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Non-Commissioned Equipment – TPWS/AWS interventions and unshielded signals.

Infrastructure Projects

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Background

- There have been a number of recent incidents in which un-commissioned AWS and TPWS have been erroneously energised during pre-testing on Projects, affecting the live running of the railway.

- Non shielded, insufficiently shielded or incorrectly shielded signals also have the potential to result in similar incidents.

- The following slides highlight a number of recent examples that have occurred and remind all testing staff and those responsible for powering up the infrastructure to be aware of the need to confirm effective isolation/shielding of external equipment prior to power up of control circuitry.

1: Un-commissioned TPWS erroneously energised

- Following power up of a location case in preparation for a resignalling project, a new TPWS OSS loop was left incorrectly energised in the operational environment. This led to the activation of the braking system on two passenger trains.

- In this case, the primary control for isolating TPWS/ AWS fuses within location cases was to cable tie the fuse carrier and apply warning labels as part of the depot testing.
- This methodology was fully complied with, however, a human error occurred 14 months in advance of the incident when the cubicle was manufactured such that the wrong fuses were isolated in the depot i.e. fuses 6, 7, and 8 (as delivered from manufacturing) instead of fuses 7, 8, and 9.

- The site tester verified the depot test sheet was signed & carried out a visual inspection to confirm that three number fuses were isolated as expected, without fully checking the correct fuses were isolated.

1: Un-commissioned TPWS erroneously energised

To mitigate against future instances of this type of failure it is recommended to:

- Review location manufacture / testing process with a view to completing all function testing prior to shipping to site / depot.
- Consider options such as removing fuses from fuse carriers in the factory and deliver to site in a bag with an inventory (Robust communications between the factory and site must be in place if this method is used due to the need to recheck fuse type and rating when reinstalled).
- Isolation of TPWS baseplate links 3&4 (Diverse isolation)

1: Un-commissioned TPWS erroneously energised

- On another recent Re-Signalling Project, two trains were subjected to an inadvertent TPWS intervention as a result of testing activities. The TSS loops which caused the intervention were associated with a non-commissioned signal.

- It was found that WAGO links connecting the TPWS TSS baseplate to the loops in the four foot were made, with a dummy load fitted in parallel, allowing the TSS loops to become active when their associated TFM was powered up.

- The root cause was the failure to ensure that all four foot equipment was suitably isolated. It is not known when the links were installed; the tester who installed the dummy load believes that they were not present at the time. One theory is that the links were installed prior to scheduled Through Testing to expedite Testing time, with the intention to remove the links after Through Testing had taken place. However, in the event the Through Testing didn't take place and the links remained in place.

Lessons Learnt: Un-commissioned TPWS erroneously energised

- All testing staff are reminded to be extra vigilant when undertaking pre-testing activities and ensure that non-commissioned equipment that has the potential to affect the operational railway is left in a safe isolated state.

2: Incorrectly Shielded Signal

- On a recent Re-Signalling Project, a signal with a position 1 position light junction indicator and an out of use subsidiary signal was incorrectly shielded.

- A bag had become detached from the sub signal and construction staff were instructed to replace it. It was incorrectly assumed that the PLJI read onto the out-of-use loop and so the bag was incorrectly replaced onto the PLJI rather than the sub signal.

- The problem was identified and rectified later that day and no incident occurred, however should a signaller have set a route that used the PLJI for the lower speed route, a driver would not have seen the PLJI and assumed that the higher speed route had been set.

Examples of poorly shielded signals on a recent Re-Signalling Project

Lessons Learnt: Incorrectly Shielded Signal

- The importance of shielding the correct signal, using the correct shield and correctly applying the shield should be highlighted to all Project Teams. Incorrectly shielded signals can cause confusion to drivers, and have the potential to cause more serious consequences.

- Suppliers are reminded that the correct shields should be ordered at the same time as placing the order for all signals, and the shield should be secured to the signal to reduce the risk of it becoming detached.

- A schedule should be produced for all signals, to enable construction and testing staff to ensure that all signals are correctly shielded. A check should be undertaken that the schedule has been correctly implemented. Staff should refer to stage plans at both the commencement and completion of tasks to ensure that the correct shield is used, and the shield is correctly applied.

3: Un-commissioned AWS erroneously energised

- A train traversing a recently installed un-commissioned AWS on a recent Re-Signalling Project, received a bell instead of a horn on the approach to a restrictive in service signal. The un-commissioned AWS for the new signal was in close proximity to an existing AWS and hit the permanent magnet of the existing AWS followed by the electromagnet of the un-commissioned AWS.

- This resulted in the driver receiving a clear AWS signal, rather than being warned of the upcoming restrictive signal.

- It was found that the electro-magnet of the un-commissioned AWS, was energised at a time when no current should have been flowing to the equipment.

- The immediate cause was the failure to break the circuit supplying current to the associated equipment after carrying out the off-site functional tests.

- No documented procedures were in place to instruct the testers carrying out the off-site functional test to break the respective circuits via the removal of fuses and links. Also, no documented procedures were in place to ensure that once the off-site functional test had been completed, the circuits had been broken.

Action Required, Taken & Lessons Learnt: Un-commissioned AWS erroneously energised

- In order to prevent reoccurrence, the Supplier involved has updated their Signalling off-site functional testing Technical Instruction to introduce the requirement for testers performing the off-site functional test to undertake a number of tasks, which are to be completed upon conclusion of off-site testing and prior to the delivery of the location case to site.

- The performance of the updated procedure, by testing teams, will remove the risk of the installation/ construction teams inadvertently installing un-commissioned energised trackside equipment which could influence the running of the live railway.

- It is suggested that other Suppliers give some thought to a similar approach in order to remove the risk of installation/construction teams installing un-commissioned energised trackside equipment which could influence the running of the live railway.

- All testing staff are reminded to be extra vigilant when undertaking pre-testing activities, and ensure that non-commissioned equipment that has the potential to affect the operational railway is left in a safe isolated state.

Summary

- The examples included within this document highlight the risk of erroneously energising un-commissioned equipment during pre-testing on Projects, that has the potential to affect the live running of the railway.

- All testing staff and those responsible for powering up the infrastructure are to be aware of the need to confirm effective isolation/shielding of external equipment prior to power up of control circuitry.

Further Information…

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