Association of Train Operating Companies

ATOC/ACOP/EC/01006
Approved Code of Practice – Management of Rail Vehicle Engineering Change

Issue: 3.5
August 2015

Approved Code of Practice - Management of Rail Vehicle Engineering Change

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Synopsis

This Approved Code of Practice (ACOP) describes an approach for the effective management of engineering change to rail vehicles together with aspects of inter-company co-operation requirements for Train Operating Companies (TOCs).

Contents

Part A

Issue record

This Guidance Note will be updated when necessary by distribution of a complete replacement.

Revisions have not been marked by a vertical black line in this issue because the document has been revised throughout.

Issue	Date	Comments
Draft	September 2003	Original Draft
1.0	March 2004	Incorporating desktop pilot and other feedback from RIA T&RS group and Engineering Council
2.0	November 2010	Incorporating changes due to introduction of 2006 ROGS, RIR and further experience
3.5	August 2015	Fully updated document to incorporate changes introduced by the Railways (Interoperability) Regulations (RIR) 2011; the Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) 2006 - as amended in 2011 and 2013 and the Common Safety Methods. The opportunity was taken to also undertake a complete review of the document by a sub-group of Technical and Standards Forum

Responsibilities

Copies of this Approved Code of Practice should be distributed by ATOC members to relevant persons within their respective organisations.

Explanatory note

This technical publication has been produced in consultation with rail professionals, and is to be disseminated within the railway industry.

However, ATOC is not a regulatory body and this publication is not a mandatory standard. This publication is advisory only and must be evaluated and implemented as appropriate at the sole discretion and responsibility of the user.

Every user is responsible for its own operation and carries full responsibility of ensuring safety of its own systems of work.

Whilst ATOC Approved Codes of Practice are intended to disseminate best practice, users must evaluate this technical publication against their own requirements in a structured and systematic way. Some parts may be determined not to be appropriate at the user's discretion.

It is recommended that the evaluation and decision to adopt (or not to adopt) this technical publication is documented and reviewed from time to time.

ACOP Status

This document is not intended to create legally binding obligations between train or freight operating companies, their suppliers, the DfT or the ORR.

Supply

The Controlled version of this document can be found on the RSSB website (rgsonline.co.uk)

Uncontrolled copies of this Guidance Note may be obtained from the ATOC Director - Major Projects, Operations & Engineering

Part B

1. Purpose

This document outlines a high-level, cross industry process for the management, evaluation and approval of Engineering Change to rail vehicles.

It is designed to set out the basic process steps from the initial inception, negotiation and review, through to implementation and ultimate completion. It is intended that the document serves as a tool to assist in the structured assessment of whether to proceed as well as how to proceed with an Engineering Change.

This document is also designed to speed up the approval of inter-company common Engineering Changes that require the approval of multiple stakeholders.

This ACOP also provides appropriate guidance with respect to compliance with relevant legislation as well as industry standards.

References to other relevant sources of guidance are also included.

2. Scope

This ACOP is applicable to all UK TOCs and FOCs and other organisations who undertake Engineering Change to rail vehicles.

It is applicable to all Engineering Changes considered for rail vehicles. At the highest level this is taken to encompass:

- Modifications, trials or experiments to rail vehicles and / or components
- Changes to rail vehicle software
- Changes to maintenance plans
- Crash repairs to damaged vehicles

It is applicable whether or not the change proceeds to implementation and it is intended that this ACOP is invoked as soon as an Engineering Change is proposed.

For clarity, this ACOP is not directly applicable to new build rolling stock, nor Engineering Changes that are covered by the Railway Interoperability Regulations (RIR). Should RIR apply (see section 7.1 for guidance on how to check) it is recommended that reference is made to ATOC/EC/GN/002 – The ATOC Guide to Vehicle Change.

Whilst the Common Safety Methods also apply to Organisational and Operational Change, such changes are out of scope of this ACOP.

In addition, this ACOP does not attempt to cover the specific requirements of ROGS (as amended); RIR (as amended) or the Common Safety Methods, but prompts references to these Regulations as appropriate.

3. Abbreviations

ACOP	Approved Code of Practice
aPEC	Amalgamated Proposed Engineering Change
APIS	Authorisation to Place Into Service
ATOC	Association of Train Operators
ArBo	Assessment Review Body
COI	Component Overhaul Instruction
COSHH	Control of Substances Hazardous to Health
CSM	Common Safety Methods
CSM RA	Common Safety Method for Risk Evaluation and Assessment
DeBo	Designated Body
DfT	Department for Transport
ECM	Entity in Charge of Maintenance
EMC	Electro-Magnetic Compatibility
ERA	European Railway Agency
ERATV	European Register of Authorised Types of Vehicles
EU	European Union
FOC	Freight Operating Company
GB	Great Britain
H&SWA	Health and Safety at Work Act
ILOP	Illustrated List of Parts
IT	Information Technology
NIR	National Incident Room (Report)
NNTR	Notified National Technical Rule
NoBo	Notified Body
NVR	National Vehicle Register
OEM	Original Equipment Manufacturer
OJEC	Official Journal of the European Commission
ORR	Office of Rail and Road
PADS	Parts and Drawings System (IT System)
PEC	Proposed Engineering Change
R2	RAVERS & RSL Replacement (IT System)
RAVERS	Rail Vehicle Records (IT System)
RCM	Reliability Centred Maintenance
RIA	Rail Industry Association
RIR	Railway (Interoperability) Regulations
RoSCo	Rolling Stock Leasing Company
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations (as amended)

RSL	Rolling Stock Library
RSSB	Rail Safety and Standards Board
RU	Railway Undertaking
SMS	Safety Management System
TSI	Technical Specification for Interoperability
T&RS	Traction and Rolling Stock
TOC	Train Operating Company
TSP	Train Service Provider
UK	United Kingdom of Great Britain and Northern Ireland
VMI	Vehicle Maintenance Instruction
VOI	Vehicle Overhaul Instruction

4. Definitions

The following definitions are used in this document:

Approvals Plan: an informal record of the verification activities, formal and informal certification and the bodies that will be involved, as agreed between the parties.

CSM - Assessment Review Body (CSM ArBo): an independent (3rd party) body that has the necessary competence and experience to check the suitability of both the application of the CSM and of its results.

Certificate of Verification: the third party certification drawn up by a NoBo as part of the verification assessment procedure and used to make a Declaration of Verification to the ORR in applying for authorisation under RIR.

Champion: the person responsible for leading the Engineering Change. Any stakeholder or company throughout the supply chain may act as a Champion for an Engineering Change.

Common Safety Methods: These have been developed by ERA to help establish a single market for rail transport services and ensure that safety is maintained at a high level and, when and where necessary and reasonably practicable, improved. They aim to provide a common approach to assess the level of safety and performance of operators at EU level and in Member States.

Completion Plan: a plan of all activities required to be carried out, following approval of the Engineering Change, in order to complete the implementation. (An illustrative but non-exhaustive checklist of issues to consider is provided for information in Appendix D.)

Designated Body (DeBo): an independent (3rd party) verification body that, for the purposes of RIR, verifies that vehicles are designed, built and tested in accordance with the Notified National Technical Rules that are relevant to a project (not the entire set), and if compliant, compiles a separate Technical File and issues a Certificate of Verification.

Design Authority: the body designated as exercising custody over the design specification for a vehicle or component and who is controlling and recording any changes to that design specification. (For more recent vehicle builds this is typically the train manufacturer.)

Engineering Change: anything that changes processes, plant (tooling), people (competence requirements) or parts (materials); this term is further defined in ATOC ACOP/EC/1003. Engineering Change is therefore taken to encompass:

- Modifications, trials or experiments to rail vehicles and / or components
- Changes to rail vehicle software
- Changes to maintenance plans and supporting documentation
- Changes to suppliers of maintenance or overhaul services
- Changes to suppliers of components
- Changes to suppliers qualification arrangements
- Crash repairs to damaged vehicles

Entity In Charge of Maintenance (ECM): Each vehicle used on the EU railway system must have an appointed ECM that is responsible for ensuring that there is an appropriate maintenance plan in place for the vehicle and that the vehicle is in a safe state of running by means of a system of maintenance. In some cases the RU will be the ECM, although the vehicle owner, the manufacturer or another Third Party can assume the role. The ECM of each vehicle must be registered in the National Vehicle Register (NVR). At the moment only freight wagon ECMs need to be formally certified (currently by the ORR in GB).

Experiment: An Engineering Change that is undertaken for a temporary period on a small number of vehicles in order to validate aspects of that Change.

FOC: a company (Freight Operating Company) - operating the vehicle. Multiple FOCs may be affected by the Engineering Change and hence be stakeholders, although they may choose to nominate a Lead FOC. The Lead FOC will need to agree the extent of its role and the authority with which it may act on behalf of the other FOCs and TOCs involved. The terms Operator (in RIR), Transport Undertaking (in ROGS) and Railway Undertaking (in the European railways general framework Directive 2001/12/EC) correspond to the term FOC in this document.

Funder: the party that will pay for both the development of the Engineering Change through this process and for the subsequent implementation of the Change (different parties may fund different elements). The Rolling Stock Leasing Company (RoSCo) may finance some or all of the change through an adjustment in lease rentals as appropriate.

Keeper: the party that exploits the rail vehicle as a means of transport and is registered in the NVR.

Maintenance Plan: A structured and documented set of tasks that include the activities, procedures, resources and the time scale required to carry out maintenance.

NoBo (Notified Body): a body qualified under RIR to compile the Technical File and issue a Certificate of Verification for the Engineering Change where required under RIR.

Owner (of the vehicle(s)): the company (in most cases a RoSCo) which is responsible for the lifelong integrity of the vehicle asset. Multiple Owners may be stakeholders (where the change applies to more

than one fleet), but they may choose to nominate a lead Owner, who will need to agree the extent of its role and the authority with which it may act on behalf of the other Owners.

Proposer: the person initiating the engineering change.

Responsible Engineer: the person, nominated by each company involved in the Engineering Change, who is empowered to share relevant information and make decisions with respect to the engineering and the process being followed.

RIR: The Railways (Interoperability) Regulations 2011 transpose the Interoperability Directive into National Law. RIR 2011 revoked the RIR 2006.

Risk Assessment: a documented process, used by a TOC/FOC, to demonstrate that the potential risks introduced by the Engineering Change have been assessed in accordance with the requirements of its SMS.

ROGS (as amended): The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS) came into force in 2006. ROGS provide the regulatory regime for rail safety, including the mainline railway, metros (including London Underground), tramways, light rail and heritage railways. The Regulations implement the European Railway Safety Directive (2004/49/EC), which aims to establish a common approach to rail safety and support the development of a single market for rail transport services in Europe. ROGS has been amended by the Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011 and the Railways and Other Guided Transport Systems (Miscellaneous Amendments) Regulations 2013. From 26 August 2011 ROGS introduced the concept of an 'entity in charge of maintenance' (ECM).

SMS: the Safety Management System that must (under ROGS) be documented and implemented by the TOC/FOC in order to operate the vehicles.

Supplier: a party directly involved in the provision of the product or service which is subject to the Engineering Change under consideration – e.g. a component OEM (Original Equipment Manufacturer), train builder, maintainer, overhauler, repairer.

Technical Authority: the person or company that the Champion, TOC/FOC(s) and Owner(s) agree is technically competent to assess the Engineering Change from an engineering perspective. The Technical Authority may be a person or organisation within one of the stakeholders or may be a separate party contracted by any of the companies involved. In any case, they must have the necessary level of industry and engineering knowledge, and appropriate autonomy, governance and oversight for assessing the Engineering Change proposed, commensurate with the potential technical and commercial impacts.

> Note: If there is a Design Authority identified for the vehicle, sub-system or component subject to the Engineering Change proposed then such Design Authority may be considered for the role of Technical Authority, or may be consulted by the Technical Authority if appropriate.

Third Party Approver: A different company (separate legal entity) that performs verification/approvals in order to:

- Issue of Certificate(s) of Verification by a NoBo and DeBo (under RIR);
- Assess any engineering change as required by the TOC/FOC's SMS (under ROGS).

Note: Whilst the TOC/FOC is responsible for securing third party approvals, it need not be the TOC/FOC who actually contracts them; indeed this may often be better done by the Champion – where the Champion is not the TOC/FOC – on its behalf.

TOC: a company (Train Operating Company) operating the vehicle. Multiple TOCs may be affected by the Engineering Change and hence be stakeholders, although they may choose to nominate a Lead TOC. The Lead TOC will need to agree the extent of its role and the authority with which it may act on behalf of the other TOCs and FOCs involved. The terms Operator (in RIR), Transport Undertaking (in ROGS) and Railway Undertaking (in the European railways general framework Directive 2001/12/EC) correspond to the term TOC in this document.

Trial: An Engineering Change that is undertaken for a temporary period on a small number of vehicles in order to validate aspects of that Change.

Validation: Confirmation that the behaviour of the developed system meets stakeholder requirements. (A check that the system is being built right)

Verification: Confirmation that a design meets its specification and implements all the requirements placed on it. (A check that the right system is being built)

5. The Need for an ACOP – Background

This Approved Code of Practice (ACOP) describes an approach for the effective management of engineering change to rail vehicles together with aspects of inter-company co-operation requirements for Train Operating Companies (TOCs).

The evaluation and implementation of Engineering Changes to the design and maintenance of rail vehicles is subject to a range of requirements arising from:

- Legislation
- Standards
- Guidance
- Industry Systems
- Contractual Obligations
- Differing decision criteria of multiple stakeholders

This ACOP attempts to explain to practitioners where proposed Engineering Changes are applicable to RIR and CSM Regulations and how to approach the assessment thereof.

The absence of a clear, defined, headline process to follow has often delayed the implementation of desirable Engineering Changes as a result of the process employed not respecting the genuine interests of all interested stakeholders.

In order to address the need for a clear Engineering Change process, this ACOP describes a process that enshrines the following principles, which have been proven through experience to assist in delivering a successful Engineering Change when completed broadly in the order listed:

1. Define the Engineering Change.
2. Identify all stakeholders.
3. Secure outline agreement that the Engineering Change is worth pursuing and will be beneficial to all parties – both technically and commercially.
4. Agree the technical aspects – including the approach and the full scope including spares, documentation and approval requirements.
5. Contract and deliver.

Users are reminded that these requirements do not supersede their own company processes for managing business change and commercial interfaces.

Simple flowcharts below set out the steps in the High Level Cross-Industry Engineering Change process and prompts consideration of other processes at appropriate points.

Any party may invoke and lead the process. This ACOP does not replace the technical and approval processes within individual stakeholders, nor does it define or constrain the negotiations between stakeholders – it extends only to proposing that these should take place and prompting a point at which they should be considered.

A template process form and log for recording data, arrangements and agreements for the benefit of all stakeholders involved are provided in Appendix C.

6. Legislative Background

Associated legislation that TOCs undertaking Engineering Change need to comply with include:

- Health & Safety at Work (etc) Act, 1974 (H&SWA), in particular section 6
- The Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) –as amended; and
- The Railways (Interoperability) Regulations 2011 (RIR)
- Common Safety Methods.

In all cases, under ROGS the TOC/FOC has responsibility within its SMS for the placement into service of new or altered vehicles and for any safety approvals required. The TOC's SMS will already detail specific competence levels, systems and facilities necessary for managing safety relevant risks, including those introduced by an Engineering Change or the need for the employment of a separate or specialist Technical Authority.

6.1 Does RIR Apply to the proposed Engineering Change?

As stated previously the introduction of new build vehicles (and major upgrades / renewals) are out of scope of this document and are covered by RIR. ATOC/EC/GN/002 – The ATOC Guide to Vehicle Change provides guidance on the criteria and arrangements for complying with these regulations.

Engineering Changes that are not being undertaken in order to achieve TSI compliance, but involve the installation of TSI compliant components should not normally need Authorisation.

Appendix A contains some guidance in relation to assessing whether RIR applies to a proposed Engineering Change.

6.2 Does the CSM RA Apply to the proposed Engineering Change?

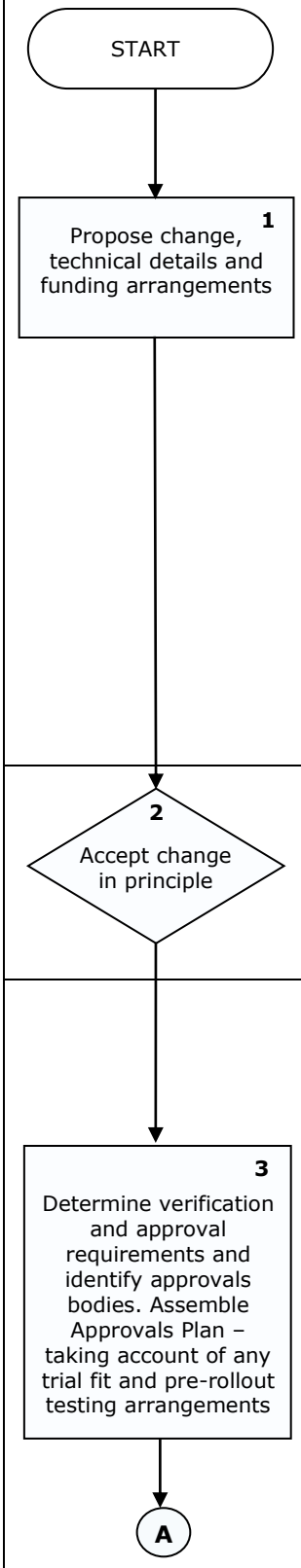
The CSM RA is a framework that describes a common mandatory risk management process for the European rail industry and does not prescribe specific tools or techniques to be used. The CSM RA is considered complementary to other domestic UK legislation e.g. Management of Health and Safety at Work Regulations. The CSM RA applies when any significant safety related technical, operational or organisational change is being proposed to the railway system. The ORR has published guidance on the application of the CSM RA: *Common Safety Method for risk evaluation and assessment. Guidance on the application of Commission Regulation (EU) 402/2013 March 2015.* This can be found at:
http://orr.gov.uk/__data/assets/pdf_file/0006/3867/common_safety_method_guidance.pdf

Appendix B contains guidance in relation to assessing the "Significance" of a proposed Engineering Change.

In the event that the proposed Engineering Change does trigger the "Significance Test" in order to assist the industry implement the requirements of the CSM RA, the RSSB have also produced six complementary Rail Industry Guidance Notes to assist practitioners apply the requirements of the CSM RA.

- GE/GN8640: Guidance on Planning an Application of the Common Safety Method on Risk Evaluation and Assessment
- GE/GN8641: Guidance on System Definition
- GE/GN8642: Guidance on Hazard Identification and Classification
- GE/GN8643: Guidance on Risk evaluation and Risk Acceptance
- GE/GN8644: Guidance on Safety Requirements and Hazard Management
- GE/GN8645: Guidance on Independent Assessment

7. High Level Cross-Industry Engineering Change Process Flowchart



1. The Proposer/Champion sets out the change as follows:
   - Who wants it and why?
   - Who are the stakeholders?
   - Who is the Technical Authority?
   - What are the outline costs and benefits?
   - Who will provide finance and/or funding?
   - Who are the critical Go/No-go decision makers?

In conjunction with the respective Responsible Engineer(s) and their company processes the Champion ensures that the basic technical, commercial and implementation details are determined, including:

- What are the success criteria?
- What needs to be done?
- Who will do it? (concerns in relation to common process);
- How it will be paid for? (could involve OJEC notice)
- What are the completion plan arrangements? (necessary actions and records)
- Any details/decisions that may, by agreement, be left for a later part of the process?

Appendix C contains a template process form and log for recording the details of the change, the parties involved, the anticipated outline programme dates and the progress made

Note: This process is equally applicable to Contract Variations or equivalent Engineering Changes proposed by external (to TOC/FOC) organisations.

2. The Responsible Engineer(s) accept the proposed change in principle, considering:

- Is the Technical Authority confident that an acceptable change can be developed (i.e. which will meet approvals requirements)?
- Given the proposed costs and benefits, is the Funder prepared to pay?

If the decision is no, the Champion may modify the proposed change and resubmit it.

3. The Champion determines the standards that apply and the appropriate approvals process; in accordance with the requirements of the lease (where applicable) and whether the change will:

- Require authorisation under RIR (vehicles that are of new construction or subject to a 'major' upgrade or renewal will generally require authorisation under RIR). ATOC/EC/GN/002: The ATOC Guide to Vehicle Change details this area specifically and guidance, particularly regarding the interpretation and application of the appropriate criteria, may also be sought from DfT and ORR and, where engaged, any specialist Technical Authority.
- Trigger the Significance Test (according to CSM Regulations refer to Appendix B); or
- Fall outside the legislated processes and be handled wholly by the provisions of the TOC/FOC's SMS

In all cases, under ROGS the TOC/FOC has responsibility within its SMS for the placement into service of new or altered vehicles and for any safety approvals verification required.

The Champion also assembles an Approvals Plan to reflect the applicable process and requirements.

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4 Obtain agreement for Approvals Plan and any revision to the technical and commercial arrangements	4. The Champion, in conjunction with the other stakeholders, makes any necessary revisions to the technical, commercial, implementation and completion arrangements and the Approvals Plan is agreed.
5 Finalise fully, the change, technical details and funding arrangements	5. Under the leadership of the Champion the Responsible Engineers finalise any outstanding details concerning: • Success criteria; • What needs to be done? • Who will do it? • How it will be paid for; and particularly • The completion plan arrangements (all necessary actions and records); and • Any details/decisions that may, by agreement, be left for a later part of the process. The Responsible Engineers in the TOC/FOCs, Owners and the Technical Authority decide, in conjunction with any other stakeholders, whether the Completion Plan identifies all the outstanding issues, and satisfy themselves that these will be adequately addressed.
6 Go / No-go	6. The Responsible Engineers in the TOC/FOCs and Owners, in conjunction with other stakeholders and with the Technical Authority, as required, each decide whether the change is worth pursuing for technical and commercial reasons and contract accordingly. If the decision is No, the Champion may modify the proposed change and resubmit it.
7 Engineer the change and implement agreed approvals process	7. The Champion arranges for the Technical Authority to review and, to the extent appropriate, engineer the change and implement the agreed approvals process. Dependent upon the change this could be first, second or third party approvers as appropriate (in some circumstances this may also be the Champion).
8 Check configuration and interchangeability implications and dependent modifications	8. Where relevant, reviewing and engineering the change could include checking the configuration of the existing vehicles / components (e.g. that they are all physically at the latest modification status and design specification). It could also include understanding any interchangeability implications with existing configurations, as amended by any other changes that are being implemented. Note: It is considered "good practice" to compile the equivalent of a "Technical File" if the rolling stock subject to Engineering Change pre-dates the RIR. The existence of such a "Technical File" equivalent simplifies the assessment of future Engineering Changes.
9 Review and accept Engineering Change	9. Agree final form of Engineering Change. The Champion and the Technical Authority work with any Third Party Approver(s) to develop the Engineering Change to meet the agreed requirements.
B	

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10 Issue approval certification (Where relevant)	10. Where relevant the Third Party Approver(s) issues any formal approval certification relevant to this stage. Such approval for first and second party certification may not be relevant in cases where a TOC/FOC is self certifying a minor change wholly under its SMS. Vehicle Owner approval is granted through contracted processes and associated documentation. Maintainer agreement is granted through contracted processes (e.g. Variations).
11 Launch implementation	11. The Champion launches implementation, with the full agreement of all relevant parties. Note: It is considered good practice to initially undertake a controlled trial in order to validate Engineering Change arrangements. In addition to monitoring the effectiveness of the Engineering Change undertaken it is recommended that monitoring is undertaken for issues affecting the fleet as a result of undertaking the Engineering Change e.g. other system fleet failures that might be as a result of being disturbed whilst undertaking the Engineering Change.
12 Close out Completion Plan	12. The Champion delivers the Completion Plan.
13 Review Effectiveness of Engineering Change END	13. The Champion leads a review of the effectiveness of the Engineering Change – against the defined success criteria. Has the Engineering Change delivered the enhancement that was anticipated?

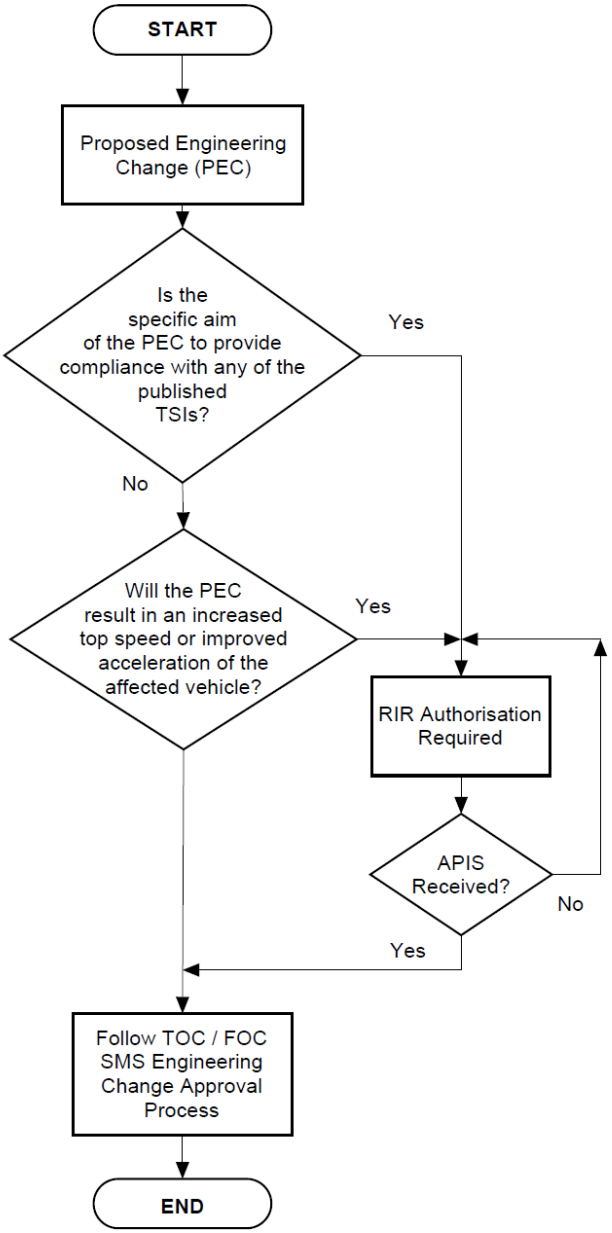
8. References

1974 H&SWA	Health and Safety at Work etc. Act 1974
2001/12/EC	European Railways General Framework Directive
2004/49/EC	European Railway Safety Directive
SI 2006 No: 599	The Railways and Other Guided Transport Systems (Safety) Regulations 2006
SI 2011 No:1860	The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011
SI 2011 No: 3066	The Railways (Interoperability) Regulations 2011
SI 2013 No: 950	The Railways and Other Guided Transport Systems (Miscellaneous Amendments) Regulations 2013
EU No: 402/2013	Common safety method for risk evaluation and assessment
ATOC EC/GN/002	The ATOC Guide to Vehicle Change
GE/GN8607	Guidance on the Use of Escrow Agreements for Rail Applications
GE/GN8640	Guidance on Planning an Application of the Common Safety Method on Risk Evaluation and Assessment
GE/GN8641	Guidance on System Definition
GE/GN8642	Guidance on Hazard Identification and Classification
GE/GN8643	Guidance on Risk Evaluation and Risk Acceptance
GE/GN8644	Guidance on Safety Requirements and Hazard Management
GE/GN8645	Guidance on Independent Assessment

Appendix A: Does RIR Apply?

It is unlikely that RIR will apply to Engineering Changes unless the specific purpose of the Engineering Change is to achieve compliance with a Technical Specification for Interoperability or as a consequence of the change an improvement in top speed or acceleration of the vehicle will result.

This is shown diagrammatically in Flowchart A1 below:

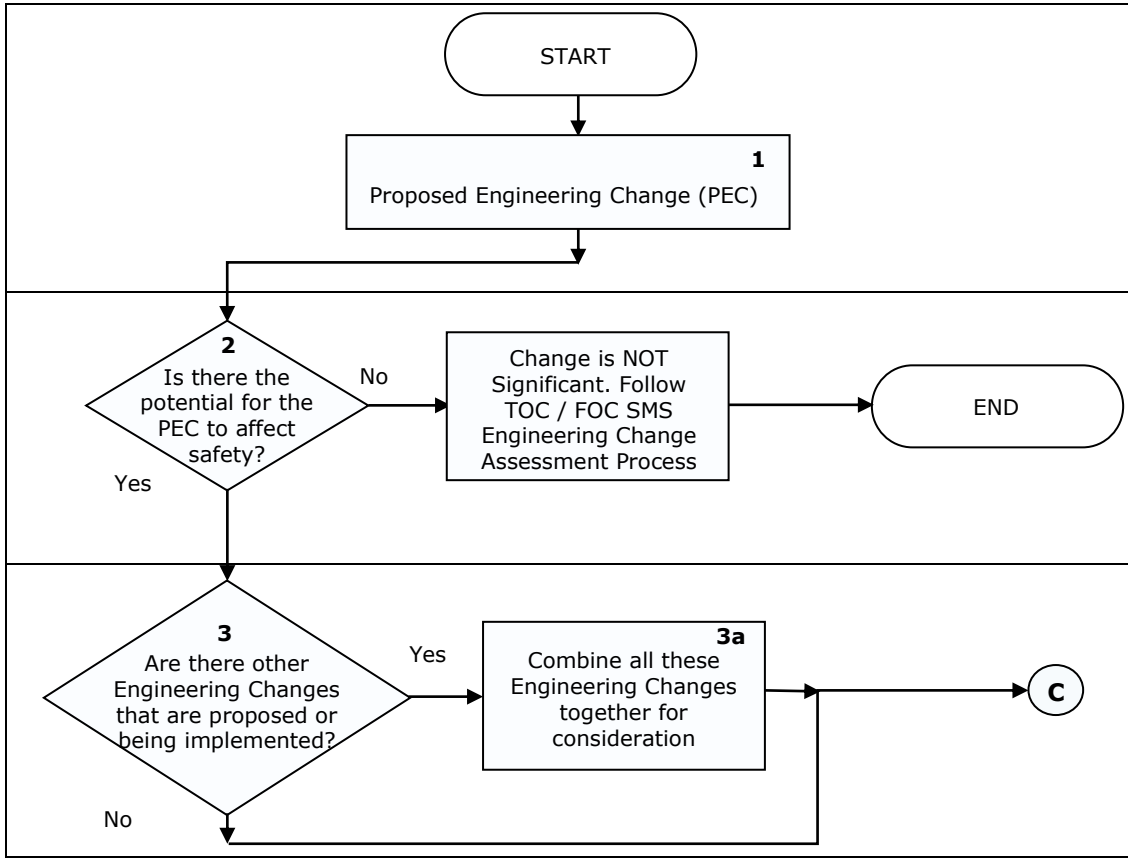


FLOWCHART A1: AUTHORISATION UNDER RIR

Appendix B: Is the Engineering Change "Significant?"

In order to ascertain whether an Engineering Change triggers the "Significance Test" described in the Common Safety Method for Risk Evaluation and Assessment, the proposer needs to consider specified aspects of the proposed Engineering Change (PEC).

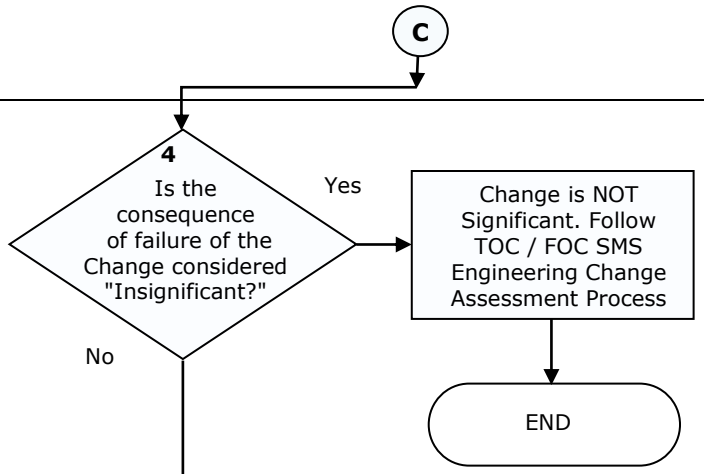
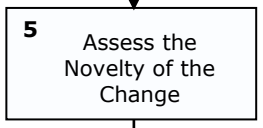
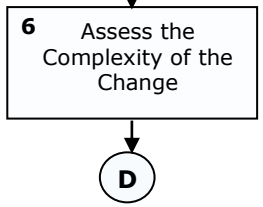
What follows is based on ORR published guidance and consists of a flowchart supported with additional commentary.

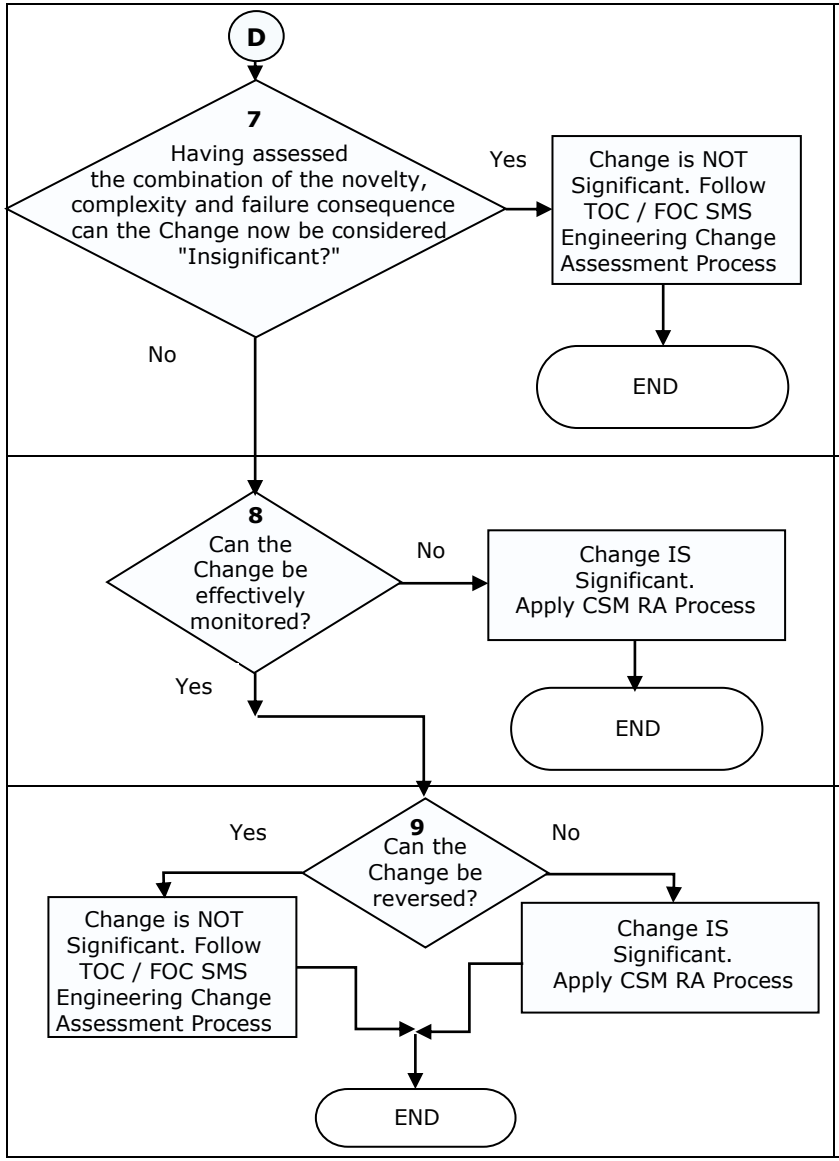


1. A Change within the scope of "Engineering Change" is proposed.

2. **Safety Impact:** If it is determined that the PEC has no impact on safety, there is no need to apply the rest of the six CSM-RA criteria. TOC/FOC SMS Engineering Change Assessment Process to be followed. **Note: There remains a need to keep a record of how this decision was reached.**

3. **Additionality:** Other "relevant" Engineering Changes (including ongoing trials or experiments) to be combined with the PEC for consideration at this stage are those changes that have yet to be fully implemented and therefore not established as working successfully at the time of the PEC.

	3a. The Engineering Changes that have yet to be fully implemented are to be combined with the PEC. This amalgamated PEC (aPEC) is then to be considered by this CSM significance test as a whole. 4. **Failure Consequence:** Should the PEC / aPEC fail, what would be the consequences? It is suggested that the following guidelines could be used to answer this question: • Insignificant (unlikely single minor injury) • Low (multiple minor injuries and/or single major injury) • Medium (multiple major injuries and/or single fatality) • High (multiple fatalities and or multiple severe injuries) If the Failure Consequence is assessed as Insignificant there is no need to apply the remaining CSM-RA criteria. TOC/FOC SMS Engineering Change Assessment Process to be followed.
	5. **Novelty:** Is the PEC/aPEC novel to the GB rail industry or to your organisation? It is suggested that the following guidelines could be used to answer this question: • No: Not novel (similar designs of the PEC/aPEC exist within your organisation) • Potentially: Some Degree of Novelty (Some aspects of the PEC/aPEC are novel to your organisation) • Yes: High Degree of Novelty (The PEC/aPEC is completely new to your organisation)
	6. **Complexity:** Is the PEC/aPEC complex? It is suggested that the following guidelines could be used to answer this question: • No: Not complex • Potentially: Some Degree of Complexity • Yes: High Degree of Complexity



7. **Holistic Review of Consequence, Novelty and Complexity:** Considering the Consequence, Novelty and Complexity of the PEC/aPEC - is it Significant? This review could be undertaken by answering the following supplementary question:

Is the outcome of the assessment that there is little novelty or complexity associated with the PEC/aPEC and that the Consequences of failure of the PEC/aPEC are Low?

- If Yes: The PEC/aPEC can be assessed as insignificant and there is no need to apply the remaining CSM-RA criteria. TOC/FOC SMS Engineering Change Assessment Process to be followed.
- If No: Further considerations in terms of monitoring and reversibility are necessary to be included in the assessment of the PEC/aPEC.

8. **Monitoring:** Can the PEC/aPEC be effectively monitored?
This assessment could be undertaken by answering the following supplementary question:

Is it possible to introduce a system of monitoring that enables effective intervention to prevent or mitigate any hazards arising from the PEC/aPEC?

- If Yes: Further considerations in relation to reversibility are necessary
- If No: The PEC/aPEC is assessed as SIGNIFICANT and there is a need to apply the CSM-RA process

9. **Reversibility:** Can the PEC/aPEC be reversed?
This assessment could be undertaken by answering the following supplementary question:

Is it possible to revert to the system that existed before the PEC/aPEC was implemented?

- If Yes: The PEC/aPEC can be assessed as insignificant and there is no need to apply the remaining CSM-RA criteria. TOC/FOC SMS Engineering Change Assessment Process to be followed.
- If No: The PEC/aPEC is assessed as SIGNIFICANT and there is a need to apply the CSM-RA process.

Appendix C – Template Process Form and Log

Note: boxes to be expanded as necessary to contain required information

ATOC/ACOP/EC/01006 – Approved Code of Practice

Management of Rail Vehicle Engineering Change - Process Form and Log

Title

Reference number (unique identifier and version control)

SECTION 1: Engineering Change Details

1. Type(s) and class(es) of rolling stock and fleet details (including part fleet(s)) affected

2. Existing document number (if applicable) (e.g. VMI, VOI, Drawing etc)

3. Description of proposed change

4. Reason for change (obsolescence, NIR, reliability, maintenance periodicity etc)

5. Benefit of change (financial, safety, quality etc – quantitative where possible, otherwise qualitative)

6. Cost of change (Including consultancy, implementation and documentation costs etc)

7. Applicable Verification process (refer to stage 3 of Engineering Change Process):

- ☐ Authorisation
- ☐ CSM-RA
- ☐ TOC/FOC SMS

Verification requirements (Approvals Plan):

8. Proposed funding and/or financing arrangements, to cover all aspects of the change including completion

9. Proposed implementation arrangements (including any staging, pre-rollout testing, fleet trials etc)

10. Completion Plan arrangements (necessary actions, updating records etc)

SECTION 2: Outline Programme Target Dates (See Section 7 for explanation of the stages below)

Flow Chart Step/stage		Target Date	Comments
2	Accept change in principle		
4	Agreement to Approvals Plan		
6	Go/No-go		
9	Agree final Engineering Change		
10	Issue of Approval Certification (where relevant)		
11	Launch Implementation		
12	Close out Completion Plan		

SECTION 3: Record of Stakeholders and Persons Involved

	Company/ Organisation	Responsible Engineer	Direct phone	Mobile	Email
Champion					
TOCs / FOCs					
Vehicle Owners					
Supplier(s)					
Technical Authority					

	Company/ Organisation	Responsible Engineer	Direct phone	Mobile	Email
Approvers? Third Party Approver(s)					
Funder(s)					
Others (define relevant interest)					

SECTION 4: Progress Log

Stage (see Flowchart)	Date Achieved	Proceed Y/N* Stages 2/6/9	Responsible Engineer	Comments / References to other documents
1 Propose change, technical details and funding arrangements				
2 Accept change in principle				
3 Determine verification and approval requirements and identify approvals bodies. Assemble Approvals Plan				

Stage (see Flowchart)	Date Achieved	Proceed Y/N* Stages 2/6/9	Responsible Engineer	Comments / References to other documents
4 Obtain agreement for Approvals Plan and any revision to the technical and commercial arrangements				
5 Finalise fully, the change, technical details and funding arrangements				
6 Go/No-go*				
7 Engineer the change and implement agreed verification process				
8 Check configuration and interchangeability implications and dependent modifications				
9 Review and accept engineering change				

* If no, state reason and inform Responsible Engineers

Stage (see Flowchart)	Date Achieved	Proceed Y/N* Stages 2/6/9	Responsible Engineer	Comments / References to other documents
10 Issue approval certification (where relevant)				
11 Launch implementation				
12 Close out Completion Plan				
13 Review the effectiveness of the Engineering Change**				

** If the Engineering Change is not successful, give reason and advise Responsible Engineers

Appendix D – Completion Plan Checklist

Checklist of issues to consider for each Engineering Change

Commercial

- Lease and rental changes agreed between TOC/FOCs and RoSCos
- Redelivery conditions
- Insurers
- Changes to spares holding
- Changes to maintenance contracts (e.g. variation to fit, action to monitor condition, variation to prevent removal)
- Contract variations to supply chain (operator, heavy maintainer, spares manager)

Approvals

- NoBo (if change is a major upgrade)
- Engineering Certification
- TOC / FOC / RoSCo (if not their change)
- Compatibility (GE/RT8270)
- ArBo (if CSM-RA applies)
- Network Change
- Railway Heritage Trust for designated items
- Technically competent specialist authorities (e.g. fire, pressure vessels, EMC)
- Design Authority
- Maintainer / TSP (Train Service Provider)

Performance and Assurance

- Critical success factors
- Trial fit required?
- Monitoring of the performance of the change
- Verify reliability, availability and maintainability requirements
- Further risk assessment
- Occupational Health and Safety Issues e.g. COSHH
- Carrying out the work
- Impact on manufacturing
- Supplier assessed and approved?
- Impact on maintenance plan / depot

Design and documentation - updating the records

- Modification instruction (including testing)
- Design calculations
- Document and drawing tree reviewed to identify changes needed
- Documents, drawings and tree updated
- Vehicle Maintenance Instruction (VMI)
- Vehicle Overhaul Instruction (VOI)
- Component Overhaul Instruction (COI)
- Illustrated List of Parts (ILOP)

- Operating manuals
- Prep and disposal instructions
- Diagram book (Length, wheelbase, etc)
- Weight distribution
- Gauging Portfolio
- Route Availability, maximum speed etc
- ESCROW (see GE/GN8607: Guidance on the Use of Escrow Agreements for Rail Applications)
- Access to software source codes
- OEM / Component Design Authority approval
- Parts system (PADS) - new catalogue numbers, notes on obsolescence and applicability, cross-references to drawings and specs. Parent/child relationships.
- Impact on other users of common components
- RCM (Reliability Centred Maintenance) database update
- Rolling Stock Library (RSL), National Vehicle Register and ERATV – others?
- Records of work done
- Interoperability records i.e. Technical File, including Declaration of Conformity (from NoBo), authorisation (from ORR), relevant TSIs and Notified National Technical Rules
- Update asset registers – e.g. RAVERS, R2

Execution

- Agreement on Timescale to implement Change
- Implementation procedure / work instruction
- Other applicable procedures (e.g. document change)
- Commissioning and testing procedure
- Will it be fitted for only a finite period – in which case arrangements for removal
- Record configuration changes (whole mod; vehicles; components)
- Software configuration management (loading, spares, identification)
- Special tools and equipment
- Spares provision / impact on spares floats (and modification thereof)
- Staff training and Competence Assessment
- Operational procedures / train crew instructions etc
- Audit plan of implementation
- Third party versus in-house labour and resources
- Warranty arrangements on work done and components fitted