



CRR-G-016-C

Guideline for Application for Acceptance of New Light Rail Rolling Stock

Guidance for CRR Inspectors and Railway Organisations

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1. Introduction

This Guideline shall be read in conjunction with the CRR ***Guideline for the Application for Acceptance for New Light Rail Works or New Light Rail Rolling Stock (CRR-G-032-B)***.

It provides:

The List of Parameters to be considered during AFA for Light Rail Rolling Stock (refer to Annex I).

Should any aspect of a specific project not be integrating into the Parameters listed in the matrix, it is expected that the matrix (Annex I) is amended accordingly on project level.

2. Independent Professional Review (IPR)

The CRR requires the project to apply the methodologies given in CRR ***Guideline for the Application for Acceptance for New Light Rail Works or New Light Rail Rolling Stock (CRR-G-032-B)***.

The following parameter scopes require independent professional review:

- Running Dynamics,
- Structure,
- Braking systems,
- Fire Safety and Evacuation,
- Train Control and Monitoring Equipment,
- Onboard Train Command, Control, Signalling Equipment,
- Access and Egress System.

The IPR shall be performed under the scope of accreditation to ISO 17020 Type A.

The work carried out by the independent professional shall be covered by a retrievable report. The report shall include all the results of examinations and the determination of conformity made from these results as well as all information needed to understand and interpret them. All this information shall be reported correctly, accurately, and clearly.

The full range of independent professional reviews may be carried out by a single organisation, or each individual review can be carried out by a different organisation. In each case, the requirement for independence of the reviewing organisation must be respected at all times.

3. Further Clarification

Further clarification on these Guidelines can be sought from the CRR.

4. Annexes

CRR-G-016-C Annex1.

Annex I - List of Parameters for consideration during AFA of New Light Rail Rolling Stock

Parameter Number	Parameter
-	-
01.00	General Arrangements
01.01	General data (rolling stock type/variant/version identification); rolling stock characteristics (purpose, payload, seating, speed, power, etc.); multiple operation arrangements
01.02	Declaration of intended design life of RST and of CCO
01.03	Weight concept
01.04	Dimensions (incl. general arrangement drawings, general interior layout)
01.05	Absence and/or control of hazardous materials during installation, operation, maintenance, de-commissioning. At min. declaration on absence of Asbestos, PCB, radioactive material (e.g. inside ionizing smoke detectors), mercury.
01.06	Resistance to environmental factors (e.g. ranges for temperature, moisture, snow level, wading depth)
01.07	Concept on protection from pressure effects in tunnels
01.08	Noise
01.09	Management of Emissions (exhaust, wastewater, protection against loss of lubricants)
01.10	Anti-climbing/surfing design
02.00	Running Dynamics
02.01	Quasi-static and dynamic effects related to guidance function; definition of geometric wheel/rail interface, equivalent conicity at speeds above 60km/h, permitted cant deficiency, permitted cant, protection against roll-over, etc.
02.02	Cross wind effects related to guidance function
03.00	Structure (layout, design loads, fatigue life approach)
03.01	Structural integrity and design of bodyshell / frame
03.02	Structural integrity and design of bogie / running gear
03.03	Structural integrity and design of wheelset (axle/wheel/axlebox/bearing)
03.04	Structural integrity and design of coupling and drawgear
03.05	Structural integrity and design of inter-vehicle connections
03.06	Structural integrity and design of crashworthiness (impact absorption Light Rail Rolling Stock-Light Rail Rolling Stock, Light Rail Rolling Stock-road vehicle, Light Rail Rolling Stock-pedestrian, controlled collapsing, occupant protection, pedestrian protection, component / load securing, etc.)
03.07	Structural integrity and design of component attachment (inside or outside the Light Rail Rolling Stock)
03.08	Structural integrity and design of underframe impact protection (ballast, debris, etc.)

03.09	Structural integrity and design of frontal impact protection (windscreen and cab structure/ fairing/ scatter lamination)
03.10	Structural integrity and design of internal and external glazing (including fitting, shattering, aerodynamic pressure effects)
03.11	Structural integrity and design of doors/ hatches/ inter-vehicle gangways (including fitting, shattering, aerodynamic pressure effects)
03.12	Structural integrity and design of electrical power collection equipment (pantograph/ pick-ups)
03.13	Structural integrity and design of obstacle deflector/bodycatcher
03.14	Structural integrity and design of miscellaneous components not included in items above
04.00	Braking Systems
04.01	General description of overall braking system (design, functions, SIL approach, performance, blending, etc.)
04.02	Service braking
04.03	Holding braking
04.04	Rollback prevention
04.05	Parking brake (including interface to alignments gradients)
04.06	Emergency braking (including interface to CCO)
04.07	Safety braking
04.08	WSP concept
04.09	Track braking (e.g. magnetic)
04.10	Dynamic electric braking (incl. Rheostats, regeneration)
04.11	Retarder
04.12	Sanding
05.00	Powered Systems (systems which use, generate, store, distribute power)
05.01	Electrical equipment other than traction (isolation devices, MCB ratings, mechanical and electrical protection (e.g. surge/lightning protection, overload protection), etc.)
05.02	Battery other than traction (load shedding to support emergency power, battery box ventilation, protection, isolation devices, voltage ranges in reception or re-generation, lightning protection, etc.)
05.03	Electric traction equipment (isolation devices, design, mechanical and electrical protection (e.g. overload protection), electrical interface, motors, motor control, regenerative braking, return path, voltage ranges in reception or re-generation, surge/lightning protection, etc.)
05.04	Traction Battery / Capacitor (isolation devices, ventilation, mechanical and electrical protection (e.g. surge protection, overload protection), isolation devices, emergency discharge, etc.)
05.05	Earthing / electrical bonding / return current
05.06	Pneumatic system (isolation devices, air supply, protection, filtering, etc.)
05.07	Hydraulic system (isolation devices, ventilation, protection, filtering, etc.)
05.08	Thermomechanical combustion engines, fuel system, power train (isolation devices, ventilation, protection, filtering, etc.)

05.09	On board power generation (generators, fuel cells, etc.) (isolation devices, ventilation, protection, filtering, etc.)
05.10	Other powered systems (isolation devices, ventilation, protection, filtering, etc.)
06.00	Fire Safety and Evacuation
06.01	Overall concept on fire safety and evacuation; including description of concept; interface to fixed Installations
06.02	Combustible materials other than fuels (fire resistance, smoke and toxic emissions): Listing of materials and quantities (non-metallic parts list/ materials inventory), test reports
06.03	Fire safety of powered systems including fuels (fire protection, smoke and toxic emissions, emergency management for powered systems, protection of heaters, etc.)
06.04	Fire barriers for occupants: Cab/saloon, inter-carriage, interior/exterior interfaces of rolling stock bodyshell, HVAC suppression
06.05	Fire barriers for powered systems
06.06	Management of fires in service: Concept on protection of occupants / essential equipment / rolling stock structure / powered systems to support to short-term movement with declared fire on board and/or to support evacuation
06.07	Fire detection and alarm equipment
06.08	Fire suppression equipment (portable fire extinguishers, fixed extinguishing systems, etc.)
07.00	Train Control and Monitoring Equipment (only functions which relate to the internal management of a train, not CCO)
07.01	General concept of systems and functions (electrics, electronics, software and/or hardware); Including intervehicle control and multiple unit operation
07.02	Safety-related functions of train control and monitoring equipment: Detailed design, safety evaluation (e.g. door management, train integrity evaluation, brake/traction management, management of powered systems, traction cut-off, supervision of axles bearings, supervision of suspension, management of fire alarm and fire suppression, etc.)
07.03	Driver Safety Device (DSD) / Driver Vigilance Device (DVD)
07.04	Driver assistance functions (e.g. automated brake tests)
07.05	Safety-related functions of train control and monitoring systems for degraded operation (e.g. failure of ATO, operation with declared fire on-board, tow or push, etc.)
07.06	Interfaces of safety-related functions of train control and monitoring systems to CCO systems (e.g. emergency brake demand, service brake demand, traction cut-off demand, train integrity evaluation, etc.)
07.07	Protection of power supply to safety-related train control functions; load shedding, individual MCBs, etc.
07.08	CCTV (interior, forward facing, etc.)
08.00	Onboard Train Command / Control / Signalling Equipment (CCO)(only CCO functions, not functions which relate to internal management of a train)

08.01	General concept of CCO systems and functions; Including operation of train formations, degraded operations
08.02	Safety-related functions of CCO systems; Detailed design, safety evaluation of CCO systems (electrics, electronics, software and/or hardware) (e.g. Automatic Train Protection (ATP), Automatic Train Operation (ATO), automated management of powered systems, remote control, detection of obstacles on track, selective door opening, platform side detection, positioning at platform, interaction with platform screen doors, etc.)
08.03	Safety-related functions of CCO systems for degraded operation (e.g. failure of ATO, operation with declared fire on-board, etc.)
08.04	Interfaces of safety-related functions of CCO systems to Fixed Installations (selective door opening, platform side detection, positioning at platform, interaction with platform screen doors, obstacle detection, etc.)
08.05	Protection of power supply to safety-related CCO; load shedding, individual MCBs, etc.
08.06	Data Logger / event recorder
09.00	Rolling Stock Interior
09.01	Lighting; Normal and emergency lighting arrangements and lighting levels, emergency lighting levels and duration, load shedding concept, SIL
09.02	Passive safety of interior design
09.03	Passenger area human factors; Mobility-impaired passenger needs, handholds, seating arrangements / dimensions, aisle dimensions, steps, ramps, etc.
09.04	Luggage storage provisions
09.05	Signage, labels and indicators, etc. (illuminated not illuminated, fixed or variable/ animated, normal or degraded or emergency operation)
09.06	Heating, ventilation and air conditioning; HVAC arrangement, ventilation, emergency ventilation arrangement and management during degraded operation or emergency
09.07	CCTV
10.00	Access & Egress
10.01	Staff access/egress during normal operation; External staff doors, cab-saloon doors
10.02	Staff access/egress in emergency; External staff doors (incl. Cab), cab-saloon doors
10.03	Passenger access/egress during normal operation; External passenger doors; Mobility-impaired passenger needs
10.04	Passenger access/egress in emergency; Passenger area emergency access/egress
10.05	Inter-vehicle connectors during normal operation; Gangways, treadplate / bridging plate arrangements etc.
10.06	Inter-vehicle connectors in emergency; Gangways, treadplate / bridging plate arrangements etc.
11.00	Driver Cab
11.01	Cab access/egress, cab side windows

11.02	Driver cab human factors; Seating arrangement, control desk arrangement
11.03	Driver cab Occupational Health & Safety incl. noise
11.04	Driver cab safety equipment (e.g. speedometers)
11.05	Driver cab signage
11.06	Visibility: Field of vision, absence of optical interference
11.07	Visibility: Windscreen wash-wipe system, demisters, sun visors
11.08	Driver cab HVAC
12.00	External Audibility/Visibility
12.01	Headlights / taillights / indicators / hazards warning lights / brake lights / marker lights, etc.
12.02	Audible warning devices
12.03	Livery; Rolling Stock visibility at distance (front / rear / sides), mobility-impaired passenger needs.
13.00	Communication Systems
13.01	Cab / Crew to control (radio) communication system
13.02	Cab to cab / to crew intercom communication system
13.03	Public address to passengers / to platform from cab or from crew (incl. recorded announcements)
13.04	Passenger to cab / to crew communication equipment (e.g. voice communication systems, other communication devices)
13.05	Passenger to control communication equipment (e.g. voice communication systems, other communication devices)
13.06	Emergency communication devices (cab, crew, passengers)
13.07	Passenger information labels / signage / displays (fixed or variable/ animated)
14.00	Rolling Stock Interfaces
14.01	Infrastructure Interface: Concept of compatibility with infrastructure and operations (general and specific operational restrictions, route restrictions)
14.02	Infrastructure Interface: Track / alignment interface criteria (including: track gauge and track tolerances, maximum gradients, minimum radii of horizontal and vertical curves, geometric limits of reverse curves, max speeds in combination with permitted cant deficiencies, max cant, check rails, guard rails, grooved rail, flange running, etc.) --> must be evaluated in conjunction with parameters on gauging concept and running dynamics
14.03	Infrastructure Interface: Free movement of bogies, gangways, etc. based on prescribed alignment criteria
14.04	Infrastructure Interface: Determination on gauging concept (kinematic/ dynamic), associated gauges and calculation rules
14.05	Infrastructure Interface: Platform interface, mobility-impaired passenger needs, powered steps/bridging plates
14.06	On-road operations Interface: protection and compatibility with Road traffic/roadway users
14.07	Coupling and drawgear Interface: Geometric position, gathering range on prescribed alignment criteria

14.08	Coupling and drawgear Interface: Mechanical coupling interface (incl. inter-vehicle coupling of trainsets)
14.09	Coupling and drawgear Interface: Electrical interface
14.10	Train detection systems interface requirements (wheel to wheel continuity, axle load, minimum metal masses, sanding, magnetic track brakes, wheel impedance, metal free space around wheels, wheel geometry, vehicle geometry, position of first/ last /intermediate wheelsets in train, requirements on wheel diameters etc.)
14.11	Traction power supply: OCS geometric interface
14.12	Traction power supply: Return power generation
14.13	EMC and harmonics: Compatibility with operating environment, signalling system, and other railways, incl. special locations/ credible fault conditions
14.14	Provisions for Rolling Stock rescue: Giving/receiving assistance, emergency coupling arrangements and limitations, compatibility with re-railing processes and equipment
15.00	Provisions for Operation
15.01	Occupational Health and Safety factors for Operations
15.02	Operational Manuals / Conditions / Requirements for nominal and permitted degraded operation modes
15.03	Operational Manuals / Conditions / Requirements for emergency operation
15.04	Operations related signs and labels, vehicle ID number, etc.
15.05	Safety related aspects of stabling and cleaning (e.g. on-board sockets, shore supply, unattended pre-heating of saloons)
16.00	Provisions for Maintenance
16.01	Occupational Health and Safety factors for Maintenance
16.02	Provisions for Maintenance: Maintenance Facilities Interfacing, Maintenance Manuals / Conditions / Requirements / Intervals / remote maintenance / emergency assistance
17.00	On Track Machines (in addition to the relevant parameters above)
17.01	External Visibility, markings: Body colour, markings, stickers / labels specific to OTM
17.02	Occupational Health and Safety: Access / egress to working positions, protection of staff in working positions, human factors, noise and vibration, visibility, OHS-related information in manuals / instructions for operation
17.03	Functional and operational requirements for working in the vicinity of operational running lines and traction energy supply conductors: Additional signalling / control / management devices, limitations of working area/ range
17.04	Safety against derailment in working mode
17.05	Safety against rollover / tilting in working mode
17.06	Braking system in working mode
17.07	Environment: Noise in working mode
17.08	Environment: Management of lubrication, hydraulic fluids and other potentially critical materials

17.09	Interface to infrastructure in working mode: Assessment on forces onto track / trackbed / structures (via rail-grips, support wheels, etc.), vibration into trackbed or structures
17.10	EMC in working mode
17.11	Lighting of working areas
17.12	Electrical protection in working mode: To include interfaces to OCS
17.13	Management (securing, limitation) of out-of-gauge equipment