Engineering change conformity verification and how it is assessed

Burhan AbdalEnus, Senior Engineer, AEGIS Certification Services, describes the independent verification process under RIS-2700-RST.

Above: Class 73 locomotive 73952 is seen at Kidderminster Station on the Severn Valley Railway during testing operations alongside ex-Great Western Railway Manor Class steam locomotive 7812 *Erlestoke Manor*. *Photograph: Phil Marsh.*

The engineering change process

Railway vehicles have a long life which can typically be 30 years or more. However, technology advances and user requirements continually change, so it is inevitable that modifications will be required during their lifespan. Examples of these range from minor changes, such as new fleet livery, the fitment of on-board CCTV and Wi-Fi systems, to more involved activities, such as the installation of alternative power systems on locomotives, or alterations to legislation requiring mandated changes to be carried out.

RSSB Rail Industry Standard RIS-2700-RST is the recognised process for verification to ensure any changes applied to railway vehicles meet the applicable stated requirements. This replaces the Engineering Acceptance process, previously undertaken by Vehicle Acceptance Bodies (VABs). The RIS-2700 process is applicable to all vehicles and machines which operate on the UK railway in running mode. This includes passenger rolling stock, freight wagons, locomotives and On-Track Machines (OTMs).

The assessment process includes a technical review of the client's engineering change documentation to confirm that it meets the standards, or other requirements as requested by the client. Construction audits are undertaken when requested to verify that the engineering change has been implemented in accordance with the assessed design and has been undertaken by competent persons in line with a quality management system. Maintenance verification ensures that the engineering change will maintain compliance during its intended period of operation (e.g. ensuring brake pads are changed at the required intervals to ensure braking stopping distances are maintained). Upon successful verification, the assessment party issues an Attestation Statement (Certificate). This statement will support the train operator's Safety Management System under ROGS.

Application of RIS-2700-RST - dual-fuel locomotive

In 2020, G-Volution approached AEGIS Certification Services regarding the approvals required to convert a Class 73 diesel locomotive to run on a combination of bio LPG/diesel, changing the vehicle into a dual-fuel vehicle. This project was administered by Innovate UK under its DfT-funded 'First of a Kind' round 3 (FOAK3) competition.

AEGIS Certiifcation Services recommended the use of RIS-2700-RST as the engineering change control process. To complete the process detailed in RIS-2700-RST, there are two key details that need to be understood - the parties involved and the verification assessment level.

Who are the parties involved?

For the verification process, there are two parties - the proposer, in this case G-Volution and the assessment party, AEGIS Certification Services. The proposer is responsible for the initiation of the process and undertaking the engineering change. The assessment party is responsible for undertaking the verification of conformity of the engineering change

Left: The installed bio LPG tank inside the locomotive, as viewed from above.

and to have an appropriate degree of independence from the proposer.

What is a verification assessment level?

There are five fundamental assessment levels that an engineering change can fall into - these are: inconsequential, minor, medium, substantial and formal. The level of assessment fundamentally comes from the risks associated to the engineering change. The factors of risk include complexity and novelty of the design and/or use of the technology, the consequence of failure, the scale of the change and its impact on the existing vehicle. As the level of risk increases so does the required verification assessment level and the assessment party's independence.

What is independent verification and who can do it?

Verification is split into three categories - these are first, second and third party. The level of independence increases from first to third-party verification.

First party is a self-declaration of an engineering change and is only used for changes that fall under inconsequential assessment. At this level, the proposer and assessment party are the same and, therefore, there is no independence.

For minor or medium assessments, these can be completed by a second-party verification. For this category, the assessment party can be part of the same legal entity as the proposer though there is a requirement for some independence. This can be either separate personnel to that of the proposer, or a separate department within the same organisation as the proposer. It is also possible for the assessment work to be carried out by a completely different entity.

Third-party verification is undertaken by a separate legal entity all together and, therefore, offers full independence and impartiality. This level of independence should be sought for substantial and medium changes. Third-party verification can be accredited, (i.e., meeting the requirements of BS EN ISO/IEC 17065:2012, the accreditation of which is carried out by UKAS), or unaccredited. Using an accredited body demonstrates the greatest assurance of technical capability.

In all cases, the proposer of the engineering change must ensure that the level of independence and the capability of the assessment party is appropriate to the complexity and novelty of the engineering change. In this case, G-Volution selected AEGIS Certiifcation Services to carry out the third-party assessment. The company is accredited as a product certification body in accordance with BS EN ISO/IEC 17065:2012 and as an Inspection Body in accordance with BS EN ISO/IEC 17020:2012, this accreditation being carried out by United Kingdom Accreditation Services (UKAS).

Certification activities include Approved Body (ApBo - the UK 'equivalent of NoBo'), Designated Body (DeBo), Verification Body (RIS-2700-RST) and Plant Assessment Body (PAB) (RIS-1710-PLT). Inspection body activities include Assessment Body (AsBo) in line with Common Safety Method (CSM) regulations.

What is verification?

The process of verification is to confirm that the engineering change, as designed, complies with the applicable design requirements. It is also possible to verify that the engineering change is then installed or manufactured in accordance with the assessed design. These two activities are known as the design conformity and construction conformity.

If it is found that the engineering change has an impact on the maintenance plan of the vehicle, then a maintenance conformity should also take place alongside the design conformity. In this example, due to the nature of the engineering change, it was found that all three conformities would be undertaken.

The design and maintenance conformity assessments were completed with a detailed review against the compliance documents

Burhan AbdalEnus, Senior Engineer, AEGIS Certification Services

provided by G-Volution. These included technical documentation, maintenance documentation and reports related to the change, such as drawings, schematics and an explanation detailing how they relate to the associated standards and legislation.

The construction conformity assessment required a construction audit to take place. This was based on the design information that had been assessed during the design conformity process for the installation of the LPG tanks, associated pipework and livery. The facilities/tools and staff competencies used were also assessed to ensure that compliance with applicable certification was in place and staff competencies met the quality management system requirements.

What happens next?

At the end of the verification, the findings will be summarised for each of the conformities. A report and an attestation statement will be issued. This shall conclude the verification confirming that the proposer has met its responsibilities in complying with the relevant legislation and regulations for the engineering change.

73952 leads classmates 73951, 73961 and 73965 on a Dollands Moor to Derby RTC infrastructure monitoring train at Otford junction. *Photograph: Jamie Squibbs.*