

Bridging or False Feeding Signalling Circuits

ESP-21-01

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1 Purpose

This procedure outlines the requirements for the application, approval removal and testing of temporary bridging, function bridging and/or false feeding of signalling circuits.

All planned works being performed by other third-party agencies, including shared infrastructure, shall follow approved bridging/stage works design for testing and commissioning of new and altered works. In addition, bridging/stage works shall require acceptance by the ARTC signalling maintenance engineer. Testing of ARTC assets and circuits before and after application of temporary bridging shall follow ARTC testing and commissioning procedures.

2 General

BRIDGING OR FALSE FEEDING IS NORMALLY NOT PERMISSIBLE.

The bridging of contacts on relays or any device, which will in any way impair the protection normally provided by the relay or circuit controlling device, shall not be done except when absolutely necessary and only in strict accordance with ARTC network rules and operating procedures, under book out conditions on a numbered form ESP2101F-01 Authority for Temporary Bridging of Signalling Circuits and/or ESP2101F-02 Authority for Temporary Setting of Signalling Functions. The bridging/function setting authority number can be allocated by the local engineer or the designer.

False feeding is a form of bridging, and similar restrictions apply.

Bridging and/or function setting shall only be undertaken by competent signalling personnel/representatives.

The application, testing and removal of bridging shall be done using work instructions/Minor Work Package/Commissioning work package which clearly references the design and provides detailed instructions of the work to be carried out. These work instructions shall be written and reviewed by a competent engineer.

All testing shall be undertaken in accordance with, ESC-21-01, ESC-21-02 and ESC-21-03.

THE USE OF BRIDGING ALWAYS REQUIRES THAT THE PROTECTION DEFEATED BE PROVIDED BY SOME EFFECTIVE ALTERNATE MEANS. FOR EXAMPLES REFER TO SECTION 18.1.

3 Reference Documents:

- ESP2401F-01 Authority for Temporary Bridging of Signalling Circuits
- ESP2401F-02 Authority for Temporary Setting of Signalling Functions
- ESC-21-01 Inspection and Testing of Signalling – Roles, Responsibilities and Authorities
- ESC-21-02 Inspection and Testing of Signalling – Plans, Programs, Documentation
- ESC-21-03 Inspection and Testing of Signalling – Inspection and Testing Principles
- ESM-00-12 Disconnection of Signalling Apparatus
- ESM-00-20 Like for Like Renewals
- SMP 08 Booking Signalling Equipment Out of Use

4 Temporary Bridging Arrangements

- Temporary bridging is bridging permitted only in exceptional circumstances, as prescribed, where it is:
 - necessary to minimise the disruption to rail traffic when signalling equipment is
 - damaged
- or disconnected/ disarranged for renewal
- or for other planned work
- and where safe and reliable arrangements can be made to prevent conflicting train movements and/or to secure the apparatus concerned so that it cannot be moved out of correspondence with the interlocking.

Authorisation of temporary bridging will generally be confined to bridging of contacts of trackside signalling apparatus that indicate the locked, fail-safe position of the apparatus (e.g. the detection contacts of points in their correct lie and locked) and will require that the specific signalling apparatus be booked out of use and be disconnected from its power source in order to prevent its operation and to secure it in correspondence with the interlocking.

Temporary bridging may be permitted to avoid unnecessary or continuous level crossing ringing to support the planned work where alternative controls are in place. Refer to section 18.1 for examples.

5 Regulation Jumper Wires for Temporary Bridging

Where temporary bridging is permitted as prescribed in these Procedures, regulation jumper wires are to be used. The jumper wires shall be not less than 1.5 metres long, be flexible, minimum conductor cross section 1.5mm squared, with insulation 0.6/1kv standard and be a bright colour which is to be:

Orange when installed for temporary maintenance requirements, unless otherwise approved by the competent Signal Representative who authorises the temporary bridging.

Pink used for testing purposes, shall be issued to individuals with their name, employee number, consecutively numbered and be registered with the competent Signal Representative. No bridging authority is required for testing purposes.

Jumper wires often form part of a testing kit of test straps, in conjunction with a register for test straps, test instruments, other tools used for testing purposes.

Testing kits should be allocated to competent staff and be recorded in a register by the local Signal Maintenance Engineer.

Competent Signal representatives can issue jumper wires as required. All issued jumper wires shall be documented in a register with individual name to whom jumper wires issued to, bridge number, date of issue and return.

Jumper wires shall be accounted for and if a jumper wire is lost or missing, the details are to be reported to the competent signal representative. Details of lost or destroyed jumper wires shall be recorded in the register.

Additional testing jumper wires are to be available from the depot/office and each identified by the depot/office name and consecutively number. Details of which shall be kept in a register, with individuals signing for each bridging jumper wire, when it is issued and when returned.

The connection lugs, plugs or clips at each end of the jumper wire shall be insulated as far as practical and applied and held secured so that there is no possibility of them connecting across adjacent circuit terminals or of an end coming loose and touching other exposed terminals.

Should it be necessary to place the bridging jumper wires within closed equipment housings and if the standard jumper wires will not fit, then the particular jumper wires involved may be reduced in length on the authority of the competent Signal Representative with the objective of keeping jumper wires at their maximum practical length.

Jumper wires are to be in good condition, clean and when not in use, to be kept in separate container or plastic bag.

In an emergency, the competent Signal Representative can approve the making up of an improvised jumper wire for temporary bridging. The emergency jumper wire is to be fitted with an identification label. The competent Signal Representative will write down a description of this jumper wire in the margin of the authorising form. Immediately after use, the jumper wire is to be destroyed.

6 Authorisation for Bridging

Bridging of contacts of vital signalling relays or control devices shall be authorised and applied by a suitably competent Signalling Representative.

Note: Temporary bridging around contacts in vital signalling circuits constitutes a disconnection of signalling equipment and the respective network rules and procedures are to be observed.

For planned works on ARTC and other shared infrastructure, approved designs along with testing documentation shall be submitted to the ARTC Signal Maintenance engineer for review and acceptance. The circuit diagram issued for the bridging shall be clearly labelled with the Authority number of the temporary bridging and should include the location and equipment to be bridged, date and time.

A maintenance mark-up may be used for bridging only in emergency situations if authorised by the competent local Signal Maintenance Engineer or Signal Engineering Manager. In this case, signal maintainer applying the bridging shall ensure that the design has been correlated prior to requesting authorisation.

Where temporary bridging is permitted as prescribed in this procedure; it requires authorisation by a competent local ARTC Signal Representative on a numbered form ESP2101F-01 Authority for Temporary Bridging of Signalling Circuits.

The competent signalling personnel who are to apply the bridging shall ensure that they have fully explained the details of the bridging required to the designated ARTC personnel authorised for approving bridging.

ESP2101F-01 Authority for Temporary Bridging of Signalling Circuits

The competent Signal Representative authorising the change shall

- ensure that they understand the circumstances requiring the bridging,
- satisfy themselves that the bridging will be applied correctly by the signalling personnel involved,
- that the protection defeated will be covered by alternate means of protection while bridging is applied, and
- that the bridging will be removed, and the normal functioning of the equipment will be tested before the alternate protection is removed.

In case of the bridging on shared infrastructure, maintainers of all RIMs are required to be informed.

7 ESP2101F-01 Authority for Temporary Bridging of Signalling Circuits

The form ESP2101F-01 Authority for Temporary Bridging of Signalling Circuits is to be signed by the competent Signal Representative when issuing authority and again when advised that the bridging is removed.

In emergency, and only when necessary, where the competent local ARTC Signal Representative, who is the Authorising Signal Representative, cannot reasonably obtain an 'Authority for Temporary Bridging of Circuits' Form, then the competent Signal Representative, provided they establishes that all other temporary bridging requirements are met and it is safe to do so, may verbally issue an interim Authority for Temporary Bridging of Circuits with the details written on an improvised form.

In this case, the interim Bridging Authority Number shall be the initials of the authorising Signal Representative followed by the date. A proper 'Authority for Temporary Bridging of Circuits' Form shall also be completed at the earliest opportunity by the authorising Signal Representative to supersede the interim copy.

Each ESP2101F-01 form issued from a particular office is to be numbered with the next consecutive Bridging Authority number. The Bridging Authority number shall be alphanumerical and identify the office from which it is issued.

8 Testing of circuit before and after temporary bridging has been applied

Before applying bridging the competent person shall correlate all affected circuits to the approved design. This check is to extend to one unaltered 'clean' termination point on each side of the alteration.

Temporary bridging shall be applied as per the approved design. After applying the temporary bridging in signalling circuits, the competent signalling personnel shall test the circuit to confirm that the function/ signal equipment/ is correctly out of use and circuit is functioning as expected with no adverse impact on any other circuits. Testing shall be performed to ensure that all contacts not intended for bridging remain effective in the circuit while the temporary bridging is applied.

Where the circuit originates and/or finishes at a remote signal location/s, it will only be necessary to test that part of the circuit including any contacts to local trackside equipment, between the incoming and outgoing cables where applicable, at the local signal location where the temporary bridge has been applied.

All testing shall be undertaken in accordance with, ESC-21-01, ESC-21-02 and ESC-21-03.

9 Removal of Temporary Bridging

Removal of bridging work shall be carried out as per the test plan and in discussion with the authorising Signal Representative.

All temporary bridging shall be removed as per the approved bridging design. After removing the temporary bridging, the competent signalling personnel shall perform the testing. All contacts within the affected circuits are required to be tested in their entirety to ensure they are effective and all temporary bridging has been removed.

The signalling personnel responsible for removing the bridging is to inform the authorising Signal Representative that the bridging has been removed.

Wherever practical, the signalling employee who applies the bridging is to be the signalling employee who removes the bridging. Where it is not the same signalling employee, arrangements shall be made for the prompt return of jumper wires to the signalling employee who applied the bridging, who is to follow up this return with the signalling employee responsible for their removal as soon as practical after the planned removal time.

In all cases, the authorising Signal Representative is to be promptly advised of the removal of the temporary bridging, either directly by telephone or by forwarding the field copy, signed off accordingly. All documentation related to bridging including but not limited to master/location test copies, certified commissioning copies, completed work instructions and bridging authority shall be submitted to the regional signalling representative within 24 hours of completion of work.

The authorising Signal Representative is to pursue advice of the removal of bridging if they have not been informed promptly after the planned removal time.

10 Temporary Bridging for an Extended Period

Where bridging is required to extend beyond one shift this would normally be for planned work and may also form part of staged works and the bridging jumper wires shall be issued from the depot/office concerned. These are to be left on between shifts where required, as prescribed.

In exceptional cases if a signalling employee applies their own personal bridging jumper wire(s) then they may remove them at the end of their shift and see them replaced by jumpers provided by the relieving signalling employee, provided the authorising Signal Representative has been consulted and agrees with this arrangement. Frequent changing of bridging wires (between shifts) is to be avoided. In this case, testing should be carried to ensure the correct function has been bridged. Installation of any bridging works should be checked by other competent personnel to ensure bridging is applied correctly and authorised signal representative is notified.

Where bridging is to be retained for extended periods of time this shall be in agreement with the ARTC Signal Maintenance Engineer, and for a defined agreed timeframe. In this scenario additional controls may need to be undertaken to ensure the bridging remains effective and secure. As an example if bridging is required for points, then facing points shall be clipped, locked and spiked to prevent an unauthorised movement of the points causing an out of correspondence with the interlocking and the bridged-out position.

11 Bridging for Planned Works

For planned works, the approved design for bridging and test plan with the details below shall be submitted to the ARTC Signal Representative at least 6 weeks before:

- Planned work details with rationale for proposed temporary bridging.
- Duration of project work and duration of temporary bridging being applied.
- Bridging/Stageworks design which has been designed, checked and independently reviewed
- Location of project works and specific signalling equipment (e.g. point, level crossing) to which bridging will be applied
- Proposed Safe working arrangements for rail and road vehicle
- Key Resources and Emergency contacts
- Details of operational lines and non-operational lines in case of shared infrastructure
- Impact on active level crossings and other equipment for ARTC
- Testing procedures for installation of temporary bridging
- Testing procedures for removal of temporary bridging
- Pre-populated IBA forms
- Regulation and procedures for the use of jumper wires
- Completed ESP2101F-01 form
- Any other items specifically requested by the ARTC representative for clarification during consultation or review of the design/test plan

Bridging on shared infrastructure shall be approved by the signalling representative of each RIM. For planned work requiring the temporary bridging to be on for more than one shift, a field copy of the Bridging Authority in its written form is to be obtained by the Signalling Representative in charge of the work before the work commences.

Where applicable, a copy of the completed ESM2401F-01 form is to be forwarded by the authorising Signal Representative to the local Signal Representative for their information and retention on file. The original is to be retained by the authorising Signal Representative and kept with the book of forms.

The local Signal Representative is to examine the details on the copy of the completed ESP2101F-01 form, investigate any matters of concern and, when satisfied, initial the copy for filing.

A copy of an extract of the circuit book including the affected circuits the circuit book is to be signed by the authorising Signal Representative and forwarded to the signalling personnel who is to apply the bridging. The original is to be retained by the authorising Signal Representative.

The circuit book is to be signed by the signalling personnel who applies the bridging at the time of bridging and signed by the signalling personnel who removes the bridging at the time of removal, and then promptly returned to the authorising Signal Representative for their record.

For planned project work with a dedicated design team, TIC/Commissioning engineer, bridging authority can be issued by TIC/Commissioning engineer as per project testing and commissioning plan and approved design upon acceptance by ARTC Signal Maintenance Engineer.

The planned work which extends over more than one shift or involves different signalling employees applying and removing the bridging, then work instructions are to be prepared by the competent Signalling Representative in charge of the work, specifying the bridging application and removal details as well as the testing requirements.

Bridging on Shared Level Crossing and other infrastructure

For planned works, the competent Signal Representative in charge of the work shall provide regulation jumper wires, individually registered, and formally issued by and returned to them (or delegate) together with associated work instructions, test plan and stage works documentation. The use of jumper wires from other sources for the work is prohibited.

Note: New Non-Commissioned Equipment

With new signalling equipment, prior to it being commissioned into use, temporary bridging may be utilised to facilitate testing on the authority of the appointed Test Engineer or Commissioning Engineer, as the circuit controlling device at this stage has not yet been commissioned to provide protection, temporary bridging of its contacts does not come under the requirements of this procedure but under relevant procedures in the manuals/ specifications for testing and commissioning new and altered works

12 Bridging on Shared Level Crossing and other infrastructure

This section provides the ARTC requirement for bridging on shared active level crossings and other infrastructure with other rail infrastructure manager where one or more of the lines remain operational during the planned work on other lines.

Whenever there is a need for bridging on shared active level crossing or other shared infrastructure which may impact the safe operation of the level crossing for road users and rail operators or signalling system, acceptance shall be required from ARTC and all other rail operators who share the active level crossing or shared infrastructure. ARTC and other RIM standards are required to be followed for bridging applications on the shared level crossing.

Signaling personnel involved in planning and performing the bridging shall comply to ARTC standard ESC-21-01 - Inspection and Testing of Signaling – Roles, Responsibilities and Authorities.

When bridging is required by other rail infrastructure managers, they shall notify the ARTC corridor manager and ARTC signal maintenance engineer at least 6 weeks before the planned date. Proposing rail infrastructure manager shall provide the approved design, test plan and rationale behind the proposed bridging to the ARTC signal maintenance engineer for their acceptance.

As a minimum, the Test plan shall include the items listed in section 11.

The Signal maintenance engineer is to accept the approved design when satisfied that it meets ARTC requirements. The Signal maintenance engineer is not required to issue the bridging authority form to the other rail operator when other RIM or their representatives undertake the planned bridging work. It is the responsibility of other RIM to regulate the jumper wires in a controlled manner as per work instructions and/or testing plan.

Testing shall be carried out on all lines to ensure that shared active level crossings operate as per the bridging design and test plan and no unsafe situation will arise from the temporary bridging, typically on operational line/s. Testing shall include all train detection approaches and island circuits for all lines of the level crossing and ensure:

- The temporary bridging has been effective on the intended line/s and does not operate the level crossing as per the test plan.
- The temporary bridging has not impacted the other line/s which is supposed to be operational and the train detection operates the level crossing for that line.

Testing shall be conducted to ensure that active level crossings operate as designed for all lines after the bridging is removed.

Other controls may be considered such as a crossing keeper or hand signaller for the duration of works, road closure/detour etc. if required based on the risk assessment.

The above principle and process can be used for other shared infrastructure e.g., crossover and points, signals, train detection, communication assets, train control, computer or relay-based interlockings, cabling, etc.

13 Network Procedures

Where signalling and other equipment is booked out of use and bridging is applied, the requirements of local ARTC Network Procedures are to be strictly followed.

14 Testing Procedures when Bridging Removed.

After the bridging is removed the signalling contacts/circuits that were bridged out shall be function tested to be effective in their normal operation. These tests will include but not limited to function test and correspondence test as required. Such testing is to be completed before the alternate protection is removed and before the signalling equipment is booked back into use.

15 Computer Based Systems – Function Bridging

The preceding sections detail the processes to be followed when applying wire bridges to relay logic and related equipment. There are many computer-based systems that now provide the same vital signalling functions as the relay-based equipment. There are capabilities within these computer-based signalling systems to effectively block a function either by disabling the function or setting a particular parameter value.

These capabilities shall be used with the same rigour and process as the application of wire bridges and false feeds. The following processes shall be applied prior to an authorised signals representative blocking any function in a computer-based signalling system.

15.1 Applicability for Computer Based Systems

The following systems may have capabilities to block a signal function or to set a parameter or value such that the signalling protection for that function is no longer applied. The systems are:

- a) Grade Crossing Predictors
- b) Computer Based Interlockings
- c) Coded Track Circuits
- d) Axle Counter Systems
- e) Vital Radio Systems
- f) Telemetry Systems
- g) Signalling Control Systems including VDU systems, Panel multiplexers and train describers.

The processes detailed below shall be followed in any change to approved configurations for these systems.

THE USE OF FUNCTION BLOCKING ALWAYS REQUIRES THAT THE PROTECTION DEFEATED BE PROVIDED BY SOME ALTERNATE MEANS.

15.2 Authorised persons for Function Setting

Signals representatives shall have competency in the respective system to perform Function Setting. This competency shall have been previously assessed and recorded. Other signals representatives without the competency for the item of equipment shall not apply Function Setting to bridge out a signalling function or system protection.

The signals representatives that design and detail the list of functions to be set shall have been trained in the design of the system and have achieved a competency rating for the system. Functions that are set shall be in accordance with the design principles of the system.

Signals representatives that have been trained in the maintenance of a system and achieved a competency rating may design a list of functions to be set. The functions so designed shall be strictly in accordance with Guidelines laid down in the System Maintenance Manual, or system Design Manual or ARTC Guidelines for Function Setting for the respective system.

15.3 Authority for Temporary Setting of Signalling Functions

The form ESP2101F-02 *Authority for Temporary Setting of Signalling Functions* is to be completed and signed by the competent authorising Signal Representative when issuing authority and again when advised that the Function Setting is removed.

In emergency and only when necessary, if the competent Signal Representative who is the Authorising Signal Representative cannot reasonably obtain an 'Authority for Temporary Setting of Signalling Functions' Form, then the competent Signal Representative, provided they establishes that all other temporary function setting requirements are met and it is safe to do so, may verbally issue an interim Authority for Temporary Setting of Signalling Functions with the details written on an improvised form. In this case the interim Function Setting Authority Number shall be the initials of the authorising Signal Representative followed by the date.

Also, in this case, a proper 'Authority for Temporary Setting of Signalling Functions' Form shall be completed at the earliest opportunity by the authorising Signal Representative to supersede the interim copy.

Each EP2101F-02 form issued from a particular office is to be numbered with the next consecutive Function Setting Authority number. The Function Setting Authority number shall be alphanumerical and identify the office from which it is issued.

15.4 Testing Procedures when Function Settings are Removed

After the Function Setting is reset to the original configuration the items that were bridged out shall be function tested to be effective in their normal operation. Such testing is to be completed before the alternate protection is removed and before the signalling equipment is booked back into use.

15.5 Function Settings for New Signalling Assets

If Function Setting is used during the commissioning into service or the removal from service of signalling assets, then the details shall be referenced on the Infrastructure Booking Authority form (IBA).

Whenever Function Setting is applied during a Commissioning, there shall be an appropriate Work Instruction and the Authority for Temporary Setting of Signalling Functions' Form shall be used and recorded as part of the Commissioning work Package. A Register of Signal Functions Settings applied shall also be included in the Commissioning Work Package.

16 Authorised Signal Representatives for Bridging and Function Setting

Signal Representatives with authority to approve Bridging or Function Setting shall have certified competency for this task. Signal Representatives to perform approved Bridging or Function Setting shall have a certified competency for this task.

The person who performs the Bridging or Function Setting shall be independent from the person who approves the authority.

17 Additional Guidance

17.1 Alternative Protection when undertaking bridging.

Where the use of bridging is undertaken; the type of protection defeated shall always be provided by some alternate means, such as in the following examples only. Other alternative protection may be used with acceptance of local signal maintenance engineer.

Asset type	Principle	Activity being undertaken requiring an alternative type of protection	Alternative protection for asset when normal mode of operation is not available
Level crossing, pedestrian crossings	To provide protection to rail and road vehicles also pedestrians.	Track works with removal of rail/s, IRJ replacements, disconnection of train detection leads, and allow trains to traverse	Isolation of road/rail traffic is the preferred alternative protection i.e. Absolute occupation or road closure. In case of absolute occupation, the requirements for track vehicles to travel across shall be considered. It may be permissible to bridge one approach only, to keep crossing functional for other approaches, only if agreed by local signal maintenance engineer and there will be no rail traffic on the line bridged. Comply to ARTC operational procedures and engineering standards.
Points	To enable trains to change route	Attend track works replacing one point blade, and trains to pass	Ensure track section, points, signals, track circuits and equipment are booked out. Clip and lock points in one lie, padlock securely, remove fuse from points, have track protection in place, and possibly hand signallers to allow trains into and out of the worksite under a controlled environment. Comply to ARTC standards and requirements for the activity.
Ground frames, Release switches	To enable trains to change route	As per above examples	As per above examples Comply to ARTC standards and requirements for the activity.