



Product Acceptance Service

Guidance Note

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1 Purpose

The purpose of this document is to provide clear guidance on the management of the Product Acceptance service, practices to be followed, authorities and policy.

The document is to support the successful delivery of a professional, effective, and transparent Product Acceptance service.

Systems, sub-systems, modules, components, and equipment will be collectively referred to as 'Products' throughout this document.

2 Terms and definitions

Term	Definition
Controlled Items	Safety critical Items for use on NR Operational Infrastructure that require catalogue numbers for which Network Rail Engineering asserts control. For any items falling into this category, it is mandatory that the product acceptance process is followed as explained in NR/L2/RSE/100/05 and this document.
Controlled "Limited Criticality" Items	Items that may be approved without further assessment on the basis that they are of low safety criticality and are proven to meet national standards (BSI's etc). These may be COTS products that are not going to be used in a way that differs from their originally intended use. These items require controlled catalogue numbers and may require entry into the product acceptance process and certification if the asset owning function determines the need (i.e. for setting conditions of use in operational infrastructure environments).
CSM	Common Safety Method on Risk Evaluation and Assessment
DFR	Design For Reliability
Hazard Record	The document in which identified hazards, their related measures, their origin and the reference to the organisation which has to manage them are recorded and referenced;
NRT	Network Rail Telecoms (engineering discipline)
NRAP	Network Rail Assurance Panel
IRIS	International Rail Industry Standard
ISO	International Organisation for Standardisation
istore	Network Rail's online procurement site for the searching and ordering of "controlled or uncontrolled" products. <i>Note: This site is available to Network Rail employees only.</i>
Operational	Any product / plant / equipment or system used to directly control, monitor, support and power the railway. In case of uncertainty the Product Acceptance team or relevant TA or NRT Engineering function can be consulted.
PADS	Parts and Drawings System. A database owned by SERCO. The data is managed by Network Rail Catalogue Management Team (NSC). This includes the creation and revision of controlled catalogue (PADS) numbers.
RGS	Railway Group Standard
RIDC	Rail Innovation and Development Centre
RIRL	Rail Industry Readiness Level
RRL	Reliability Readiness Level
SRP	System Review Panel
TA	Technical Authority (Network Rail)
TSI	Technical Specification for Interoperability
TRL	Technology Readiness Level
Uncontrolled Items	Items for which Network Rail Engineering asserts no control. Products in this category are low risk items that do not require acceptance. The issuing of uncontrolled numbers is managed by the Network Rail Catalogue Management Team within Route Services. <i>Note: numbers are applied for by NR employees via the istore site.</i>

3 Scope

This guidance document provides information relating to gaining acceptance of Critical Products that are:

- a) a new or modified controlled product that, where relevant aligns with the Network Rail challenge statements, that have been evaluated against the Rail Industry Readiness Levels (RIRL's) where;
 - technology readiness level (TRL) 6 is completed
 - Reliability Readiness Levels (RRL) 7 is completed as outlined in Design for Reliability (DFR) standard NR/L2/RSE/0005.
- b) a change of application of a controlled product *;
- c) a change of manufacturer of a controlled product *;
- d) a change of operational environment for a controlled product *;
- e) a compatibility issue for Network Rail's infrastructure potentially caused by installation of a product not owned by Network Rail on the infrastructure.

have reached the appropriate readiness levels are assessed for Product Acceptance via the methods described in the Network Rail standards NR/L2/RSE/100/05 and/ or NR/L2/RSE/100/07 and DFR standard NR/L2/RSE/0005 if required**.

Product Acceptance **does not** apply to the following which are outside of the Process scope:

1. civil engineering infrastructure, as defined in NR/L2/CIV/003, which includes:
 - a. structures (including equipment and support structures);
 - b. buildings and other civil engineering infrastructure that have been designed for a unique application;
2. non Network Rail owned trains and rolling stock;
3. depots, sidings and other facilities off the operational infrastructure.

NOTE Network Rail equipment or products that are mounted on, or installed in, railway vehicles that Network Rail intends to use for its own purposes are included in the scope of this process.

** NOTE 2 All changes to products must be applied for as Change Requests (changes to already approved products) via the online application form. Typical changes include but are not limited to the following:*

- Changes or additions to the physical product.
- Changes to how products are used if not covered by the scope of existing certification.
- Changes to where products are used if not covered by the scope of existing certification
- Any other changes that would require and change to a certificates scope, conditions, configuration details etc
- Extensions to certification that has expired.
- Extensions to trials that require new certification.

NOTE 3 Changes relating to transfer of manufacture, manufacturer location and name changes are covered in 13.4 and 13.5 of this document and clause 12.2 of the NR Standard NR/L2/RSE/100/05.

***NOTE 4 DFR is a separate process to PA but is managed in parallel to PA as per the RIRL's. This process is not managed by the PA team, however, the requirement is reviewed at the point of PA application and DFR is required to have been completed prior to the issue of PA certification.*

Information on the types of products deemed critical and requiring approval, which are based on their risk to the business and currently defined in our guidance document: <https://cdn.networkrail.co.uk/wp-content/uploads/2019/03/product-acceptance-guidance-note-how-to-decide.pdf>

Please note that this list is not exhaustive.

Products identified as "controlled" requiring Product Acceptance are assessed via NR/L2/RSE100/05, this guidance note supports the management of the process.

For further guidance please email us at prodacc@networkrail.co.uk

4 Management

The Network Rail Technical Authority is responsible for the management of the service.

Roles and responsibilities

Role	Responsibilities
Applicant (Sponsor)	A suitable Network Rail employee (usually Project or Route Asset Manager) who acts in a sponsorship capacity and demonstrates the business need for the product or change. The Applicant is accountable for the submission of the initial product application, liaising with and requesting evidence from manufacturers against the generic and technical requirements and liaison with Route / Infrastructure Projects to arrange any operational trials required.
Route Services Catalogue Management Team	Responsible for the allocation of catalogue numbers and the entry and management of approved product details into the PADS (Parts and Drawings System) database and Network Rail catalogue (istore).
Route Services Category Manager	Responsible on behalf of the Category council to review the PA submission in terms of product and supplier alignment with the appropriate category strategy.
Duty Holder	Responsible for carrying out a particular duty under the applicable regulations.
TA/ NRT Lead Reviewer	A competent Network Rail or independent engineer from within TA or Network Rail Telecoms (NRT) with delegated authority from the Professional Head of Asset discipline for setting the approval requirements, assessing submitted evidence, and recommending acceptance of the product.
Product Acceptance Process Specialist	Delegated authority from NRAP to manage the acceptance process for applications. Liaises with Applicants, engineers and Head of Asset discipline. Responsible for tracking and reporting the acceptance performance.
Product Development Panel	Responsible for reviewing evidence from projects/proposals and agreeing RIRL/TRL levels and the associated stage gate actions with projects. Reviews the project investment paper (if applicable at relevant stage gate) and provides recommendations to the R&T Board for endorsement.
Professional Head of Asset discipline	Delegated authority from NRAP to authorise and sign off the approval of products to be used in or on Network Rail infrastructure.
Route / Infrastructure Projects	Responsible for making infrastructure available for 'trials'.
System Review Panel	Delegated authority from NRAP to set and assess requirements for multi-discipline applications.
Supplier Quality Assurance	Responsible for identification of appropriate assurance controls to the products.

Resources

The resources allocated to the service shall be agreed within the relevant STE Engineering discipline.

STE will offer a service* to applicants seeking to gain approval for the use of a Product on or about Network Rail's infrastructure.

**provision of service is dependent on the applications meeting the requirements of initial reviews and commercial category/ engineering strategy checks. Applications will be rejected if they do not include sufficient detail including a robust business case, are not applied for by or on behalf of a suitable Network Rail individual prepared to act in a sponsorship capacity or are not at the required minimum Rail Industry Readiness Level (RIRL).*

5 Process



Application phase

The following table provides an overview of the main stages, tasks and responsibilities associated with the application and initial review stages of the Product Acceptance process.

Ref	Stage	Who	Tasks
1.1	Application	NR Applicant (Sponsor)	<ul style="list-style-type: none"> Submits application via online application form* https://www.networkrail.co.uk/industry-and-commercial/research-development-and-technology/product-acceptance/product-acceptance-form/ <p><i>*Also submits evidence via the form to demonstrate that the requirements of TRL6 and RRL7 of the RIRL's have been completed (usually at completion of RIRL5).</i></p>
1.2	Initial review	Product Acceptance Process Specialist	<ul style="list-style-type: none"> Determines if the Product or change requires approval* Determines if the Product or change is critical* Determines or seek clarification that the Product or change is at the required Rail Industry Readiness (RIRL) Level* Determines the lead and any affected asset groups. Determines if review by SRP is required* Progresses the application for Category Management, Engineering and SQA review. Issues any relevant initial Generic Acceptance Requirements to NR Applicant (Sponsor)** <p><i>* Seeks clarification from the Professional Head or Delegate, Lead Reviewer or SRP as required.</i> <i>** List of generic non- product specific technical requirements applicable to all applications i.e. general arrangement drawings, configuration lists, CE marking details, user manuals etc.</i></p>
1.3	Category Management Review	Category Manager (NSC)	a) Determines via Category Management check, the business need and whether the Product is in line with any applicable policy or strategy.
1.4	Initial Engineering Review	Professional Head of Asset Discipline or delegate or SRP.	b) Determines whether the Product or change is in line with any applicable policy; or strategy within that discipline. c) Determines the criticality level of the product or change. d) Determines if the Product is an Interoperability constituent. e) Allocates the Lead Reviewer.
1.5	Supplier Quality Assurance Review	Supplier Quality Assurance	f) Determines whether a new manufacturer requires an SQA Audit.
1.6	Design For Reliability (DFR) Review	Professional Head of Asset Discipline or delegate, Design For Reliability Process manager or SRP.	g) Determines whether a Design For Reliability assessment is required against the requirements of NR standard NR/L2/RSE/0005. h) Determines the DFR Process route as per the requirements of NR standard NR/L2/RSE/0005

Assessment phase

The following table provides an overview of the main stages, tasks and responsibilities associated with the assessment stages of the Product Acceptance process.

Ref	Stage	Who	Tasks
2.1	Initiate assessment	Product Acceptance Process Specialist	<ul style="list-style-type: none"> Provides application details and any initially supplied evidence to the TA/ NRT Lead Reviewer. Requests that the TA/ NRT Lead Reviewer sets the product specific engineering requirements. Requests that Supplier Quality Assurance activities be carried out if required. Requests that Design For Reliability activities be carried out if required Notifies Professional Development & Training of the new Product.
2.2	Set requirements	TA or NRT Lead Reviewer	<ul style="list-style-type: none"> Reviews the information provided. Specifies product specific engineering requirements for approval. Specifies the Design For Reliability route if required. Provide requirements to NR Applicant (Sponsor). <p><i>(Affected Asset Groups shall also assign a Reviewer to set any approval requirements)</i></p>
2.3	Submission	NR Applicant (Sponsor)	<ul style="list-style-type: none"> i) Liases with Manufacturer/s / Supplier/s to coordinate/ obtain evidence against generic and specific engineering requirements and any relevant Design for Reliability requirements. j) Produces a submission of evidence to demonstrate compliance against the generic and specific engineering requirements set and any relevant Design for Reliability requirements.
2.4	Assessment	TA or NRT Lead Reviewer	<ul style="list-style-type: none"> k) Review the submission for completeness. l) Assesses the submission of evidence against all set requirements (Product Acceptance and DFR). <p><i>(Affected Asset Groups also assess the submission)</i></p>
2.5	Approval	TA or NRT Lead Reviewer	<ul style="list-style-type: none"> m) Decides whether approval is to be granted or declined n) Requests catalogue numbers from NSC Catalogue Management for items within the configuration deemed "controlled". o) Drafts appropriate Approval Certification or provides advice on rejection.
3.7	Final review	Product Acceptance Process Specialist	<ul style="list-style-type: none"> p) Reviews certification for completeness. q) Updates database records r) Obtains endorsement from Professional Head of Asset Discipline or delegate or SRP.
2.6	Professional Head approval	Professional Head of Asset Discipline or delegate or SRP.	<ul style="list-style-type: none"> Authorises/ endorses and "signs off" approval.
2.7	Delivery	Product Acceptance Process Specialist	<ul style="list-style-type: none"> s) Issues approval certification (for trial or full approval) or rejection advice to the Customer. t) Updates database records.

Operational trial phase

A trial may be required to assist in the assessment of a product or system's suitability, fitness for purpose, reliability, performance and to assist in the mitigation of safety risk.

Applicants shall first consider conducting trials on non-operational infrastructure or within a simulated environment. Trials on the operational infrastructure shall only be considered if demonstrable evidence cannot be obtained from testing or trialling within a simulated or non-operational environment. The Professional Head of Asset discipline or delegate or the System Review Panel shall decide whether operational trials are required.

No trial shall be carried out on Network Rail infrastructure until the relevant trial acceptance certificate has been issued. Items cannot be used and should be removed from the infrastructure after the expiry date of a certificate has passed.

NOTE 1 The Lead Reviewer may recommend an operational trial to the Professional Head of Asset discipline following the review. Trials are not a substitute for the documented justification against the acceptance requirements.

NOTE 2 Trials may be limited to a small number of locations, specific Projects or for a limited number of products.

NOTE 3 The NR applicant (sponsor) shall arrange for all equipment that is unsuccessful in the trial, or is no longer required after the trial to be removed from the infrastructure.

NOTE 4 If an NR Applicant (sponsor) moves roles and/ or can no longer support a live Product Acceptance trial, the responsibility shall be handed over to a suitable replacement and this shall be advised to the Product Acceptance team in the first instance..

The following table provides an overview of the main stages, tasks and responsibilities associated with the assessment stages of the Product Acceptance process.

Ref	Stage	Who	Tasks
3.1	Authorisation	Professional Head or delegate or SRP.	u) Authorises Trial.
3.2	Trial requirements	TA or NRT Lead Reviewer	<ul style="list-style-type: none">Specify requirements and success criteria for the trial.Draft Trial Certification
3.3	Endorsement	Professional Head of Asset Discipline or delegate or SRP.	<ul style="list-style-type: none">Endorses Trial Certification.
3.4	Trial Arrangement	NR Applicant (sponsor)	<ul style="list-style-type: none">Arrange trial with Project/ Route.
3.5	Trial	Route/ Project	<ul style="list-style-type: none">Undertake trial in operational service.
3.4	Trial report	NR Applicant (sponsor)/ Route/ Project	v) Route/Applicant/Project to produce a trial report providing evidence that the trial requirements have been met.
3.5	Assess trial report	TA or NRT Lead Reviewer	w) Lead reviewer assess' the trial report and if satisfied recommends approval.
3.6	Approval	TA or NRT Lead Reviewer	x) Decides whether approval is to be granted or declined. y) Drafts appropriate Approval Certification or provides advice on rejection.
3.7	Final review	Product Acceptance Process Specialist	z) Reviews certification for completeness. aa) Updates database records bb) Obtains endorsement from Professional Head of Asset Discipline or delegate or SRP.
3.8	Professional Head approval	Professional Head or delegate or SRP.	cc) Authorises and "signs off" approval.
3.9	Delivery	Product Acceptance Process Specialist	dd) Issues approval certification (for trial or full approval) or rejection advice to the Customer and updates PA System.

Product Acceptance Certification


All controlled products require a valid Product Acceptance certificate prior to their use or installation on Network Rail Infrastructure. Certificates are issued after the assessment and trial phases detailed in pages 8 & 9.

Authority to undertake an operational trial is granted by the provision of a Trial or Pilot certificate. Trial and Pilot certification is normally limited to specific geographic locations, individual projects and to the number of items allowed to be tested or installed. Details of the trial/ pilot scope, conditions and limitations are detailed within the certification

Certification is granted for a new or changed product (including additions to items within the configuration) after a full technical review has successfully been completed, against criteria required within technical standards and/ or specifications. The certification includes the following information as a minimum:

1. The Products unique Product Acceptance PA05/ reference number
2. the product description and configuration details .
3. the scope of authority for acceptance of the product, including specific application;
4. specific conditions governing the use or installation of the product;
5. where appropriate, if a product is or is not accepted for use in accordance with the UK Interoperability Regulations
6. expiry dates or monitoring periods (normally for trials);
7. details of the assessed documents;
8. previous certificate history;
9. the scope of acceptance;
10. Lead Reviewer and Applicant names.

If a change to 2 to 9 above is required, a change request application needs to be submitted by or on behalf of the Network Rail Applicant (Sponsor). Expired certification invalidates the approval of a product.



Certificate of Acceptance	
PA05/XXXXX	
Manufacturer: <Insert manufacturer name>	Issue : X (T if Trial) Valid From : dd-mm-yyyy Monitoring Period <or Review Date>: X Months / dd-mm-yyyy
<Product Name>	
Product Description <Insert brief description of Product/System>	Product Image <Insert product image here>
Scope of Acceptance Full Acceptance / Trial Acceptance (delete as appropriate) <Insert summary scope of Acceptance>	
Network Rail Acceptance Panel (NRAP) hereby authorises the product above for use and trial use on railway infrastructure for which Network Rail is the Infrastructure Manager under the ROGS regulations. Authorised by: Name Job Title (Product Acceptance)	
Name Professional Head	

It is the responsibility of each company or individual identified in the acceptance certificate to comply with the conditions of acceptance. It is the responsibility of anyone using the product on Network Rail infrastructure to comply with the acceptance certificate.

No controlled products shall be commissioned into use on Network Rail infrastructure until the acceptance certificate to cover their use has been issued. Products shall not normally be purchased until a full certificate of acceptance has been issued, this ensures that products are not being purchased until they have been approved having undergone a full technical review.

6 Review by System Review Panel

The approval of infrastructure schemes or high risk systems, products and complicated multi-disciplinary new and novel system or product applications are dealt with in accordance with Network Rail Standard NR/L2/RSE/100/07. This standard is owned by the Network Rail Assurance Panel (NRAP). For most infrastructure schemes and systems requiring assessment, NRAP delegates this to System Review Panels (SRP).

If at initial stages it is agreed that an SRP review by panel is required, the approval process described in NR/L2/RSE/100/07 is to be followed with a NRAP authorised person appointed as Chairperson of the panel, with panel membership as detailed below.

In order to reach a conclusion, the Chairperson shall seek to achieve a consensus of members present at the meeting.

If a consensus cannot be achieved, the final decision shall be taken by the Chairperson.

The Chairperson of each panel is accountable to NRAP.

In addition to panel members, additional expert advice on specific issues may be called upon.

For further guidance relating to System Review Panels, please email us at prodacc@networkrail.co.uk

System Review Panel constitution

Membership

Membership of each generic system or product System Review Panel shall comprise:

- a) Chair;
- b) Professional Heads or Heads of Asset Disciplines/Specialists as required for the system under consideration;
- c) Secretary.

Membership of each route or programme System Review Panel shall comprise:

- a) Chair;
- b) Route Asset Managers;
- c) Additional expertise as required for the system under consideration;
- d) Secretary.

The SRP may invite observers to panel meetings.

NOTE: Recommended observers include representatives from Infrastructure Projects or the Safety Authority.

Observers shall be noted in the minutes and shall not have a deciding vote over items considered by the panel.

The Chair of each System Review Panel is accountable to Network Rail Assurance Panel.

7 Examples of items that require approval

The following list provides examples of the categories products and types of items that typically require Product Approval, please note that this list is not exhaustive and advice may be required to determine whether your product requires approval. The guidance document <https://cdn.networkrail.co.uk/wp-content/uploads/2019/03/product-acceptance-guidance-note-how-to-decide.pdf> should be reviewed for further detail and the PA team contacted (prodacc@networkrail.co.uk) to seek clarification if the item is either not listed or is a new innovation.

NOTE: A number of regularly applied for products such as boundary fencing, PPE, operational site lighting and civils materials such as coatings and concretes are deemed as uncontrolled items that either do not require PA or need to be assessed via NR Civils design processes/ standards. See the above link for more examples.

Signalling Applications

- Signals (mechanical, filament and LED colour light).
- Control Systems (lever frame, panel, VDU, ground frames/ panels)
- Interlockings (mechanical, relay, electronic, disconnection boxes)
- Apparatus Housing (location cases, equipment buildings.
- Train Detection (track circuit, axle counters, treadles)
- Point End (mechanical, clamp lock, machine, HPSS)
- Train Protection (AWS, TPWS, ATP)
- Train Describers (mechanical, electronic)
- Signalling Power Supplies (transformers, UPS, battery, power cables)
- Infrastructure Specific Relays/ Boxes (large plug in, BR930, sub-miniature cradle, shelf type, DCPI)
- Event Logging and Condition Monitoring Systems.
- Line side Signage to Support Signalling (operational and non-operational signage).

Level Crossing Applications

- Control Systems (manually controlled, automatically controlled, passive/ user worked)
- Barriers (manually controlled barriers, automatic barriers)
- Signalling and Communication (road traffic lights, pedestrian warning lights, audible warnings, crossing CCTV cameras, telephones, panel indicators, panel monitors)
- Track Bed (surface, deck, track, drainage, road markings, crossing trespass guards, fencing, rail signage, crossing signage, gates and stiles, vegetation management, CCTV lifting equipment, lighting, electrical supplies)

Electrification & Power Applications

- HV Switchgear AC (oil filled, vacuum, SMOS, air, .vacuum GIS).
- HV Cables (solid/ XLPE, oil filled/ paper).
- Contact Systems (OLE and components, CRE and components)
- HV Transformers (standard, auto, booster)
- DC Electrification (oil filled, vacuum, vacuum GIS, transformers/ rectifiers, LV cables)
- Electrical points and Conductor Rail Heating (systems and components, cabling)
- Tools and equipment (live line, non live line)
- Power Supplies (systems, cables, switchgear and transformers, power generation).
- Miscellaneous (electrical equipment enclosures, monitoring and control).

Telecommunications Applications

- Transmission System (transport layers optical and copper, LAN/WAN node/ data network)
- Network Management (hardware, software)
- Trunk Cabling (copper, fibre, immunisation, cable routes)
- Operational Voice Comms (concentrators, public emergency telephone systems, voice recorders, operator MMI, CSR/RETB/NRN/ORN, radio spot scheme, BSS, NSS, cab mobile, GSM-R handheld, FTS, tunnel and lineside telephone systems)
- Sub-surface Station Management Control (customer information system, public address, surveillance CCTV)
- Train Dispatch (DOO CCTV, DOO mirror)
- Power Supply (power supply chargers, earthing, UPS, rectifier, inverter, battery)

Plant Applications

- On Track Plant OTP (MEWPS, RRV, rail lifters, sleeper layers, mobile flashbutt welders, rail clippers, powered trolleys, access platforms, excavation machines, track access systems, grinders, cranes, rollers, dozers, multipurpose vehicles)
- On Track Machines OTM (tamperers, rail cutting machines, ballast cleaners, tilting wagons, multipurpose vehicles)
- Manually Propelled Powered Equipment (rail clippers/ clip removers, track jacks, rail grinders, rail stressing equipment, rail straighteners/ benders, welding machines, rail head cleaners, sleeper replacers, rail thimbles)
- Manually Propelled non Powered Equipment (hand trolleys, rail skates)
- Non Rail Mounted Plant or Machinery (chippers, dozers, cranes, scaffold, mowers, lifting beams)
- Tools and Equipment (rail saws, track measuring devices TMD's, detection systems. Cable locators, total stations, rail stressing equipment, testing and diagnostic equipment, data loggers and condition monitoring equipment, generators, train/ track warning systems, grinders, communication systems)
- Non Powered Tools and Equipment (lifting accessories, tension meters, insulated hand tools)

Track Applications

- Plain Line (rail, sleepers, ballast, formation)
- Drainage (drainage, formation)
- Monitoring Systems (temperature, inspection)
- Tools (gauges)
- Welding (track welding processes, welding peripherals)
- Miscellaneous (lubricants, grease distribution units)

S&C (Switches & Crossings) Applications

- S&C (rail, bearers, crossings, half sets sleepers, ballast, formation)
- Drainage (drainage, formation)
- Monitoring Systems (temperature, inspection)
- Tools (gauges)
- Welding (track welding processes, welding peripherals)
- Miscellaneous (lubricants, grease distribution units)

8 Rail Industry Readiness Levels (RIRL's)

Applications should only be submitted for Product Acceptance when the Products or Systems have been fully developed and have reached RIRL 6 having completed RIRL5 (upto TRL7 & RRL8 below, MRL/ IRL etc do not apply for PA).

Rail Industry Readiness Levels: Reference Alignment									
A level can only be claimed once <u>COMPLETED</u>									
Version 1.6									
	RIRL 1 Conception	RIRL 2 Opportunity Develop't	RIRL 3 Proof of Concept	RIRL 4 Industry Specification	RIRL 5 Prototype	RIRL 6 Operational Transition	RIRL 7 Initial Deployment	RIRL 8 Roll Out	RIRL 9 Whole Life Mgmt
Technology Readiness	TRL 1 Idea Technology idea is conceived and developed using desktop and laboratory research	TRL 2 Invention Experimentation and desktop modelling used to verify veracity of technology in line with anticipated usage	TRL 3 Proof of Concept Proof of concept is ascertained using robust and repeatable processes TRL 4 Development Technology is validated against high level requirements in a laboratory and/or experimental environment	TRL 5 Validation Technology is validated against user requirements in a representative environment	TRL 6 Demonstration Performance of pre-production assets / system is demonstrated in an oper'y representative environment	TRL 7 Qualification Production standard assets are qualified for use in an operational environment	TRL 8 1st of Class First of Class asset deployed for operational usage under commercial conditions	TRL 9 Production Repeated and repeatable technology deployment in conjunction with managed asset development / evolution	Ongoing Continuous Improvement & Reliability Growth
Manufacturing Readiness		MRL 1 Basic Principles Basic Manufacturing Implications have been identified	MRL 2 Concepts and Feasibility Manufacturing concepts and feasibility have been detm'd and processes have been id'd MRL 3 Proof of Manufacturability A manufacturing proof-of-concept has been developed	MRL 4 Pre-Production Capability exists to produce the technology in a laboratory or prototype production environment	MRL 5 Component Production Capability exists to produce prototype components in a prod'n relevant environment	MRL 6 Production Integration Capability exists to produce integrated system or subsystem in a production relevant environment. MRL 7 Production Facility Capability exists to produce systems, subsystems or components in a production representative environment.	MRL 8 Low Rate Production Low rate initial production is underway	MRL 9 Full Rate Production Full/volume rate production capability has been demo'd	
Integration Readiness		IRL 1 Interface Interface requirements between component / system elements have been established IRL 2 Interaction Required mode and content of interaction between component / system elements has been established	IRL 3 Compatibility Quantitative interaction between component / system elements is demonstrable and repeatable IRL 4 Quality and Assurance Successful and repeatable interaction between component / system elements meets quality and assurance requirements	IRL 5 Control Action / reaction through the control chain is demonstrated and manageable within required operational parameters IRL 6 Communicate Performance and associated communication / stimulation within / by the operational environment delivers required functionality	IRL 7 Verification and Validation Performance in a represent'Ve operational environment is repeatable, verifiable and validated to req'd standards		IRL 8 1st Of Class Whole system deployed under commercial arrangements for operational usage IRL 9 Proven Repeated and successful low-risk deployment of integrated system for operational usage		
System Readiness		SRL 1 Thinking Mind picture supported by notes and discussions developed to share thinking SRL 2 Rich Picture Rich picture depicting system elements and interaction of those elements	SRL 3 Framework Architecture Structured depiction and robust definition of the system and its associated components	SRL 4 Interfaces Qualitative and evidential definition of intra and inter system interface requirements SRL 5 Detailed Architecture Robust system architecture and associated models able to explore evolving system properties	SRL 6 Integration Integration of system elements in an appropriate environment producing a functioning system for evaluation SRL 7 Pre-Production Qualified production standard system elements available for test, verification and validation		SRL 8 1st of Class First commercial deployment of whole system in an operational environment	SRL 9 Series Production Repeated and repeatable quality whole system deployment in expanding operational usage	
Software Readiness	SwRL 1 Basic Principles Basic principles described, software concepts researched and documented, appropriate languages reviewed	SwRL 2 Conception Approaches to deliver software derived functionality outlined and algorithm testing commenced	SwRL 3 Proof of Concept Quantitative and/or Qualitative analysis of software approach confirms proof of concept for critical functionality	SwRL 4 Laboratory Validation Software code and functionality validated in a laboratory environment	SwRL 5 Relevant Environment Validation Software code and functionality validated in a simulated / safe but realistic operational environment SwRL 6 Relevant Environment Demonstration Software code and functionality demonstrated in a simulated / safe but realistic operational environment	SwRL 7 Operational Environment Demonstration Software code and functionality demonstrated in a real operational environment (beta standard)	SwRL 8 Software Qualification Software code and functionality qualified and certified to appropriate operational standards (first release)	SwRL 9 Operational Software Software in operational service and under formal change management control	
Demand Readiness	DRL 1 Demand Identified Something is missing	DRL 2 Demand Verified Identification of a specific need DRL 3 Function Identified Identification of the expected functionalities for the product/new service	DRL 4 Function Tested Quantification of the expected functionalities DRL 5 Forecasted Usage Identification of the systemic capabilities	DRL 6 Specified Requirement Translation of the functionalities into needed capabilities	DRL 7 Product Resource Definition of the necessary sufficient competences and resources DRL 8 Expert Resource Identification of the Experts possessing the competencies		DRL 9 Market Penetration Building the adapted answer to the expressed need on the market		
Reliability Readiness	For RRL steps, refer to Network Rail Design for Reliability Standard – NR/L2/RSE/0005	RRL 1 Requirement Definition Completed all DFR process steps up to 8.1.9	RRL 2 Preliminary Design Completed all DFR process steps up to 8.2.6 RRL 3 Design Assessment Completed all DFR process steps up to 8.3.9 RRL 4 Installation & Commissioning Process Assessment Completed all DFR process steps up to 8.4.4 RRL 5 Manufacturing Process Assessment Completed all DFR process steps up to 8.5.9		RRL 6 Component (or sub-system) Testing Completed all DFR process steps up to 8.6.6 RRL 7 System Testing Completed all DFR process steps up to 8.7.6 RRL 8 Manufacturing Process Testing Completed all DFR process steps up to 8.8.8	RRL 9 Installation & Commissioning Validation Completed all DFR process steps up to 8.9.7 RRL 10 Trial Performance Validation Completed all DFR process steps up to 8.10.7		RRL 11 In Service Performance Validation Completed all DFR process steps up to 8.11.8	
Market Readiness	MrRL 1 Theoretical Opportunity Early ideas to satisfy an emerging or existing market need	MrRL 2 Route to Market (Initial) Ideas shared and route to exploitation; route to market outlined MrRL 3 Business Case (draft)		MrRL 4 Market Testing Informal market engagement and commercial structures implemented	MrRL 5 Route to Market Route to market planned and all stakeholder needs identified	MrRL 6 Commercial Arrangements Commercial, funding and exploitation arrangements formalised; work share agreed	MrRL 7 Market Engagement End user and supply chain stakeholders engaged to refine the market offering and to support demonstration	MrRL 8 Delivery Commercial delivery commenced, marketing translates to sales / selling	MrRL 9 Market Maintenance Sustained selling, with feedback used to develop offering evolution / development

9 Design For Reliability (DFR)

DFR is a structured procedure identifying minimum requirements for suppliers to demonstrate that they have designed reliability into new or changed controlled products and addressed potential reliability risks using documented outputs from proven tools. It was mandated from 3/4/2017 by the Network Rail Business Process NR/L2/RSE/0005, first issued in June 2016.

DFR was designed to address causes of unreliability, whilst also considering whole life cost. NR expect our suppliers to demonstrate the use of DFR tools when submitting items for *Product Acceptance (PA) and many supplier selection events and we put greater emphasis on sharing historic failure mechanisms with suppliers. When applied to product changes, it considers best methods to confirm that correct cause/s have been identified and addressed.

DFR adds a reliability element to the legal and safety elements of PA. Although DFR focuses on reliability, it also assists safety, as reliability products need less manual intervention and eliminate both safety and non-safety-related failures.

DFR is split into 11 Reliability Readiness Levels** with most being possible before a physical prototype is made. This is followed by testing away from the operational railway under conditions representing a thorough list of factors from the real world, with attention to interactions with other systems. The final activities, after PA, occur on the operational railway. DFR places increased early emphasis on installation processes, suitability of measurement devices and maintenance regimes during the design process, where it is cheaper and quicker to address potential risks. Clear evidence of how our requirements are prioritised to become design features, process parameters and ultimately process controls is also required.

Different paths through DFR are stated for new products, revised products, products designed prior to Network Rail involvement, supplier relocation, changing supplier, potential risk, low volumes and the extent of a change.

**NOTE DFR is a separate process to PA but is managed in parallel to PA as per the RIRL's. This process is not managed by the PA team, however, the requirement is reviewed at the point of PA application and DFR is required to have been completed prior to the issue of PA certification.*

***NOTE 2 See the RIRL matrix on the previous page. RRL's 1 – 8 are in the earlier stages of the Product Management Lifecycle, prior to PA, evidence of completion of these RRL's is requested after a PA application has been submitted.*

Why Was DFR Introduced

DFR is a proactive element of Structured Continuous Improvement, introduced because, although delay minutes had gradually improved since 2000/2001, they had plateaued, with a recent slight rise due to greater delay per incident.

As new products are introduced using DFR, we should see less repetition of past issues, easier processes for effective installation, less asset related train delay and lower whole life costs.

Further Guidance

The DFR business process applies to products seeking Product Acceptance (PA) that require engineering assessment from NR. It applies to existing and potential suppliers, and NR staff in departments including Engineering, Procurement, Supplier Quality Assurance (SQA), Reliability and Product Acceptance.

It applies to new and changed rail infrastructure products, systems, sub-systems, measurement equipment, materials, On-Track Machines and 'rail specific parts' of On-Track Plant to be 'purchased' by NR entering the PA process. It is also recommended for On-Track Plant entering the PA process, that may be 'hired' by NR. It also applies to products for use in new applications with changes in product requirements and existing products sourced from new suppliers. It also applies in a limited form when a supplier relocates their premises, or a product with an unchanged design to be manufactured by a new supplier.

DFR is not mandated for PA requests exclusively covering new software or software changes, as demonstrating reliability of software typically requires different approaches to physical products. It does however, apply to any new or changed hardware related to such software.

Accessing the DFR Business Process

External parties can access the Network Rail standards catalogue, containing the order form, by searching for “standards” at: <http://www.networkrail.co.uk>

An online database at: <http://uk.ihs.com/products/rail/index.htm>.

Can be subscribed to by calling IHS on 01344 328300 for login details, or to order “NR/L2/RSE/0005”, “Product Design for Reliability”.

SAI Global is a new digital format available for hand-held devices at:
<http://www.i2isolutions.net/networkrailproducts>.

Call SAI Global for details on 01344 636314.

How to Demonstrate Application of DFR when Applying for PA

A Standard DFR evidence template available from DFR@networkrail.co.uk should be used to submit reliability evidence when applying for Product Acceptance. This contains sample evidence for an example product.

Finding out More

Suppliers and NR staff can apply to DFR@networkrail.co.uk for 3-day DFR training. If you have a NR applicant prepared to act in a sponsorship capacity who can demonstrate a NR business need for the product/change, you can discover:

The required path through DFR

The PA Lead Reviewer and engineering contact

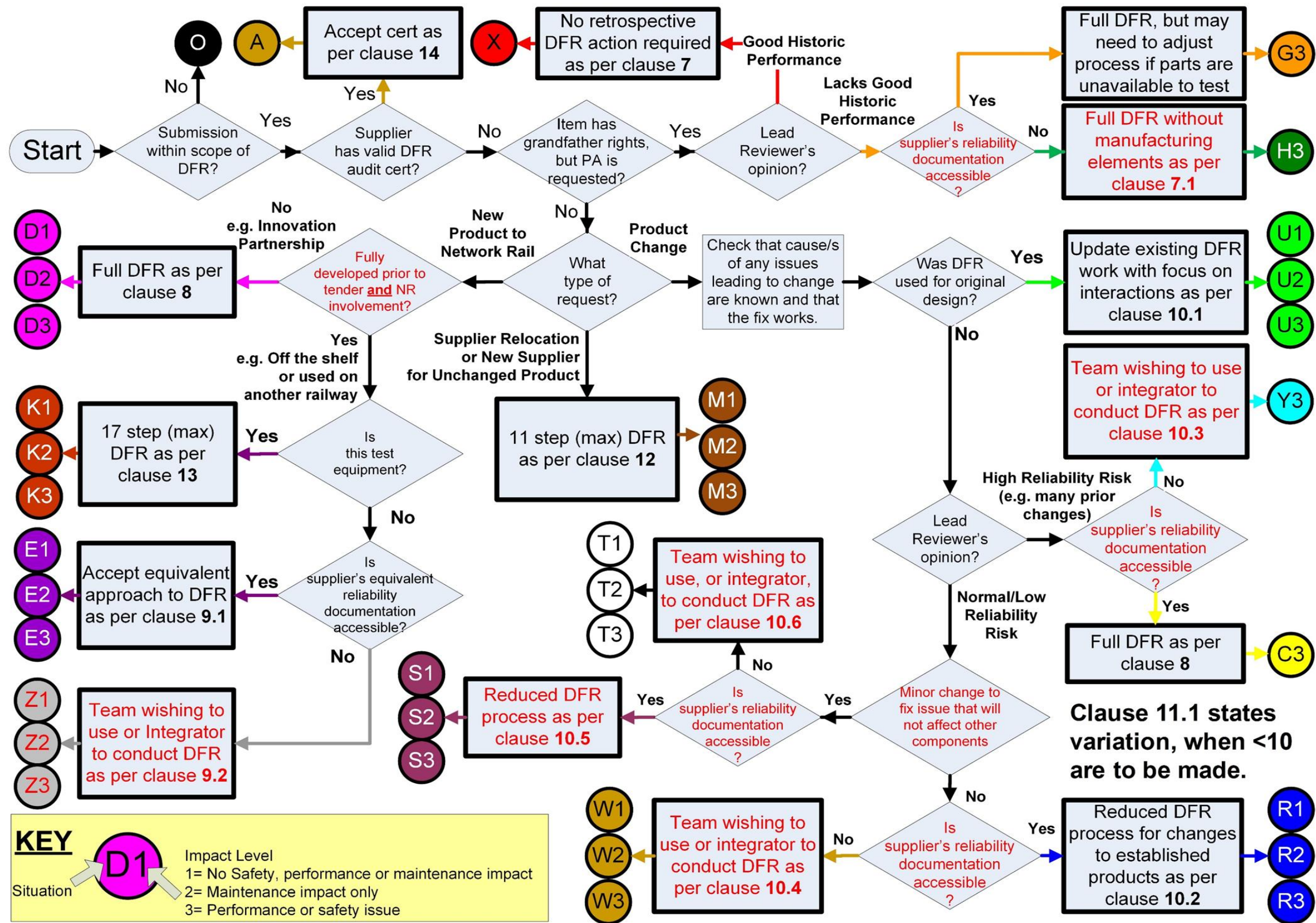
The PA number for the application

by submitting a preliminary PA application stating ‘DFR enquiry’* in the ‘Business Case’ field.

**NOTE This is intended to provide an opportunity to seek early DFR assistance, this will not start the PA process as this starts after TRL7 (RIRL5). PA will start when the applicant (sponsor) advises the PA team or TA/NRT Lead Reviewer that the DFR process completed RRL8.*

DFR Flow Variations

There are various routes through the Design for Reliability process, the diagram below provides guidance on each of these routes.



10 Product Acceptance Assessment for Plant assets via Plant Assessment Bodies (PAB's).

Manufacturers and suppliers are now able to apply direct to one of the Plant Assessment Bodies (PABs) for Product Acceptance assessment of items of plant equipment. This will then be conducted in line with the relevant PAB commercial arrangements and pricing structure. This entails an assessment against technical acceptance requirements as agreed with the Network Rail (NR) Professional Head and as per the current process. After successful completion of an assessment by the PAB, the NR Professional Head of Plants' team will agree on the outcomes and endorse any resulting certification prior to issue by the NR PA team. Further details can be obtained from the Product Acceptance team or direct from PAB's.

The old avenue for PA through the NR Professional Head of Plant's team still remains for a limited number of PA applications which will continue to be processed when applied for via a suitable NR Applicant (sponsor). Such PA applications will be gauged against NR's engineering strategy and alignment with the company's challenge statements. The Professional Head of Plant retains the authority to determine which applications can be processed through the internal route instead of a PAB. Note: Timescales for internal applications cannot be specified.

The plant PA process covers the different categories of plant equipment used on Network Rail Managed Infrastructure (NRMI). PA applicants will be advised of the options, should they choose to pursue the PAB alternative. This option incurs additional costs to applicants. However, this typically results in a swifter turnaround time for processing applications due to the PAB resource capabilities.

NOTE: The majority of applications are being requested to apply via the PAB route, PAB contact details can be obtained by contacting us at prodacc@networkrail.co.uk.

NOTE 2: The services of a NR Applicant (Sponsor) is not required for applications being managed via a PAB

NOTE 3: An Assessment level form (below) needs to be completed and attached to the PA Application form.

Reference to NR/L2/RSE/100/05 and NR/GN/RMVP/27702



PLANT PRODUCT ACCEPTANCE ASSESSMENT LEVEL APPLICATION			
PA Ref Number	Version Number	Application Type Select from below	
Product/System Name			
Applicant	Submitted by:		
Manufacturer	Name		
	E-mail address		
	Job title		
Plant Product / Plant System (to be completed by Applicant) Attach photograph of the equipment to application			
1. What can the plant product / plant system do? What service or job does the plant product or plant system provide or support? What other machines does it have to work with to function or optimise capability?			
2. How many people (Just machine specific roles) are required to operate it or make it work? What existing competences apply? Are new competences required? Are training materials available?			
3. How does it work in degraded mode? How is it recovered in an emergency?			
4. How is it constructed? Are major assemblies (single or multiple plant) required to be coupled together?			
5. What other machine with a current PA certificate is it similar to? What is different about this machine?			
6. What part of the infrastructure does it interface with? What infrastructure disciplines does it affect (E.g. Plant, Track, S&C, Telecoms, Civils, Structural)? What special permits or arrangements does it need (ALO, CHLE, 3 rd and 4 th Rail)?			

Assessment Scoring			
Novelty Score	Select from below	Complexity Score	Select from below
Uncertainty (Likelihood) Score = Novelty Score + Complexity Score		0	
Safety Impact Score	Select from below	Performance Impact Score	Select from below
Consequence Score = Safety Impact Score + Performance Impact Score		0	
<p>Green (Levels F); Yellow (Level E); Amber (Level D); Red (Levels A, B & C)</p>		Total Score	0
		Colour Code	Select from below
		Should additional criteria such as Monitoring and Reversibility be considered?	Select from below
		Comments	
		Risk Score after Additional Criteria	
		Colour Code after Additional Criteria	Select from below
Assessment Level			
Select Assessment Level		Select from below	
Justification			
Technical Review and Approval			
Lead Reviewer		Approval	
Job title		Job title	

11 Interoperability

Network Rail has a duty to comply with the Railways Interoperability Regulations 2011 (and subsequent amendments) referred to as RIR2011.

This is a European Commission initiative to promote a single market in the Rail sector. The Legislation aims to remove technical barriers to the supply of equipment and the running of trains between member states.

Interoperability is the ability of a system or a product to work with other systems or products without special effort on the part of the customer. Interoperability is made possible by the implementation of standards.

The Railways (Interoperability) Regulations 2006 (RIR) came into force on 1 April 2006 and incorporates the European Directives on railway interoperability into UK Law (Directives 96/48/EC, 2001/16/EC and 2004/50/EC). The Regulations replaced the previous 'High Speed' Regulations (of 2002). They provide a process for the authorization and placing in service of interoperable railway subsystems.

The Purpose of the Directives

- This is to allow common technical standards, Technical Specifications for Interoperability (TSI's) to be applied across Europe's Railways. This is to establish a common European verification and authorisation process for placing new, upgraded or renewed infrastructure into service; and to provide a process for putting certain rail components known as interoperable constituents onto the rail market, without duplication of process in each Member state.
- RIR extends the assessment and authorisation process provided by the High-speed regulations to the conventional rail part of the Trans-European Network (TEN).

Nb - Changes to the infrastructure not subject to authorisation under RIR need to be managed under the provision of ROGS.

How do I know which items of equipment are (or should be) interoperability constituents?

- Interoperability constituents are listed in the applicable TSIs Technical Specifications for Interoperability (TSIs).
- In addition, manufacturers can declare an assembly of listed interoperability constituents as an interoperability constituent. This could be useful where listed interoperability constituents are routinely used together in a defined combination, and by verifying and declaring that combination as sort of "super" interoperability constituent, the workload associated with verification at the sub-system level is further reduced.
- Apart from the point immediately above, there is no freedom to "invent" new types of interoperability constituents that are outwith the listed definitions in the TSIs. This does not, of course, prevent a manufacturer from developing and marketing all sorts of constituents – but he cannot declare them to be interoperable if they are not within the scope of the listed definitions in the TSIs.

Further information is regarding ICs and TSIs available via the Office Of Rail and Road (ORR) website here:

<http://orr.gov.uk/what-and-how-we-regulate/health-and-safety/regulation-and-certification/interoperability>

NOTE: This guidance and the associated NR Standard will remain until the U.K. future relationship with EU is confirmed.

12 How to apply for Product Acceptance

To apply for a new item or for a change request* to an existing item, the Network Rail applicant must complete our online application form which is available via the NR corporate website and can be found via the following link:

<https://www.networkrail.co.uk/product-acceptance/>

The applicant will need to provide justification by demonstrating monetary, safety and / or performance benefits to Network Rail.

The applicant will receive an email notification when we have processed your application successfully. This will include your unique Product Acceptance reference number and details of the next approval steps.

For further guidance please email us at prodacc@networkrail.co.uk

NOTE:: Change Requests should be submitted for the following:

- Changes or additions to the physical product
- Changes to how products are used if not covered by the scope of existing certification.
- Changes to where products are used if not covered by the scope of existing certification
- Any other changes that would require and change to a certificates scope, conditions, configuration details etc
- Extensions to certification that has expired.
- Extensions to trials that require new certification.

This list is not exhaustive and guidance should be sought prior to making an assumption regarding whether the change needs approval.

NOTE 2: Notifications regarding changes of manufacturer, manufacturing locations or manufacturer names should be advised in writing to the Product Acceptance team via the email address above. See 12.3 & 12.4 for further details.

13 Further guidance

13.1 Catalogue Numbers

“Operational” means any product / plant / equipment used to directly control, monitor, support and power the railway. In case of uncertainty the Product Acceptance team or relevant Engineering function shall be consulted. Safety Critical items that are required for use on the operational railway are required to be assessed via the Product Acceptance process and will be allocated Controlled catalogue numbers.

“Controlled” means catalogue numbers for which Network Rail Engineering asserts control.

For any items falling into this category, it is mandatory that the product acceptance process is followed as explained in NR/L2/RSE/100/05 and this document.

“Uncontrolled” means catalogue numbers for which Network Rail Engineering asserts no control. Products in this category are low risk items that do not require acceptance. The issuing of uncontrolled numbers is managed by the Network Rail Catalogue Management Team.

13.2 How to find an approved product

There are more than 85,000 products already accepted for use* on our infrastructure.

The catalogue of accepted products is available on the PADSnet website at:

<https://www.padsnet.co.uk/>

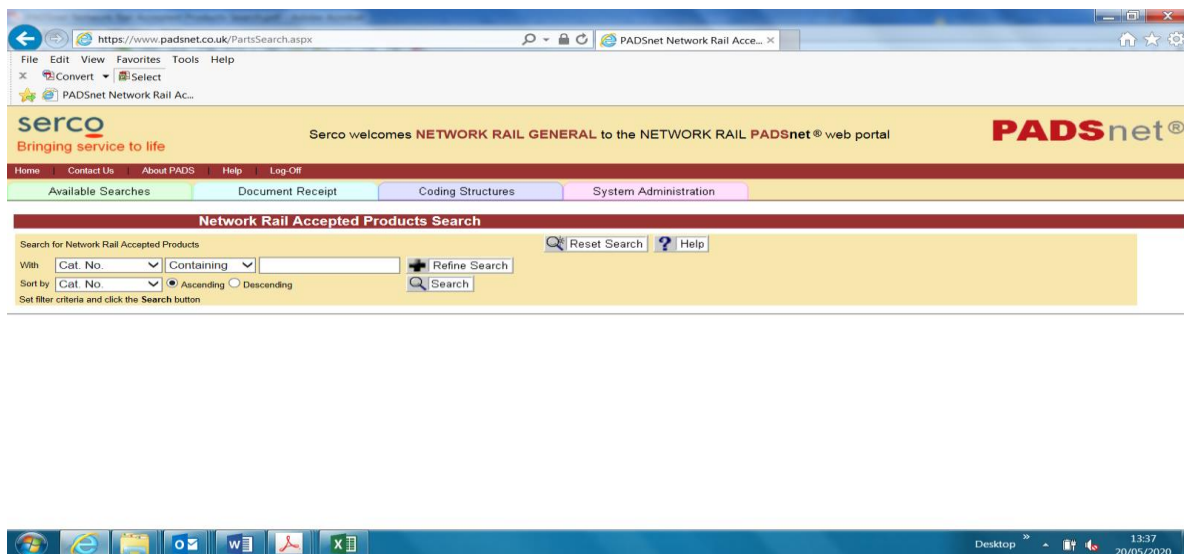
PADS** (Parts and Drawings System) is owned by SERCO and the data is managed by the Network Rail Route Services Catalogue Management team. This includes the creation and revision of PADS numbers.

iStore is Network Rail's online procurement site where you can search for and order products. This site is available to Network Rail employees only via the connect portal.

If you have any queries relating to catalogue numbers or PADSnet, please contact the Catalogue Management team, Route Services) at cataloguequeries@networkrail.co.uk

**Applicants are required to check PADS, prior to the submission of an application for acceptance, to establish whether suitably approved products are already approved for use.*

***PADS is not an approval process. Items are registered in PADS after successfully gaining approval via the NR Product Acceptance process.*



13.3 Grandfather Rights

The Professional Head of Asset discipline or delegate may grant “Grandfather Rights” to products, equipment or systems if:

- a) they were in use on the network on 1 April 1994;
- b) they were approved, or taken into use, by the British Railways Board (or predecessor body);
- c) they have not subsequently been withdrawn for safety or other reasons;
- d) they have not had any significant change to design or manufacture;
- e) the standards to which the product was originally designed or manufactured have not changed;
- f) they are being used for an application equivalent to that for the original use.

Manufacturers or Applicants should not assume that “Grandfather Rights” apply to their products.

To determine whether “Grandfather Rights” apply, manufacturers or Applicants shall provide supporting evidence to Network Rail in writing.

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Any physical changes to a product, equipment, or system accepted under "Grandfather Rights" shall invalidate Network Rail product acceptance.

In these cases, the product or system shall be subject to the product acceptance and change process mandated by this module.

Products accepted by Railtrack shall normally be considered as accepted by Network Rail.

13.4 Transfer of manufacture

Product acceptance cannot be transferred between manufacturers, manufacturing sites, or countries unless approved by the Network Rail Professional Head of Asset discipline or delegate.

To gain approval for transfer, the outgoing manufacturer shall provide supporting evidence in writing to prodacc@networkrail.co.uk.

The Professional Head of Asset discipline or delegate will then review the evidence provided.

The supporting evidence must include the following:

- a) the transfer of patents;
- b) design authority;
- c) skill base;
- d) tooling;
- e) fitness for purpose;
- f) safety integrity;
- g) reliability;
- h) processes for assuring the competence of the workforce required to operate or maintain the product.

These risks are non-exhaustive and additional evidence may be requested by the Professional Head of Asset discipline or delegate.

The Professional Head of Asset discipline or delegate shall approve or decline the request.

The Product Acceptance Process Specialist shall amend all necessary records and issue certification as directed if required.

13.5 Change of company name

Changes in company name shall be advised by the manufacturer to the Product Acceptance Process team in writing at prodacc@networkrail.co.uk.

The manufacturer will need to provide evidence evidence that there is no change to:

- a) the manufacturing site;
- b) patents;
- c) design authority;
- d) skill base;
- e) tooling;
- f) fitness for purpose;
- g) safety integrity;
- h) reliability.

These risks are non-exhaustive and additional evidence may be requested by the Professional Head of Asset discipline or delegate.

The Professional Head of Asset discipline or delegate shall approve or decline the request.

The Product Acceptance Process Specialist and Catalogue Management team will amend all necessary records and issue certification if required* for new products.

**NOTE: Certificates should reflect the name of the manufacturer at the time of approval, therefore certification is not normally amended with new manufacturer details for items that have already been approved. Certification also no longer includes addresses.*

13.5 Network Rail Standards

There are a number of ways for suppliers, principal contractors and subcontractors to access Network Rail standards and the standards awareness briefing report:

Online: SAI Global – a new digital format available for hand-held devices at: <http://www.i2solutions.net/networkrailproducts>. Call SAI Global for more details on 01344 636300

Online: IHS Network Rail Standards Online at: <http://uk.ihs.com/products/rail/index.htm>. Call IHS Customer Services on 01344 328039 for login details.

Hard copy: To buy individual standards, call IHS Customer Services on 01344 328039 or emeastore@ihs.com.

13.6 Weather Resilience

Adverse and extreme weather events already significantly impact the reliability of our assets and the performance and safety of the railway. Climate change is shifting the past weather patterns and will affect their frequency and severity influencing when and how badly we suffer these impacts. To maintain the safety and reliability of the railway into the future we have to ensure that our methods of assessing and managing the risk from weather events look at both the current and future risks. This includes the design and testing of the component products that make up our rail system.

For products vulnerable to weather (e.g. temperature, humidity or water ingress) the environmental requirements shall set specifications which account for expected climate changes during the product's operational lifespan. The change factors to use in setting specifications should be sourced from NR/GN/ESD23. Queries regarding this and/or comments from suppliers regarding the available parameters should be sent to the SustainableDevelopment@networkrail.co.uk mailbox. Additional background on climate change can be found at [The Met Office](#).

'Triage'/guidance table

Product vulnerability	Weather resilience and climate change consideration in product design
No weather vulnerabilities	No
Vulnerable to one or more weather events/types, but expected operational lifespan is less than 10 years	Product design should account for current weather impacts
Vulnerable to one or more weather events/types, expected operational life span in beyond 10 years	Product design should account for current weather impacts and future impacts under climate change