mapped across to these organisations.

END

1. Competence of the Individual Carrying Out the Work (also known as the Installer)

1.1 The individual carrying out the work shall hold the necessary competencies as indicated below:

a) The removal of the item being replaced and fitting of the replacement item.

Where the replacement does not require configuration or set up by the Installer and can be undertaken using site diagrams, then as a minimum the person shall hold basic signalling competencies.

NOTE: *Basic signalling courses such as SEM1 and SEM2 provide a level of competency that allows the installation of simple signalling equipment to be undertaken using existing wiring diagrams. This includes replacement of wires, cables, terminal blocks, free wired and plug-in components.*

b) Where integral component replacement tasks are required to be undertaken (e.g., replacement of lock and detector assembly) or where the replacement requires equipment to be set up or configured by the Installer, the Installer shall be competent to undertake the work independently from the Tester.

c) Where diagram amendments are required to be undertaken (e.g., as a result of a cable diversion) the Installer shall be competent to undertake the work independently from the Tester.

2. Competence of the Signal Maintenance Tester

2.1 The Signal Maintenance Tester shall hold the necessary competencies for the equipment being replaced and tested.

2.2 The Signal Maintenance Tester shall be responsible for:

a) Carrying out the defined checks during both the before and after phases of the testing.

b) Recording any notes that are required during the maintenance test plan process.

c) Carrying out the defined tests during both the before and after phases of the testing.

d) Completing and returning the Log Sheet, the Maintenance Test Plan List (if provided) and all other mandatory testing documentation to the SM(S).

e) Completing the Record Card (if provided).

f) Checking any amendments to diagrams and reporting these alterations to the SM(S).

3. Levels of Competence for Signal Maintenance Testers

When undertaking Signal Maintenance Testing activities, the role and responsibilities of the Signal Maintenance Tester are determined by the activity being undertaken. An individual undertaking the duties of a Signal Maintenance Tester can be categorised as (see also Figure 1):

a) Individual that Requires Training

An Individual who has been selected for development, as part of a development action plan, to become a Signal Maintenance Tester and has not yet successfully completed the Initial Training Event. The Individual is not permitted to complete any Signal Maintenance Testing Activity in the role of Tester.

b) Signal Maintenance Tester in Action Learning (Trained Requires Supervision)

A Signal Maintenance Tester in Action Learning has successfully completed the Initial Signal Maintenance Testing Training Event and has not successfully completed a Signal Maintenance Testing Renewal Event for the relevant testing activity being undertaken. A Signal Maintenance Tester in Action Learning is not permitted to return equipment to service after Signal Maintenance Testing Activity and requires the presence of a Competent and Experienced Signal Maintenance Tester.

c) Competent Signal Maintenance Tester (Competent)

A Competent Signal Maintenance Tester has successfully completed a Signal Maintenance Testing Renewal Event for the relevant testing activity being undertaken. A Competent Signal Maintenance Tester can undertake Signal Maintenance Testing unaided and return equipment to service after Signal Maintenance Testing activities.

d) Competent and Experienced Signal Maintenance Tester (Competent and Experienced)

A Competent and Experienced Signal Maintenance Tester has met the requirements of a Competent Signal Maintenance Tester. They are nominated by their Line Manager, have a minimum of 36 months experience holding the relevant Signal Maintenance Testing competence and exhibit good non-technical skills and behaviours.

A Competent and Experienced Signal Maintenance Tester can undertake Signal Maintenance Testing unaided, return equipment to service after Signal Maintenance Testing activities and act as a nominated Competent and Experienced Signal Maintenance Tester that is responsible for the testing activities being undertaken by a Signal Maintenance Tester who is in Action Learning.

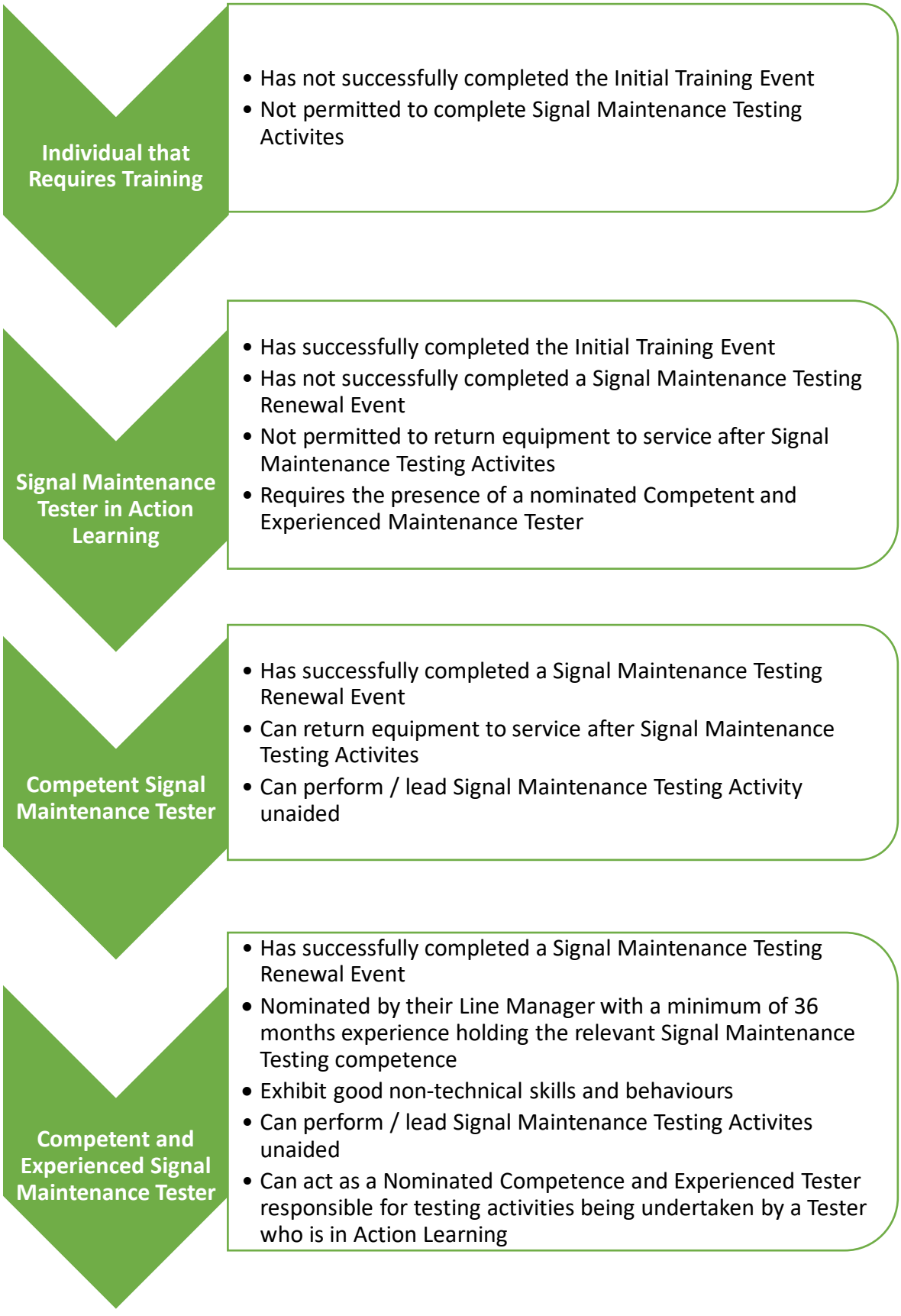


Figure 1: Competence Levels of a Signal Maintenance Tester

4. Authority to work of a Signal Maintenance Tester

4.1 Signal Maintenance Testers shall be issued an authority to work by their employer that clearly details what competencies they hold.

NOTE: *Network Rail use NR/L2/SIG/50035/07 – Competence and Training for the competence framework; CCS Signal Maintenance Testing for the structure of SMTH competence for Network Rail staff. Other Employers may choose to use the same structure. Further information on authority to work requirements can be found in NR/L2/CTM/201 – Competence Management.*

5. IRSE Licensing requirements for a Signal Maintenance Tester

5.1 The Signal Maintenance Tester shall meet the requirements of NR/L2/SIG/10160 – Specification for Application of the IRSE Licensing Scheme.

NOTE: *A competent SMTH tester will normally hold a valid IRSE licence in a relevant category.*

6. Development of an Individual that Requires Training for Signal Maintenance Testing

6.1 The Individual that requires training for Signal Maintenance Testing shall be developed using an Initial Training Event approved by the Network Rail Network Technical Head Signalling.

NOTE: *The approval of Training Events is currently managed through the Signalling Capability Development Group. Further details of Signal Maintenance Testing development can be found in NR/L2/SIG/50035/07 - Competence and Training for the competence framework; CCS Signal Maintenance Testing.*

7. Signal Maintenance Tester in Action Learning

7.1 A period of Action Learning shall be required for Signal Maintenance Testers where they:

a) Are newly qualified.

b) Have been deemed Not Yet Competent as an outcome of a Signal Maintenance Testing Renewal Event.

7.2 The initial period of Action Learning shall be up to 6 months.

NOTE: *Action Learning should be completed within 6 months and supported with a development action plan. If Action Learning is not completed within the initial 6 months, this period can be extended for a further 6 months.*

7.3 If Action Learning has not been completed within 12 months, the line manager shall arrange for the individual's competence to be withdrawn.

NOTE: *Network Rail uses NR/L3/CTM/306 – Skills Assessment Scheme for competence assurance. Action learning is in addition to the mentorship requirements detailed in NR/L2/SIG/10160 – Specification for Application of the IRSE Licensing Scheme.*

7.4 Signal Maintenance Testing that is undertaken by a Signal Maintenance Tester in Action Learning shall be completed in the presence and to the satisfaction of a nominated Competent and Experienced Signal Maintenance Tester.

NOTE: *Individuals selected as Competence and Experienced may develop other Signal Maintenance Testers and can have a large influence on the Signal Maintenance Tester that is in formal Action Learning. The Nominated Signal Maintenance Tester does not have to be the same individual for each Tester in Action Learning.*

7.5 Where paper SMTH log sheets are being used, the SMTH log sheet should be completed by the Signal Maintenance Tester in Action Learning and countersigned by the nominated Competent and Experienced Signal Maintenance Tester.

Where an e-SMTH Log Sheet is being used the nominated Competent and Experienced Tester should complete the e-SMTH Log Sheet and insert the name of the Signal Maintenance Tester in Action Learning in the comments.

7.6 A Signal Maintenance Tester in Action Learning shall only move to a Competent Signal Maintenance Tester and work without supervision after successful completion of a Signal Maintenance Testing Renewal Event approved by the Network Rail Network Technical Head Signalling.

NOTE: *The approval of competency Renewal Events is currently managed through the Signalling Capability Development Group. Further details of Signal Maintenance Testing development can be found in NR/L2/SIG/50035/07 - Competence and Training for the competence framework; CCS Signal Maintenance Testing.*

NOTE 2: *The assessment for renewing a Signal Maintenance Tester competence is used for the Signal Maintenance Tester in Action Learning with the expectation that an individual has to meet the same minimum level of competence required to practice Signal Maintenance Testing.*

Upon Successful completion of a Signal Maintenance Testing Renewal Event, the Signal Maintenance Tester in Action Learning will become a Competent Signal Maintenance Tester. The full competence validity period should begin from day of successful completion.

8. Competent Signal Maintenance Tester

8.1 A Signal Maintenance Testing competence validity period shall not exceed 36 months from the date of the Signal Maintenance Testing Renewal Event for the relevant Signal Maintenance Testing Competence.

8.2 The Signal Maintenance Tester shall have their competence renewed using a Signal Maintenance Testing Renewal Event approved by the Network Rail Network Technical Head Signalling.

NOTE: *The approval of competency Renewal Events is currently managed through the Signalling Capability Development Group. Further details of Signal Maintenance Testing development can be found in NR/L2/SIG/50035/07 - Competence and Training for the competence framework; CCS Signal Maintenance Testing.*

8.3 If the Signal Maintenance Testing Renewal Event decision is 'Not yet Competent', the individual shall undergo a period of formal Action Learning supported by a development action plan.

8.4 If the renewal assessment decision is 'Not Competent', the individual shall be treated as an individual that requires training.

NOTE: *The Structure of the Network Rail approved Signal Maintenance Testing Renewal Event is aligned to NR/L2/SIG/50035/07– Competence and Training for the competence framework; CCS Signal Maintenance Testing. Other Employers may choose to use the same structure for easy mapping into their own Competence Management Systems.*

9. Competent and Experienced Signal Maintenance Tester

9.1 A Competent and Experienced Signal Maintenance Tester shall meet the same requirements of the Competent Signal Maintenance Tester and:

a) Be nominated by their Line Manager.

b) Have a minimum of 36 months experience holding the relevant Signal Maintenance Testing competence.

c) exhibit good non-technical skills and behaviours.

9.2 A competent and Experienced Signal Maintenance Tester can act as a nominated Competence and Experience Signal Maintenance Tester and assist with the development of a Signal Maintenance Tester in Action Learning.

NOTE: *Nominated Competent and Experienced Signal Maintenance Testers can observe multiple Testers in Action Learning.*

9.3 The nominated Competent and Experienced Signal Maintenance Tester shall be responsible for the testing that has been undertaken by the individual that is under formal Action Learning.

NOTE: *This includes the satisfactory completion of any testing documentation.*

If the nominated Competent and Experienced Signal Maintenance Tester, who is observing a Tester in Action Learning, changes during the activity this should be treated as a 'Handover Where Testing Cannot Be Completed' between the two nominated Competent and Experienced Signal Maintenance Testers as defined in NR/SMTH/Part01/Module/09 (Testing Sequence) – Clause 6.

END

1. Maintenance Test Plans

1.1 Maintenance Test Plans are the primary test documents. Maintenance Testing activities shall not be undertaken without reference to these documents.

1.2 A Maintenance Test Plan consists of numbered steps in a logical sequence.

1.3 Maintenance Test Plans are pre-determined test specifications, which comprise checklists of the minimum safety tests to check the safe operation of replaced signalling or telecommunications equipment where the work has operational safety implications.

1.4 The test sequence should be followed, it is permissible to complete the steps out of sequence if the situation requires. However, the Tester shall confirm before testing finishes that all the steps have been completed.

1.5 Maintenance Test Plans are divided into two sections, covering tests needed BEFORE INSTALLATION WORK and those required AFTER INSTALLATION WORK.

NOTE: *On occasion, to assist with the smooth completion of a Test Plan, a third section called "DURING INSTALLATION WORK" is inserted between the Before and After sections of a test plan.*

1.6 A Maintenance Test Plan need not list every task required to perform the work.

1.7 New Maintenance Test Plans, when required, should be produced using the closest, existing Maintenance Test Plan as a guide and independently checked before use.

1.8 A Maintenance Test Plan is not required for adjustment activities where electrical circuits are designed to be adjusted, e.g. transformer tappings, track circuit feed set or resistor block strapping, or wire wound resistors with a tapping ring.

Check that adjustment straps are correctly terminated, and no stray connections are possible.

1.9 Terms or words used in a Maintenance Test Plan, which describe defined tests in Part 03, are to be written in block capitals (e.g. WIRE COUNT).

1.10 Tests or checking sequences which are already defined in the Signalling Maintenance Specifications (NR/SMS under NR/L3/SIG/10663) shall be referenced from this handbook when required.

1.11 Each Maintenance Test Plan is normally indexed by use of an equipment index.

1.12 Some Maintenance Test Plans have hyperlinks within the text these are provided to assist navigation around the documents.

1.13 Maintenance Test Plans are not required for mechanical adjustments or checking that equipment is left secure, e.g., bolts tightened, or pins correctly fitted.

1.14 During any other work, including fault diagnosis, which involves disconnections or substitutions, the relevant Maintenance Test Plans shall be used.

2. Additional Testing Requirements Caused by Replacement or Alteration of an Item of Equipment

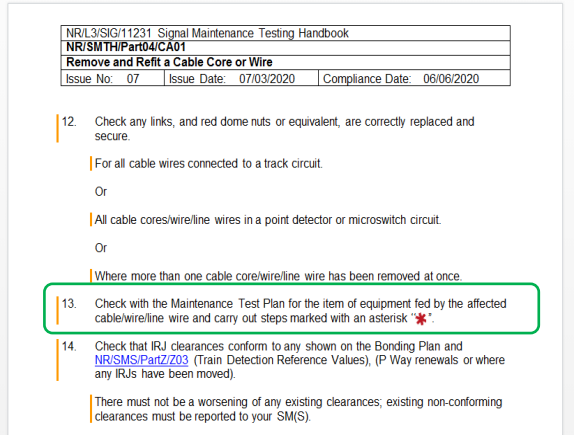
2.1 In some cases, the replacement or alteration of an item of equipment could have consequences on a second item of equipment.

2.2 A Tester shall confirm that any associated equipment has not been affected by the work carried out during the original replacement.

2.3 To assist with this requirement any Maintenance Test Plans that requires this additional confirmation, includes a step which re-directs the tester to an additional test plan/s.

2.4 An example of this would be the replacement of a cable to an LED GPL. When the Tester reaches Step13 of SMTH Part04 CA01, they are instructed to refer to the test plan for an item fed from the replaced cable (circled in green in Figure 1) and carry out the test steps marked with a red asterisk ✱ in the left-hand margin.

The Tester would move to the new Test Plan for the Replacement of Ground Position Light Signal (SMTH Part04 SG15) and carry out test steps 18 and 20 indicated by the asterisks and circled in blue in Figure 2.



NR/L3/SIG/11231 Signal Maintenance Testing Handbook
NR/SMTH/Part04/CA01
Remove and Refit a Cable Core or Wire
Issue No: 07 | Issue Date: 07/03/2020 | Compliance Date: 06/06/2020

12. Check any links, and red dome nuts or equivalent, are correctly replaced and secure.

For all cable wires connected to a track circuit.

Or

All cable cores/wire/line wires in a point detector or microswitch circuit.

Or

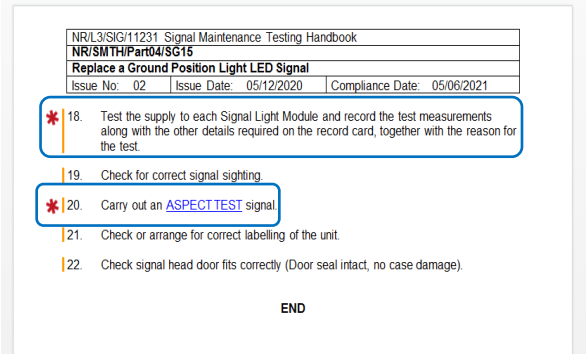
Where more than one cable core/wire/line wire has been removed at once.

13. Check with the Maintenance Test Plan for the item of equipment fed by the affected cable/wire/line wire and carry out steps marked with an asterisk "✱".

14. Check that IRJ clearances conform to any shown on the Bonding Plan and NR/SMS/Part7/Z03 (Train Detection Reference Values), (P Way renewals or where any IRJs have been moved).

There must not be a worsening of any existing clearances; existing non-conforming clearances must be reported to your SM(S).

Figure 1 – Test Plan CA01



NR/L3/SIG/11231 Signal Maintenance Testing Handbook
NR/SMTH/Part04/SG15
Replace a Ground Position Light LED Signal
Issue No: 02 | Issue Date: 05/12/2020 | Compliance Date: 05/06/2021

✱ 18. Test the supply to each Signal Light Module and record the test measurements along with the other details required on the record card, together with the reason for the test.

19. Check for correct signal sighting.

✱ 20. Carry out an ASPECT TEST signal.

21. Check or arrange for correct labelling of the unit.

22. Check signal head door fits correctly (Door seal intact, no case damage).

END

Figure 2 – Test Plan SG15

2.5 On completion of the additional test steps Tester shall return to the original Test Plan.

2.6 Step 2.3 shall be carried out for each item fed or affected by the original replacement.

END

1. Independence Exempt.

1.1 Maintenance testing can be used to achieve independent verification of installation work and the Maintenance Tester shall be independent of the Installer.

1.2 The requirements for a test plan to be “Independence Exempt” are as follows:

a) Straight forward equipment replacement, such as plug in components.

b) No configuration or setup is required.

c) The work is simple in nature, non-complex.

d) Common mode mistakes are extremely unlikely and low risk.

1.3 If all these requirements are met, the test plan shall be endorsed ‘Independence Exempt’.

1.4 If there is any doubt, the test plan shall not be marked as “Independence Exempt”.

1.5 A Test Plan that is “Independence Exempt” is indicated by a banner on the first page, see Figure 1.

*****Independence Exempt*****

Figure 1 - Independence Exempt Banner

1.1 An Independence Exempt Test Plan allows the “Before Installation” and “After Installation” tasks to be carried out without the need for the work to be checked by an independent Tester.

1.2 To carry out an Independence Exempt Test Plan the person carrying out the task shall be a qualified SMTH Tester.

1.3 The completion of an SMTH Log sheet is required.

END

1. General

1.1 Maintenance Testing shall be used to test equipment replaced into a previously working and commissioned system during preventative and corrective maintenance activities and minor renewals.

1.2 The replacement shall be like-for-like and any new item shall be equivalent to the original item which it replaces.

1.3 The following specific alterations to equipment can be tested using SMTH:

a) Cable or wire found cut, separated from its connection or with a length missing.

b) Other previously working equipment found physically missing or separated from its normal position.

c) Temporary diversion of a cable wire for corrective maintenance activities only.

1.4 Maintenance Test Plan Lists (NR/SMTH/Part02/Form/02) shall be used whenever more than one Maintenance Test Plan is required to carry out a task.

1.5 Temporary alterations/reinstatement of equipment is covered by Signal Intermediate Testing Handbook.

1.6 Emergency renewals following an incident shall be undertaken using the correct Test Plan with authorisation from the S&TME or the Route Engineer (Signalling) / Principal Route Engineer (Signalling) or equivalent.

2. Telecommunications Systems

2.1 Work on communications systems carrying safety related data required for railway operations shall be undertaken in accordance with NR/GI/E041 (Signalling Circuits in Telecommunication Systems).

2.2 For work on operational telecommunications equipment, see NR/SMTH/Part/06 (Test Plans for Telecoms, DOO and RETB).

NOTE: *Full details are given in NR/L2/TEL/31001 (Telecommunications Maintenance Testing & Failure Investigation (TMT&FIP).*

3. Signalling Maintenance Diagrams

3.1 Test diagrams and engineering details are not provided for SMTH work, and instead the existing infrastructure maintenance records shall be used as the reference documents.

3.2 If the infrastructure maintenance records are missing, inform your SM(S) who will direct you on how to proceed.

3.3 Further information on Signalling Maintenance Diagrams can be found in NR/SMS/PartA/A11 (Maintenance Diagrams) and NR/L3/SIG/SG0162.

END

1. Introduction

1.1 This module details the SMTH Testing for equipment that is a like for like replacement but are not part of reactive corrective maintenance activities and should be pre-planned.

2. Pre-Planned Like for Like Replacements

2.1 Equipment that is being replaced before failure or life expired, which are being replace as like for like in a pre-planned manner such as:

a) Relay re-servicing.

b) Mechanical treadle replacements.

c) Installing and changeover of a top nutted cable.

2.2 Equipment that has failed but could not be replaced immediately on a like for like basis, due to such reasons as track access or the time taken to acquire the component, for example:

a) The replacement of a point machine.

b) Signal head.

c) Lineside or signalling tail cable.

2.3 The SM(S) shall be responsible for planning the work.

3. Pre-Installation Work

3.1 Installation work carried out off-site in advance of site work shall be Maintenance Tested.

3.2 The extent of the Maintenance Testing completed shall be recorded. The record of the off-site testing shall be included with the technical information details described in clause 6.1. The record shall clearly indicate the item of equipment it applies to, i.e. by serial number or another unique identifier.

Details of the process required to undertake these activities are in Clause 6.

4. Test Plans

4.1 The Maintenance Test Plans in SMTH Part04 shall be used if they are applicable for the activities carried out as pre-planned work.

5. Maintenance Test Plan Lists

5.1 Maintenance Test Plan Lists (NR/SMTH/Part02/Form/02) shall be used whenever more than one Maintenance Test Plan is required to carry out a task.

6. Planning the Work

6.1 Pre-planned work involving SMTH shall be planned in accordance with the Infrastructure Maintenance Planning Handbook (NR/L3/MTC/PL0175). If the work is undertaken by contractors, the planning process used shall be comparable to that used by Network Rail.

7. Additional Responsibilities of the (SM(S) or Renewals Manager (Signals) or equivalent

7.1 The following additional information might be required as part of the Work:

a) Wiring diagrams.

b) Signalling plans.

c) Where point systems are involved, a relevant extract of the site plan (locking sketch) showing the normal lie of the points. Permutation charts are to be provided as part of the testing.

d) Certificates of conformity or pre-testing.

e) Details of any off-site maintenance testing undertaken (completed or partially completed test plans).

f) Identity of replacement equipment (e.g. make and model number, serial number or another unique identifier).

g) Where more than one asset of the same type is being replaced, identify the position (location) of the equipment being substituted.

This list is not exhaustive and other relevant items are to be added if they are appropriate for the work and maintenance testing.

7.2 The SM(S) / Renewals Manager (Signals) or equivalent, shall brief the requirements of the planned work to the Maintenance Tester in overall charge of the work, and all other staff who are going to be involved in the work, prior to it being undertaken.

7.3 The Responsibilities of the S&TME, SM(S), Team Leader, Lead Maintenance Tester / Maintenance Tester and other members of the team is covered in NR/SMTH/Part01/Module/03.

8. Undertaking the Work

8.1 The work shall be carried out as planned; the Maintenance Tester shall stop all work and inform the SM(S) or Renewals Manager (Signals) or equivalent if the work plan and/or associated technical information are missing, incorrect or incomplete.

9. Changes to the Maintenance Testing

9.1 The Maintenance Tester shall amend the details of the test plans undertaken if the requirements for testing vary from those detailed in the work planning.

9.2 Changes to the person(s) undertaking the work or the Maintenance Tester shall be recorded.

9.3 These changes shall be recorded by the Maintenance Tester and returned as part of the work planning details to the relevant SM(S) or Renewals Manager (Signals) or equivalent.

Details shall include:

a) The reason for the variance.

b) The new maintenance test plans used (if amended).

c) The new person(s) undertaking the work or Maintenance Tester (if amended).

d) Any other relevant information.

10. Completion of Work

10.1 On completion of the work, the Maintenance Tester shall review all the details of the actual maintenance testing undertaken and log any variances from the original plan.

10.2 The Maintenance Tester shall return the completed maintenance testing details to the SM(S) or Renewals Manager (Signals) or equivalent.

10.3 The SM(S) or Renewals Manager (Signals) or equivalent shall check the maintenance testing details.

10.4 If the maintenance testing actually undertaken is considered inadequate or any variances details have changed the scope or perspective of the maintenance testing, the SM(S) or Renewals Manager (Signals) or equivalent shall immediately arrange for the maintenance testing to be undertaken again by another competent Maintenance Tester, independent of the original Maintenance Tester.

10.5 If the situation dictates it, the S&TME shall authorise the tested item to be signed out of use until they are assured that maintenance testing has been successfully carried out.

11. Storage of Maintenance Testing details for Pre-Planned Work

The SM(S) or Renewals Manager (Signals) or equivalent shall be responsible for the safe storage of completed paper maintenance testing documents for pre-planned work.

END

1. Testing Sequence

1.1 The relevant Test Plan shall be selected and carried out in sequence:

a) 'Before Installation' tests, checks or preliminary work.

b) The replacement or diversion work itself.

c) 'After Installation' tests or checks.

2. Errors

2.1 Any errors found during the “Before Installation Work” shall be reported to the SM(S).

2.2 Any errors found during the “After Installation Work” testing shall be corrected by the person doing the work.

2.3 The correction shall be rechecked by the Maintenance Tester along with anything that could have been affected by the remedial work.

3. Replacement of Equipment that is found to be Missing

3.1 A standard SMTH Part04 Test Plan shall be used, and the SMTH Log Sheet endorsed “Item Missing”.

NOTE: *Missing Equipment Test Plans have been withdrawn, and the missing step added to the relevant Test Plan.*

3.2 To qualify for replacement as missing equipment the following criteria shall be met:

a) The missing equipment shall have been present and working, prior to its damage or removal.

b) Confirm that the equipment is meant to be in service and has not been removed for a genuine reason.

c) Check the location/equipment room for newly installed stage work wiring, as the removal of the item could be related to an on-going signalling renewal.

d) Documentation is available to allow the “correct type” to be identified.

e) Complete and accurate diagrams are available, and the work shall not require any change to diagrams.

f) For equipment that requires to be placed in a critical position, such as axle counters, treadles etc, check that the documentation is available which identifies the correct line, alignment, position and orientation of the equipment to be replaced.

3.3 If the criteria in 3.2 cannot be met or the Tester has any concerns, advice on how to proceed shall be sort from the SM(S).

3.4 Cables associated with any missing equipment shall be tested before being re-terminated on the replacement equipment, this is to confirm they are undamaged and safe to re-use.

4. Amendments

4.1 If the available diagrams have previously been amended by hand, e.g. with a temporary diversion, details shall be noted on the SMTH Log Sheet as part of the record of test.

5. SMTH Log Sheets and Wire Count Check Sheets

5.1 SMTH Log Sheets shall be fully completed on site as shown in SMTH/Part01/Module/10 (Completion of the SMTH Log Sheet).

5.2 A Wire Count check sheet (see NR/SMTH/Part/02) shall be completed on every occasion that a Test Plan requires a wire count to be undertaken.

5.3 Where the SMTH Tester is unable to complete all applicable testing steps, escalation to the SM(S) is required before allowing equipment to enter service. This shall be noted on the completed SMTH Log Sheet.

5.4 In the event of the SMTH Log Sheet being completed for failure attendance, the relevant infrastructure control shall also be included on the e-mail so that it can be added to the FMS entry.

5.5 If a maintenance test plan is deficient in anyway, details shall be noted as part of the record of test and any additional tests carried out before the equipment is returned to service.

5.6 Any shortfalls or corrections shall be reported to the SM(S) as soon as possible. The SM(S) shall arrange to have the equipment retested if a maintenance test plan is deficient.

6. Handover Where Testing Cannot Be Completed

6.1 If a test plan is partially completed by a Tester, it may be handed over to a continuing Tester to complete. Completed steps shall be recorded on a SMTH Log Sheet, incomplete steps shall be marked as incomplete. A copy of the SMTH Log Sheet shall be forwarded to the continuing Tester. If using a paper SMTH Log Sheet, the incomplete steps shall be lined out.

6.2 A clear understanding shall be reached between first Tester and the second Tester, as to the exact tests/steps completed at the point of hand over.

6.3 The continuing Tester shall record steps they complete on a new SMTH Log Sheet, steps completed by other Tester(s) shall be marked as completed by others. If using a paper SMTH Log Sheet, steps completed by others shall be lined out.

6.4 Tests documented as completed need not be repeated but any which are not listed as complete shall be assumed not done. Both records of test shall be submitted to the SM(S) after completion.

7. Testing for Correct Operation

7.1 On completion of the required testing defined in the maintenance test plan(s) the part of the signalling system affected by the work shall be checked to prove correct operation.

This check can, for example, involve watching a train pass through a signalled route and observing that the track circuits occupy and clear in the correct sequence; signals are restored to danger, etc. It can involve observing that points move in correspondence with the Signaller's controls.

7.2 If equipment cannot be safely restored to service, then the provisions of Rule Book Handbook 19 shall be applied to the failed equipment.

8. On Completion of Testing

8.1 Before the equipment is returned to service, the work and all testing shall be completed, and an SMTH Log Sheet produced, unless exempted in the maintenance test plan.

8.2 Any test instrumentation or straps provided for testing shall be completely disconnected from the commissioned system, except where permitted by NR/GI/U033 (Use of Monitoring and Test Equipment) and NR/GI/U034 (Management and Control of Temporary Straps).

8.3 On completion of the maintenance testing work, the Maintenance Tester shall check that the installation / equipment is left in a secure condition and that arrangements have been made for the prompt removal from site of any displaced equipment. Where manual handling is practicable, this removal shall be immediate.

8.4 On completion of the work and prior to leaving site, the Tester shall submit the completed SMTH Log Sheet and wire count check sheets to the SM(S). If using paper SMTH Log Sheets and Wire Count check sheets a photo/scan shall be sent to a designated Route e-mail address.

The designated route email addresses are:

- SMTH-Log-Slips-Anglia@networkrail.co.uk
- SMTH-Log-Slips-East-Coast@networkrail.co.uk
- SMTH-Log-Slips-East-Midlands@networkrail.co.uk
- SMTH-Log-Slips-North-and-East@networkrail.co.uk
- SMTH-Log-Slips-NW&C-Central@networkrail.co.uk
- SMTH-Log-Slips-NW&C-NorthWest@networkrail.co.uk
- SMTH-Log-Slips-NW&C-WCS@networkrail.co.uk
- SMTH-Log-Slips-Scotland@networkrail.co.uk
- SMTH-Log-Slips-Kent@networkrail.co.uk
- SMTH-Log-Slips-NR-High-Speed@networkrail.co.uk
- SMTH-Log-Slips-Sussex@networkrail.co.uk
- SMTH-Log-Slips-Wessex@networkrail.co.uk
- SMTH-Log-Slips-Wales@networkrail.co.uk
- SMTH-Log-Slips-Western@networkrail.co.uk

8.5 In the event of the SMTH Log Sheet being completed for failure attendance, the relevant infrastructure control shall also be included on the e-mail so that it can be added to the FMS entry.

8.6 The Team Leader (person in charge of the work) shall check the SMTH Log Sheets have been submitted prior to leaving site.

8.7 If using paper SMTH Log Sheets and other supporting paperwork, hard copies shall be returned to the SM(S) on return to depot.

8.8 Where the SMTH tester is unable to complete all applicable testing steps, escalation to the SM(S) is required before allowing equipment to enter service. This shall be noted on the completed SMTH Log Sheet.

9. Final Checks before Returning to Service

9.1 The Signaller shall be requested to restore any signalling functions operated for testing, e.g. cancel routes and normalise levers.

9.2 Where applicable, the system shall be restored to its normal state in accordance with NR/GI/B003 (Releases and Restoration) i.e. with no stored conditions, before it is permitted to re-enter service.

END

1. When is a SMTH Log Sheet not required?

1.1 There are occasions for simple tasks when the completion of an SMTH Log Sheet is not required. These are shown by the banner in Figure 1.

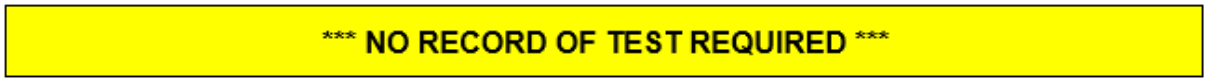


Figure 1 – Banner of No Test Required

2. SMTH Log Sheet Requirements

2.1 When Maintenance Test Plans are used a SMTH Log Sheet shall be completed by the Tester whilst carrying out the work.

2.2 The information shown in Table 1 shall be recorded as a minimum:

Key	Requirement
1	The date of the work.
2	The time of rectification or completion.
3	Any fault number or N/A if not required.
4	The site of work.
5	A summary of affected equipment (ID/serial numbers).
6	Basic details of the work (summary).
7	The first SMTH Maintenance Test Plan used.
8	The second SMTH Maintenance Test Plan used.
9	The name of the person or persons doing the work.
10	The name of the person carrying out the testing.
11	Any relevant Notes shall be recorded here these could include: • Any links slipped during the work which require recording. • Any details of handover to/from another team (time, date, names). • Any testing steps required which have not or cannot be carried out. Any suggested Maintenance Test Plan deficiency and any additional testing carried out as a result. • Any amendments to diagram. • Any temporary strapping / diversions Any problems encountered during the work or testing.
12	The Section Manager should initial and date in this area when a paper SMTH Log Sheet has been reviewed.

Table 1 – SMTH Log Sheet Requirements

3. e-SMTH Log Sheets

NOTE: *e-SMTH Log Sheets are completed within the e-SMTH Mobile App.*

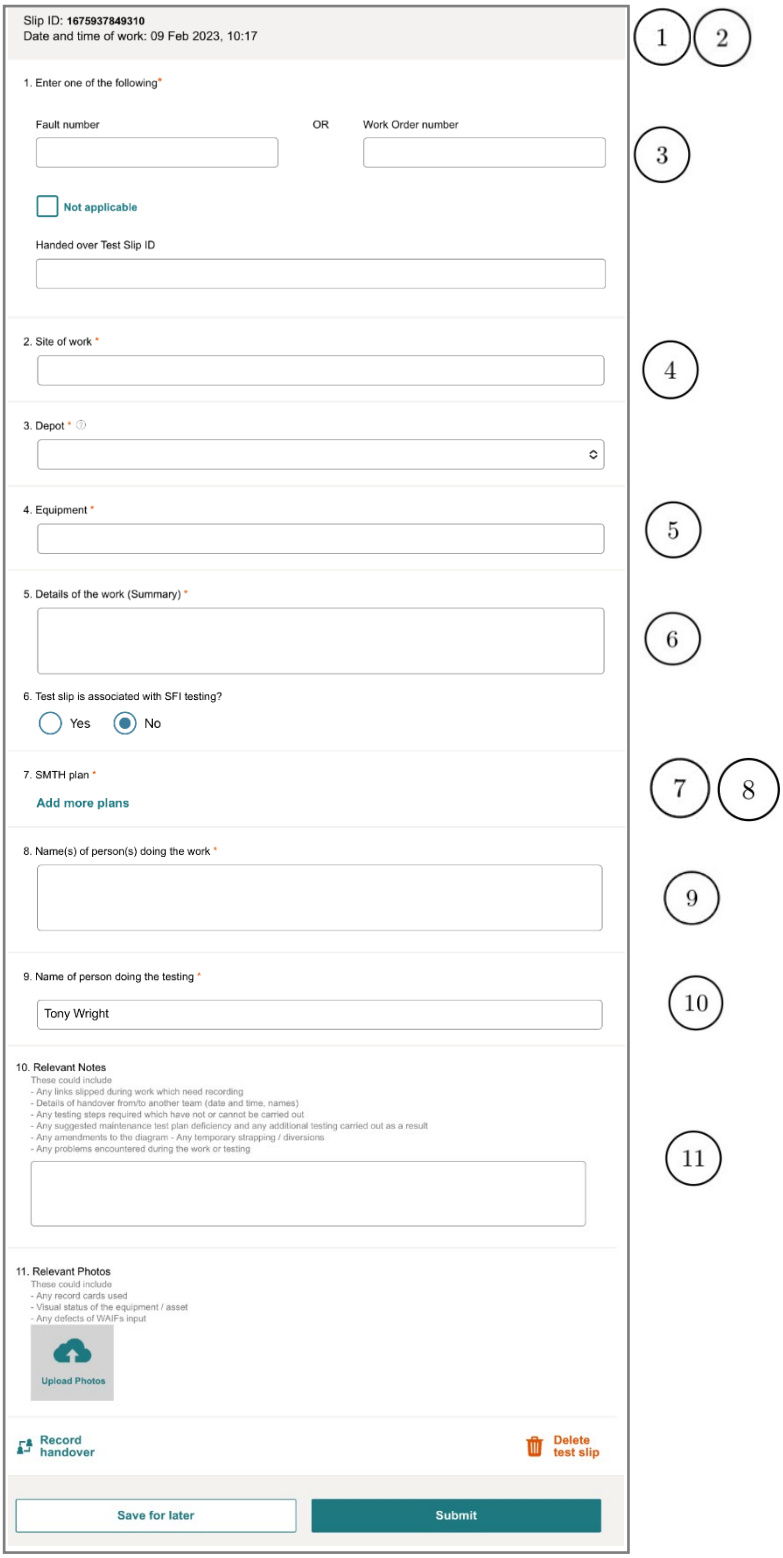


Figure 2 - e-SMTH Log Sheet mapped to Section 2 – SMTH Log Sheet Requirements

4. Recording e-SMTH Test Plan steps

4.1 Add appropriate Test Plan(s) to the SMTH Log Sheet.

Multiple Test Plans can be attached to one SMTH Log Sheet.

4.2 All Test Plans on the same SMTH Log Sheet shall be for the same piece of equipment.

NOTE 1: *Serial numbers are captured within each Test Plan.*

4.3 Record the outcome for each Test Plan step undertaken.

a) If the Test Plan step is fully completed select a ‘tick’.

b) If the Test Plan step cannot be fully completed select a ‘cross’ and record a comment to indicate why the step was not completed.

c) If the Test Plan step is not applicable select ‘N/A’.

4.4 If a Test Plan step requires a Defined Test, i.e. WIRE COUNT, complete the necessary forms within the Test Plan step.

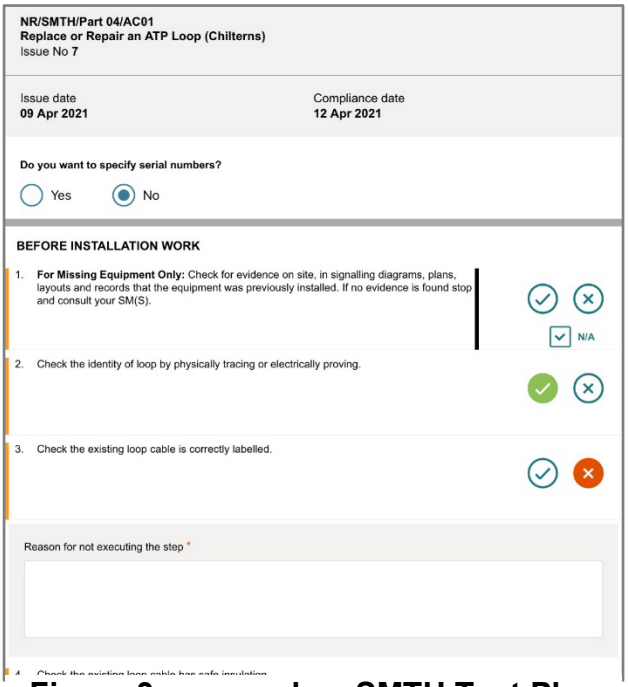
4.5 Partially completed Test Plans can be handed over to another Tester for completion.

4.6 Mark all Test Plan steps to be handed over.

4.7 Submit SMTH Log Sheets for review.

4.8 All submitted SMTH Log Sheets are retained in line with the company records policy for the lifetime of the equipment.

NOTE 2: *Manager review of SMTH Log Sheets is managed within the e-SMTH Portal.*


NR/SMTH/Part 04/AC01
Replace or Repair an ATP Loop (Chilterns)
Issue No 7

Issue date
09 Apr 2021

Compliance date
12 Apr 2021

Do you want to specify serial numbers?

Yes No

BEFORE INSTALLATION WORK

1. For Missing Equipment Only: Check for evidence on site, in signalling diagrams, plans, layouts and records that the equipment was previously installed. If no evidence is found stop and consult your SM(S). N/A
2. Check the identity of loop by physically tracing or electrically proving.
3. Check the existing loop cable is correctly labelled.

Reason for not executing the step *

Figure 3 – example e-SMTH Test Plan

5. Paper SMTH Log Sheets

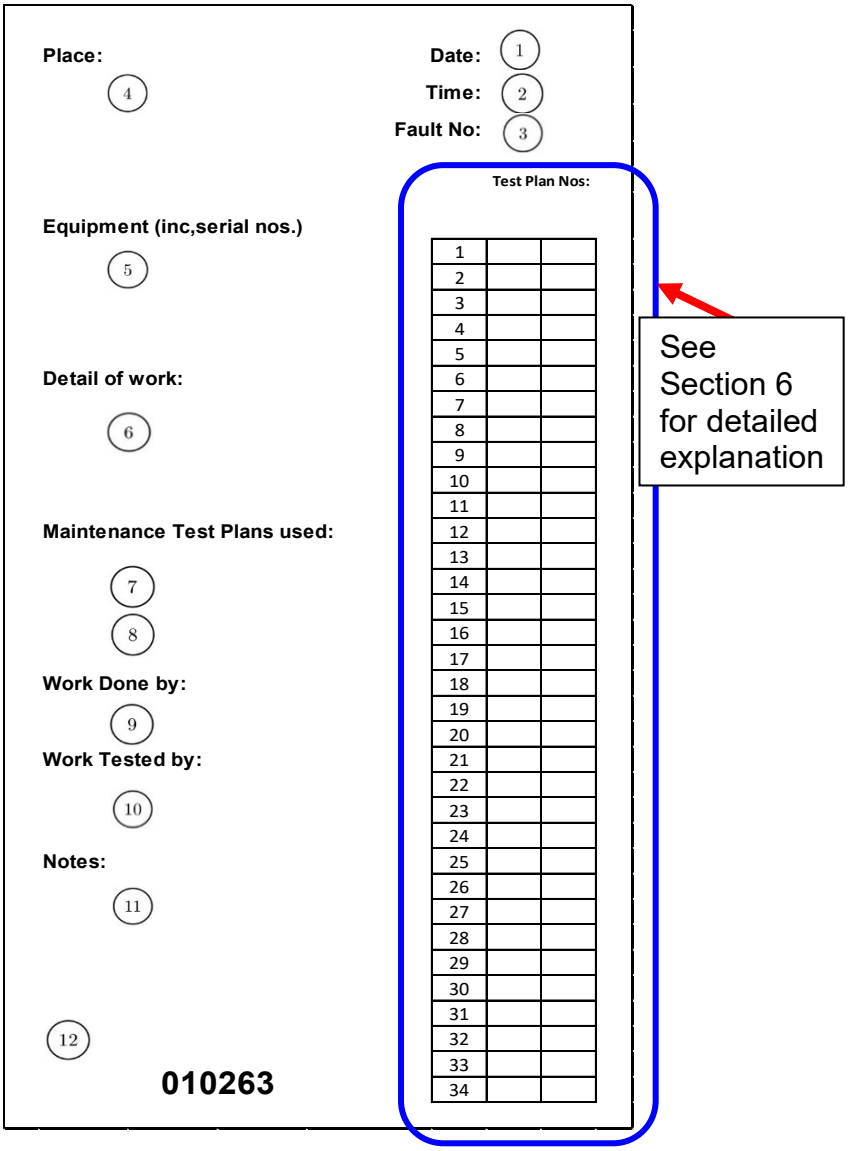


Figure 4 – Paper SMTH Log Sheet Mapped to Section 2 – SMTH Log Sheet Requirements

5.1 One identical copy of each paper SMTH Log Sheet shall be submitted to the Manager and another identical copy retained by the Maintenance Tester.

Test records shall be retained in accordance with company records policy for the lifetime of the equipment.

6. Recording Paper SMTH Test Plan steps

NOTE 1: *The purpose of the check box matrix on the paper SMTH Log Sheet is to record the Test Plan(s) steps which have been completed.*

NOTE 2: *The matrix is shown in Table 2.*

Key	Requirement
(13)	*This column is a list of the Test Plan steps.*
(14)	*The first Test Plan being used shall be recorded here.*
(15)	*If a second Test Plan is being used this shall be recorded here.*

Table 2 – Tick Box Requirements

6.1 Record the Test Plan reference at the top of the left-hand blank column, marked '14' in Table 2.

6.2 Record the outcome for each Test Plan step undertaken in the box corresponding to the Test Plan step number in the Test Plan:

a) If the Test Plan step is completed 'tick' the corresponding box.

b) If the Test Plan step cannot be fully completed the box shall be left blank and reported to the Manager with an explanation as to why it was not completed.

NOTE 3: *The box is left blank so that it can be completed if the Manager determines the step is required.*

c) If the Test Plan step is not applicable, then write 'N/A' in the corresponding box.

6.3 If only using one Test Plan, draw a line from top to bottom of the right-hand column to indicate only one Test Plan is in use.

6.4 If using a second Test Plan, record its reference at the top of the right-hand blank column, marked '15' in Table 2. Record the outcome for each Test Plan step in the boxes below as for the first Test Plan.

	Test Plan Nos: (14)	(15)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		

Table 3 – Check Box Matrix

6.5 If a Test Plan is partially completed, indicate all steps that have been completed and strike out the others.

6.6 If taking over the testing of a partially completed Test Plan, a new SMTH Log Sheet shall be used. Strike out the steps which have not been completed by the Tester completing the SMTH Log Sheet.

7. Examples of Completed Paper SMTH Log Sheets

NOTE 1: *Figure 5 shows a paper SMTH Log Sheet when used to record a single Test Plan and Figure 6 shows a paper SMTH Log Sheet when used to record two Test Plans.*

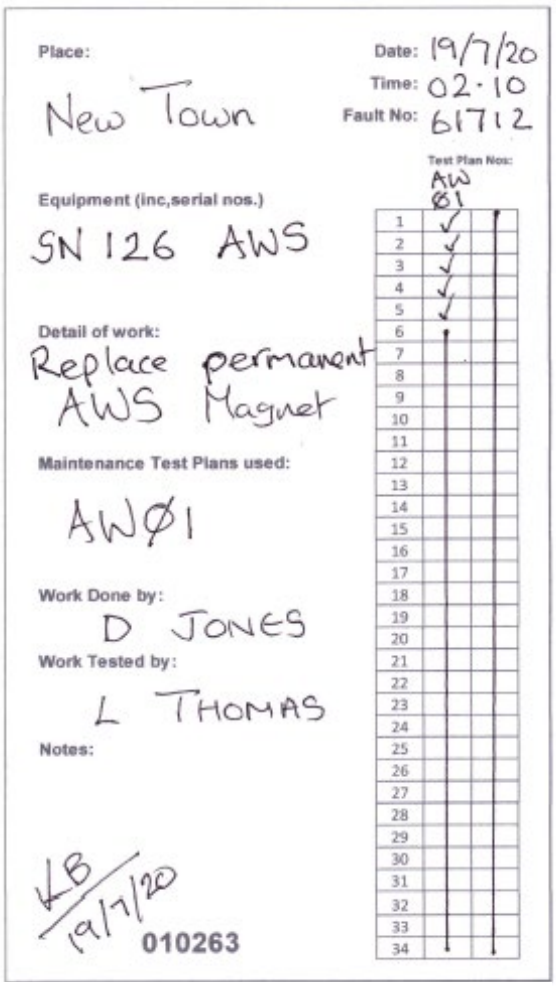


Figure 5 – One Test Plan

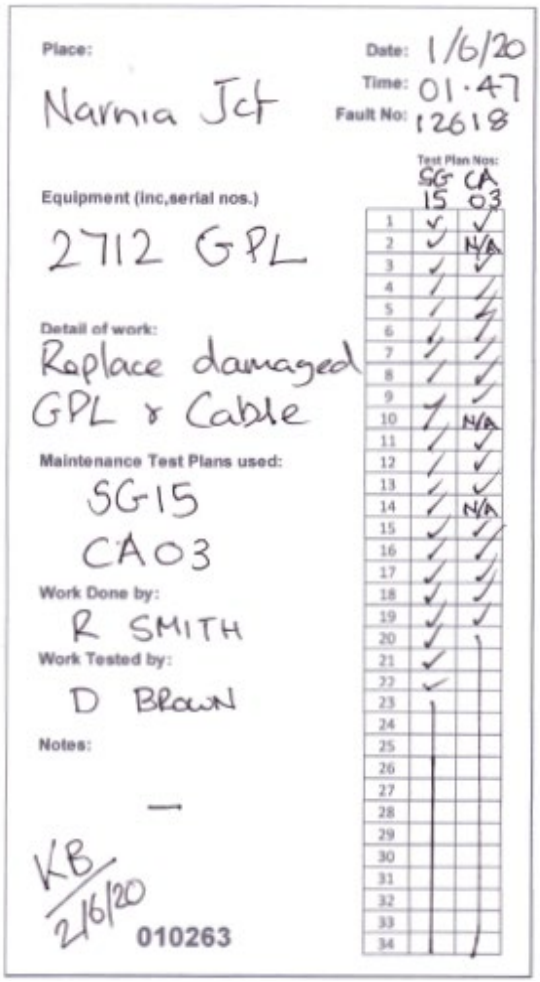


Figure 6 – Two Test Plans

END

1. Testing Where No Maintenance Test Plan Exists

1.1 Where no maintenance test plan exists for the work to be undertaken in Part 04 of the SMTH, a new maintenance test plan shall be produced by the Maintenance Tester.

1.2 The requirements for a Maintenance Test Plan are given in NR/SMTH/Part01/Module05 (Test Plan Requirements).

1.3 Before using the new maintenance test plan, it shall be checked by an independent Maintenance Tester not involved in writing it.

This check should be carried out on site with reference to the equipment concerned except where the person concerned is sufficiently familiar with the equipment.

1.4 If there is any doubt about the testing required, and whether it is maintenance testing, the SM(S) shall be consulted.

1.5 On completion of the work and testing, the new maintenance test plan shall be forwarded as part of the record of test.

1.6 The SM(S) shall arrange to have the equipment retested if the maintenance test plan is deficient.

1.7 The S&TME is responsible for forwarding the new maintenance test plan to signalengineers@networkrail.co.uk.

END

1. Reasons for Diversion

1.1 Circuits can be temporarily diverted in a number of ways. Examples are the diversion of circuits from faulty to spare cores, the reallocation of a faulty relay contact and the emergency repositioning of an item of equipment.

1.2 Maintenance Test Plans are provided to divert a faulty cable core and to reallocate a relay contact.

2. Diversion of Faulty Cable Cores

2.1 If it is necessary to divert a cable core, it shall be assumed that the cable has been damaged in some way. An open circuit core might be the only detected problem, but the cause could be a nail which is still shorting two other conductors together.

2.2 Existing wiring which is diverted shall be clearly labelled. If new wires need to be run, they shall be of single multi-stranded core (9/.030 to BR spec 872) red wire and remain clearly visible and labelled.

2.3 The spare cable core used for the diversion, shall be checked to make sure it is not being used for any other purpose and is disconnected at both ends (nor calling at intermediate points).

2.4 The links at both ends of the faulty core shall be removed and a red dome nut placed on the faulty cable core side of the terminal block see Figure 1. This is to prevent the link being accidentally replaced (similar devices have been provided for other types of link such as Wago).

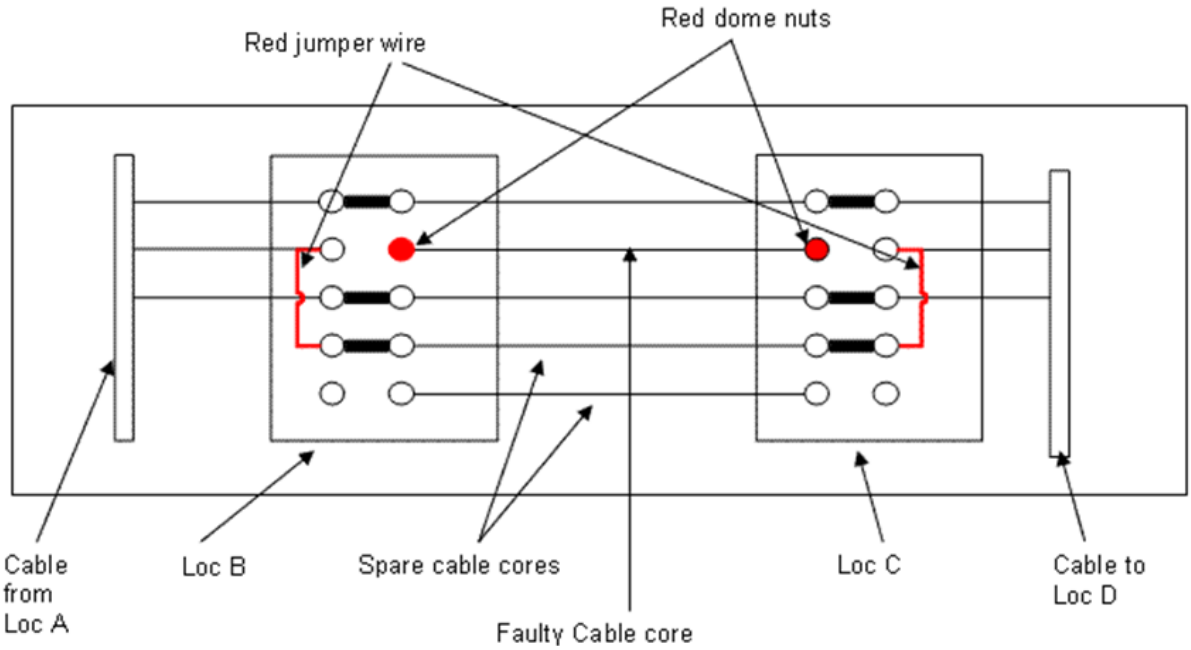


Figure 1 - Schematic drawing of applying a diversion to a fault cable core

Figure 2 - Diversion Applied to a Terminal Block

2.5 If the terminal is a binding post, the faulty core shall be removed and insulated to prevent contact with any other terminal or working circuits.

2.6 Any alternative cable cores used (either within an existing cable or a specially run temporary cable) shall be labelled at each termination point in the diversion.

2.7 All affected location diagram copies shall be amended in red, signed and dated by the Signalling Technician undertaking the work and checked by the Maintenance Tester. The SM(S) shall be advised as soon as possible. For cable core diversion this shall include diagrams in each location where the original and any alternative cable are terminated.

If the location diagram is printed on “Laminated Paper”, it is acceptable for these details to be written on a sticky white label then applied to the location diagram.

This label shall not obscure any non-related details on the location diagram.

NOTE: *Used sticky label can then be removed following the repair work without the need to order additional diagrams. If an alteration is to be made permanent, then replacement diagrams should be ordered via the SM(S).*

2.8 A cable core diversion shall not bypass more than one cable at a time. It shall only be applied to the terminal posts at each end of the faulty core so that intermediate controls are not by passed.

2.9 The SM(S) shall maintain a record of spare core usage, faulty cores, cross core jumpering and associated dates. The faulty cable insulation values measured at the time of diversion shall be retained for future reference.

2.10 Maintenance Test Plan NR/SMTH/Part04/CA05 (Divert a Faulty Cable Core) allows the full INSULATION TEST and CONTINUITY TEST of the existing cable to be deferred where serious traffic delay or increased safety risk is likely.

2.11 A minimum test of all spare cores or 10% of cable capacity (whichever is greater) is required.

The test results are to be checked against the minimum insulation requirement in NR/SMS/PartZ/Z05 (Cable – Reference Values). Any failure to meet these insulation requirements shall be actioned before any decision to proceed with a deferral.

2.12 In all cases, the decision to defer testing shall be made primarily on the basis of safety. Before agreeing to a deferral, the SM(S) shall access factors such as the importance for safety of the other circuits in that cable, and whether the damage has been found.

2.13 If the minimum test is satisfactory, the diversion work shall be carried out and the full INSULATION TEST and CONTINUITY TEST can be deferred for:

a) 72 hours when the cable has no existing faulty cores.

b) 48 hours when the cable already contains one or more existing faulty cores which are out of use (function diverted).

3. Temporary Labelling of Diverted Cores and Records

3.1 Part A of the label shown in Figure 3 shall be completed and secured to each end of the cable core or the temporary jumper containing the diverted circuit.

After the work has been completed by the Signalling Technician it shall be checked by the Maintenance Tester.

3.2 The Maintenance Tester shall complete and return Part B of the label to the SM(S).

3.3 When the cable has been restored to full working order by repair or replacement, the diverted circuit shall be returned to its original position and Part A of the label returned to the SM(S) endorsed by the Maintenance Tester.

A suitable blank label is provided in NR/SMTH/Part02/Form/01 for copying as required.

3.4 The SM(S) shall be responsible for:

a) Creating a record for the defective cable.

b) Making arrangements for the cable to be tested at the intervals laid down in NR/SMTH/Part01/Module/13 (Procedure for Monitoring a Damaged Cable). The results of these tests shall be kept with the record for the defective cable.

c) Repair of the cable, or if repair is impracticable, escalating the fault to the S&TME to authorise the replacement of the cable.

d) Attaching Part A of the label to the record for the cable.

e) Arranging for new diagrams to be ordered if necessary and arranging that these are placed in the relevant locations.

Cable Core Temporary Label — Network Rail

PART A	
Circuit	
Strap From	
Strap To	
Date	
Signature	
Name	
Company	

Cable Core Temporary Label — Network Rail

PART B	
Strap Information	
Location	
Situation	
Strap From	
Strap To	
Reason	
Signature	
Name	
Company	

Figure 3 - Example of a Cable Core Temporary Label

4. Diversion of a Circuit to an Alternative Relay Contact

4.1 Where a replacement relay is not available, it might be necessary to temporarily re-allocate the circuit through another contact of that relay. NR/SMTH/Part04/EL13 (Re-allocate a Contact) exists for this work.

4.2 Diagrams shall be suitably amended, signed and dated in red by the Signalling Technician doing the work and checked by the Maintenance Tester. The SM(S) shall keep a record of all such re-allocations.

5. Emergency Repositioning of Equipment

5.1 Where equipment size constraints or other emergency conditions apply, equipment can be placed in a different position to that shown on the diagram.

5.2 Repositioning of equipment shall be carried out in the same way as circuit diversion, with consideration of electrical isolation from other equipment or wires and the security of fixings.

5.3 Relevant labelling and diagram amendments shall be made, and the SM(S) advised.

6. The Use of Circuits Unaffected by the Cable Damage

6.1 As long as other circuits continue to use cores in the damaged cable (although the circuits might be unaffected by the cable damage), there is a risk that there will be a subsequent failure (which could be wrong side) caused by further deterioration of the cable.

6.2 This risk shall be controlled. NR/SMTH/Part01/Module13 (Procedure for Monitoring a Damaged Cable) gives a procedure for controlling the risk.

6.3 On final rectification and replacement of all associated red wiring, the SM(S) shall arrange for revised final record copies.

7. Permanent Adoption of Temporary Alterations

7.1 Any proposals to retain the equipment, core or contact in its new position (effectively becoming permanent) shall be advised to the S&TME.

7.2 Where the alteration becomes permanent, the SM(S) shall arrange for any red wiring to be replaced and the issue of new record copies.

7.3 Where coloured wiring has been installed for monitoring purposes the S&TME may permit retention subject to the wiring being installed to a standard which allows for its permanent adoption.

8. Rectification

8.1 The S&TME shall check that all temporary diversions, repositioned equipment and temporarily re-allocated relay contacts are permanently rectified, and any red wiring replaced.

8.2 Where a temporary alteration is required to become permanent the S&TME shall be advised.

8.3 At rectification the SM(S) shall confirm that the diagram alteration is cancelled, and new record copies obtained or if the alteration was recorded on stick on labels then these have been removed.

8.4 If repositioned equipment remains in its temporary position for more than one month the SM(S), shall arrange to obtain new record copies marked ‘temporary position’.

8.5 If the temporary diversion remains in use for more than one month the SM(S), shall arrange to obtain new record copies marked ‘temporary wiring’.

8.6 Ongoing test provision for damaged cables shall be agreed with the S&TME taking account of the risks, cable condition and timescale for the cable renewal.

END

1. Process

Initial and Subsequent Tests

1.1 A full INSULATION TEST of the faulty cable shall be arranged by the SM(S) at the end of the first month. The Maintenance Tester shall carry out the work and return the results to the SM(S).

1.2 The SM(S) shall examine the results recorded and compare them with the values noted at the time of diversion. This test shall be repeated at the end of the second and third months of diversion.

1.3 Environmental conditions can have an effect on obtained values (e.g. damp and wet conditions). This should be taken into consideration when planning the tests.

2. Review of Obtained Results

2.1 If each of these three, monthly retests indicate an acceptable insulation value, and does not show progressive deterioration, the SM(S) may authorise a change of the retest frequency. The frequency shall not exceed 12 months.

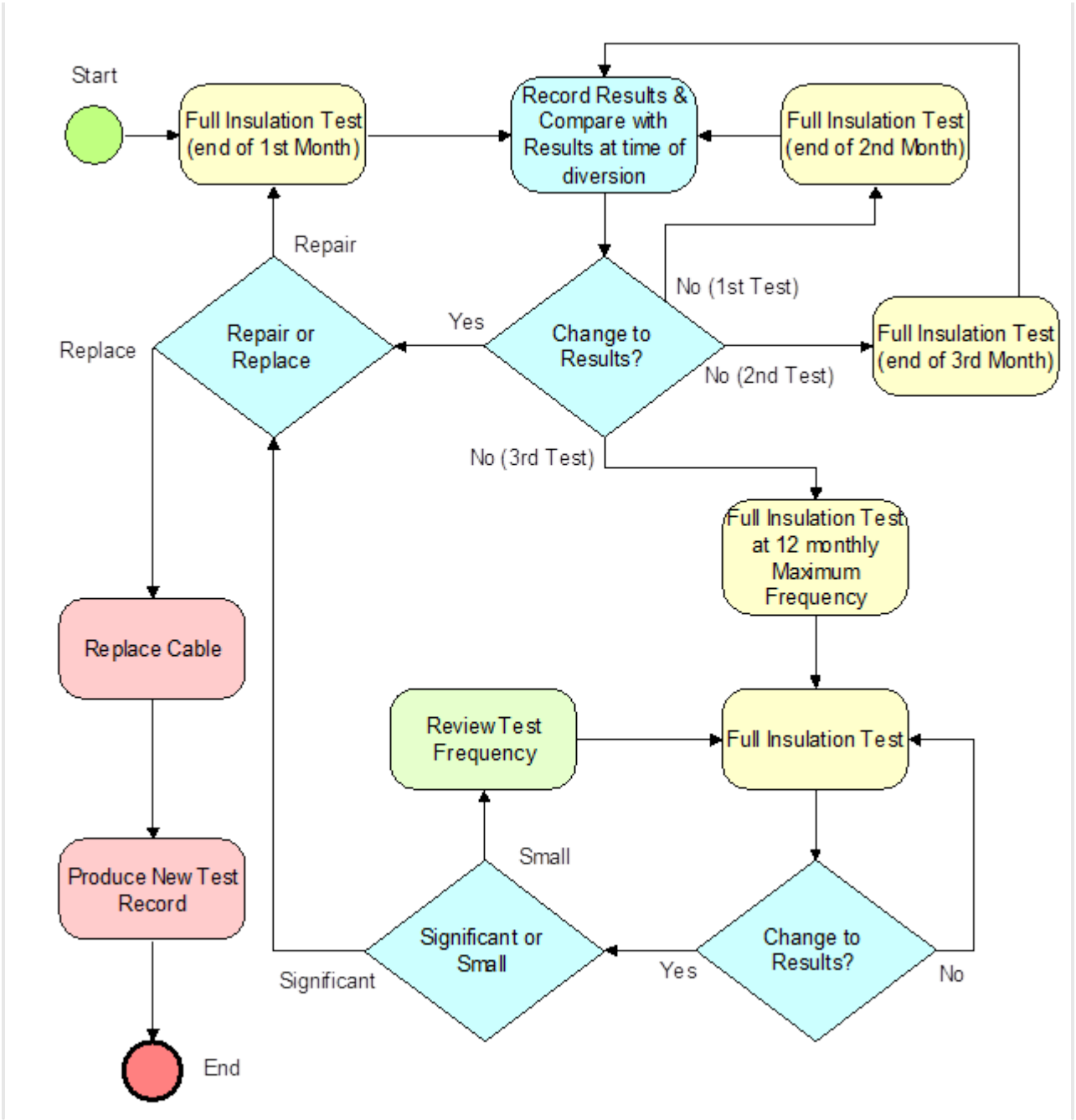
2.2 If at any time these tests indicate that cable insulation values have fallen below an acceptable value, or there is evidence of significant deterioration, the cause shall be investigated, and repairs undertaken without delay.

3. Continuation of Result Monitoring

3.1 The SM(S) shall continue to compare test results and use the information to assess the risk and determine whether annual or more frequent retesting is required.

3.2 The maximum interval between retests shall be 12 months. The circumstances shall be reviewed with the S&TME at a mutually agreed frequency not exceeding 12 months.

4. Process Flowchart for Monitoring a Damaged Cable



END

1. Testing - General

1.1 Maintenance Testing is based on the assumption that equipment is correctly wired and correctly documented before work commences.

1.2 Complete and accurate site records shall be available at each installation. A completed SMTH Log Sheet shall be provided by the Maintenance Tester for each replacement or alteration unless exempted in the maintenance test plan. The requirements for test records are given in NR/SMTH/Part01/Module/10 (Completion of the SMTH Log Sheet).

2. Testing with Site Records

2.1 The installation shall be checked by the Maintenance Tester against the diagrams before work is started and again after work is complete, to check that the installation is correct.

3. Testing where Site Records have been Amended

3.1 If, when needed for fault rectification or renewal work, diagrams are available but have an unsigned and undated amendment which affects that work, the work shall **STOP**.

3.2 Advice shall be sought from the SM(S). This also applies to any diagrams found marked ‘Installation Copy’.

The following action shall be taken:

a) If the diagram shows amendments, it shall be checked to the wiring on site.

If the diagrams are clear and in agreement with the wiring, the SM(S) can allow work to continue.

Arrangements shall be made to obtain revised diagrams. If revised diagrams cannot be supplied, the S&TME shall be advised and arrangements made to reduce any risks to as low as reasonably practicable. In both cases a note shall be included with the record of test.

b) If the diagrams are unclear, or if a discrepancy with the wiring is found, the SM(S) shall arrange for the discrepancy to be resolved and determine the method for the work to be completed.

Design assistance to produce any revised diagrams shall be arranged.

3.3 Diagram amendments reported that are unrelated to the work, shall be dealt with using the local procedures for arranging revised diagrams.

4. Testing where Site Records Differ from Wiring

4.1 If a difference is discovered between the wiring being worked on and the diagram, the work shall **STOP**. Advice shall be sought from the SM(S).

4.2 The action to be taken shall depend on the extent of the difference. In all cases, where the diagrams are related to the work in hand a note shall be included with the record of test, and arrangements made to obtain revised diagrams:

a) If the difference only involves the looping arrangement or contact / terminal allocation detail and is otherwise electrically identical, the SM(S) can permit the work to proceed.

The diagram shall be suitably amended, signed and dated in red.

If the location diagram is printed on “Laminated Paper” It is acceptable for these details to be written on a sticky white label applied to the location diagrams.

This label shall not obscure any non-related details on the location diagram.

NOTE: *Used sticky label can then be removed following the repair work without the need to order additional diagrams.*

If an alteration is to be made permanent, then replacement diagrams shall be ordered.

b) If any other discrepancy is found, the SM(S) shall arrange for the discrepancy to be resolved and determine the method for the work to be completed.

Design assistance to produce any revised diagrams shall be arranged.

4.3 Diagram discrepancies reported that are unrelated to the work, shall be dealt with using the local procedures for arranging revised diagrams.

5. Testing where there are No Site Records

5.1 If site records are missing, the work shall **STOP**. Advice shall be sought from the SM(S).

5.2 The action to be taken shall depend on the work being done. Where work is permitted to continue, as outlined below, the maintenance test plan(s) shall be used. In all cases, a note shall be included with the record of test and arrangements made to obtain revised diagrams:

a) If the equipment being changed is a pin-coded plug-in component, the SM(S) can allow the work to proceed omitting any requirement to check to the wiring diagram.

b) If the component is a simple piece of equipment not involving control circuitry, the equipment can be changed on the authority of the SM(S) who assess the experience of the staff doing the work and testing.

A sketch drawing shall be produced showing the wiring connected to the equipment which shall then be used in lieu of the original diagram.

The sketch shall be left on site, signed and dated in red. Transformers and lamp holders are typical of the equipment that can be dealt with in this way.

c) If the equipment involves control circuitry, additional testing resource shall be involved in the change.

Design assistance to produce any revised diagrams shall be arranged.

The work shall be tested using NR/L2/SIG/30014 (NR/SWTH).

6. Test Records

6.1 At the earliest opportunity the SM(S), Works Delivery Manager, or nominated deputy shall carry out a 100% check of completed SMTH Log Sheets to verify accuracy and completeness.

6.2 Once this check has been completed, the SMTH Log Sheet shall be authorised. If using paper SMTH Log Sheets the checker shall initial and date the SMTH Log Sheet.

6.3 Faulting and Maintenance SM(S)'s or their nominated deputies shall complete a daily check of the fault management system to confirm they have received 100% of SMTH Log Sheets for their area of responsibility.

6.4 These checks shall determine that the correct maintenance test plans have been used and that enough detail has been recorded. Deficiencies shall be followed up by the corrective action such as monitoring or retraining.

7. Version Control of Site Records

7.1 If there is reason to doubt that the site records are the latest version, ask your SM(S) to confirm the status with the National Records Group.

END

1. Use of the Balise - Certificate of Conformity

1.1 When a Balise needs to be replaced and the programming of the Balise is carried out in advance, then a Balise Certificate of Conformity (CoC) shall be completed by the person programming the Balise.

The text in red in Figure 1 gives details of the entries required on the CoC.

NR/L3/SIG/11231 Signal Maintenance Testing Handbook		
NR/SMTH/Part02/Form/04		
Balise – Certificate of Conformity (CoC)		
Issue No: 02	Issue Date: 04/09/2021	Compliance Date: 04/12/2021

Positioning Form Number	*Insert the number of the associated positioning form*	Version	*Insert the version of the positioning form*
Balise Data File Number	*Insert the name of the data file used*	Version	*Insert version of data file*
Balise Serial Number			
Balise Group ID (BG)	*Insert the balise group ID*	Location of Balise	*Geographic location Miles and yds, Kilometres and Meters or GPS must state method used*
Position in BG	*Insert the position in BG*	ELR	*ELR*
Balise Label ID	*Record the balise label ID*	Line Name	*Up Fast/ DN Slow*
Application code	*APCO/ASDO/TASS/ETCS*	Direction of BG Normal or Reverse	*Direction the balise group is read in N or R*
Installation record Check list - Insert a tick if correct (To be completed by programmer)		**Installation record check list – Insert tick if correct (for use by installer)**	
Balise correctly Labelled	*Tick/NA/strike through*	Balise correctly labelled	*Tick/NA/strike through*
Label included for bracket	*Tick/NA/strike through*	Label included for bracket	*Tick/NA/strike through*
Label included for cable (if applicable)	*Tick/NA/strike through*	Label included for cable (if applicable)	*Tick/NA/strike through*
Positioning Record Included	*Tick/NA/strike through*	Positioning Record Included	*Tick/NA/strike through*
Positioning record number matches the number recorded above.	*Tick/NA/strike through*	Positioning record number matches the number recorded above.	*Tick/NA/strike through*
Name of programmer		Name of Installer	
Name of Verifier		Name of Tester	

Figure 1 – Example of a Certificate of Conformity

1.2 After programming, the completed CoC shall be attached to the Balise.

1.3 The completed CoC shall then be verified by the Tester against both the replacement Balise and the Balise Positioning Form before installation.

1.4 If any discrepancies are noted, work shall stop, and the SM(S) shall be informed.

1.5 On completion of the work the CoC shall be returned to the (SM)S with the SMTH Log Sheets.

A Blank Balise - Certificate of Conformity can be found at NR/SMTH/Part02/Form/04 (Balise - Certificate of Conformity).

END

ACTION DEFINITIONS

Term	Definition
Check	Visually inspect for alignment, obstructions, breakages, decay, obvious damage, and/or operation within its defined tolerances, and/or fulfilment of purpose.
Clean	Remove moisture, dirt, corrosion, or roughness (e.g., from contact faces).
Examine	Closely inspect apparatus and connections for wear, security, corrosion, deterioration, decay, and damage.
Isolate	Electrically disconnect from working circuitry as detailed in NR/SMTH/Part03/Check/A05 (Defined Check: Check for correct isolation).
Measure	Apply an approved, calibrated measuring instrument/gauge, then read, and record the result.
Note	Make a physical record of the visible state, the position, or displayed indications of the equipment or item and its associated controls or operating system(s).
Observe	Look at the equipment in use to make sure it is working correctly and is not faulty.
Rectify	Make good any faults discovered and/or adjustments required.
Record	Enter the obtained measurement readings or observations on a suitable record card or in a site logbook.
Remove/Refit	Disconnecting and refitting existing component or equipment.
Replace	Replace an existing component or equipment “like for like” as detailed in NR/SMTH/Part01/Module07 (Maintenance Testing - Like for Like Replacement).
Test or Gauge	Examine apparatus and run it (or use the appropriate tool, gauge or instrument) to make sure it is working correctly and is adjusted within its specification.

END