URBAN RAIL PLATFORM

5th of October 2011

FUNDAMENTAL REQUIREMENTS FOR URBAN RAIL SYSTEMS DESIGN, CONSTRUCTION, MANUFACTURE, OPERATIONS & MAINTENANCE

RECOMMENDED BASIC REFERENCE FOR DEVELOPING A MINIMUM SET OF STANDARDS FOR VOLUNTARY USE IN THE FIELD OF URBAN RAIL ACCORDING TO MANDATE M/486 EN

This document is the one mentioned in the "Mandate for programming and standardisation in the field of Urban Rail" M/486 EN addressed to the European Standardisation Bodies in order to develop standards for voluntary use. This document shall be used as a basic reference for the execution of this mandate.

This document is intended to serve as recommendations for Competent Authorities responsible for design, construction, operation and maintenance of urban rail systems.

The starting point for this document is the fact pointed out in the mandate that the so-called "Essential Requirements" for interoperability set out in Annex III of the Interoperability Directive 2008/57/EC were not intended to cover urban and local rail systems.

The scope is covering general requirements as presented in clause 1 and requirements related to sub-systems as presented in clause 2.

DEFINITIONS

- ***Urban Rail systems***

  Urban Rail systems cover both Urban Guided Transport systems (UGT) and other rail systems which might be excluded from the scope of the Interoperability Directive 2008/57/EC (Article 1.3 (a) and (b))[1].

  Urban Guided Transport systems (UGT), which cover Metro, Tram and Light Rail, are defined as public transport systems permanently guided at least by one rail, intended for the operation of local, urban and suburban passenger services with self-propelled vehicles and operated either segregated[2] or not from general road and pedestrian traffic.

- ***Categories of Urban Rail systems include:***

  (I) Metros: UGT systems operated on their own right of way and segregated from general road and pedestrian traffic. They are consequently designed for operations in tunnel, viaducts or on surface level but with physical separation in such a way that inadvertent access is not possible. In different parts of the world Metro systems are also known as the underground, the subway or the tube. Rail systems with specific construction issues operating on a segregated guideway (e.g. monorail, rack railways) are also treated as Metros as long as they are designated as part of the urban public transport network.

  (II) Trams: UGT systems not segregated from general road and pedestrian traffic, which share their right of way with general road and/or pedestrian traffic and are therefore embedded in their relevant national road traffic legislation (highway codes and specific adaptations).

  (III) Light Rail: Light Rail is defined as a UGT system operated in parts of the system not segregated from general road and pedestrian traffic, and in parts of the system with segregated right-of-way. The segregation may include some sections of line where inadvertent access is not possible.

  (IV) Local rail systems which by national decision complying with Article 1.3 (a) or (b) of directive 2008/57/EC may be excluded from the European Community Rail System[3]**.** Such systems connect city centres with their suburban hinterland or regional local centres. Such systems are operated on rights of way which are basically segregated from general road and/or pedestrian traffic and/or which can be declared by law as independent from the public environment even if they are not segregated by location, form of construction or appropriate measures. For historical reasons they might be strongly influenced by conventional railway parameters and their operations procedures.

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[1] (a) Metros, Trams and other Light Rail systems;

(b) networks that are functionally separate from the rest of the rail system and are intended only for the operation of local, urban or suburban passenger services, as well as railway undertakings operating solely on these networks; […]

[2] The segregation is achieved by appropriate measures such as kerbstones, railings, hedges, rows of trees, level crossings or fixed barriers of fences.

[3] Due to the unclear boundaries of this category, it may not be possible to address specific aspects during the programming phase under mandate M/486.

- ***Design***

  Design is the initial project phase of the development of a system, sub-system or component covering all steps from preliminary outlines to final documentation before implementation.

- ***Construction and manufacturing***

  Construction and manufacturing covers new construction or manufacturing as well as a significant change to a system, sub-system or component (e.g. infrastructure or rolling stock). Therefore, "construction" applies to construction, extension, upgrade and renewal.

- ***Infrastructure***[4]

  In this document, infrastructure encompasses:

  - ***Stopping places and stations****: places where passengers can enter or leave the system:*

    - ***Stations***

    Stations *are defined as parts of the infrastructure intended for boarding and alighting of passengers to/from trains (e.g. platform areas) as well as areas providing access from the public environment to the transport system, i.e. the area under the responsibility of the transport company.*

    - ***Stopping places***

    Stopping places *are intended for boarding and alighting of passengers as part of the public environment.*

  - ***Guideway:*** *part of infrastructure intended for movements or storage of trains (including sidings and stabling areas). The guideway is made up of engineering structure (including tunnels, viaducts and bridges) and track.*

- ***Traction Power Supply***[5]

  The traction power supply system, including electric power generation, transformation and conversion, power distribution and power storage.

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[4] **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU** ("2.1. Infrastructure: The track, points, engineering structures (bridges, tunnels, etc.), associated station infrastructure (platforms, zones of access, including the needs of persons with reduced mobility, etc.), safety and protective equipment.")

[5] **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU.** The words "Traction Power Supply" are used instead of the word "Energy" and the definition is slightly changed ("The electrification system, including overhead lines and the trackside of the electricity consumption measuring system.").

- ***Signalling, Automatic Train Control and Operations Control Systems***[6]

  All the equipment necessary to ensure safe movements of trains, including control of route elements, as well as to manage and supervise train operations and possibly to ensure safe passenger transfers between trains and platforms.
  These include:
  - *Signalling Systems;*
  - *Automatic Train Control Systems;*
  - *Operations Control Systems.*

- ***Rolling Stock***[7]

  Rolling Stock means single or multiple unit vehicles operated on urban rail systems as a train-set or as a part of a train-set. Rolling stock, which is not intended to be separated during train operation, is considered to be one train set.

- ***Operations***[8]

  Operations means all measures intended to effect the transport of passengers, both under normal and degraded conditions, including training of operations staff, traffic planning and management.

- ***Maintenance***[9]

  Maintenance of infrastructure, rolling stock and other subsystems covers all preventive and corrective activities intended to keep a system or sub-system in proper operating condition. It covers prevention of failures in service, retarding deterioration, and repairing or replacing components or equipment after failure.

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[6] **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU** ("2.3. Trackside control-command and signalling: All the trackside equipment required to ensure safety and to command and control movements of trains authorised to travel on the network." & "2.4. On-board control-command and signalling: All the on-board equipment required to ensure safety and to command and control movements of trains authorised to travel on the network.").

7 **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU** ("Structure, command and control system for all train equipment, electric current collection devices, traction and energy conversion units, on-board equipment for electricity consumption measuring, braking, coupling and running gear (bogies, axles, etc.) and suspension, doors, man/machine interfaces (driver, on-board staff and passengers, including the needs of persons with reduced mobility), passive or active safety devices and requisites for the health of passengers and on-board staff.").

[8] **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU** ("Operation and traffic management: The procedures and related equipment enabling coherent operation of the various structural subsystems, during both normal and degraded operation, including in particular train composition and train driving, traffic planning and management; The professional qualifications which may be required for carrying out cross-border services.").

[9] **This definition is different from the one of Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU** ("The procedures, associated equipment, logistics centres for maintenance work and reserves providing the mandatory corrective and preventive maintenance to ensure the interoperability of the rail system and guarantee the performance required.").

- ***Passenger information systems***[10]

  Passenger information systems cover applications providing passengers with information before and during the journey.

- ***Ticketing systems***[11]

  Ticketing systems cover aspects related with fare selection, sale and validation of tickets or passes, and control of access to - or exit from - the system.

[10] **This definition is different from the one given under "Telematics Applications" in Annex II of the Directive 2008/57/EC modified by Directive 2011/18/EU.** ("Telematics Applications. In accordance with Annex I, this subsystem comprises two elements:
(a) applications for passenger services, including systems providing passengers with information before and during the journey, reservation and payment systems, luggage management and management of connections between trains and with other modes of transport;
(b) applications for freight services, including information systems (real-time monitoring of freight and trains), marshalling and allocation systems, reservation, payment and invoicing systems, management of connections with other modes of transport and production of electronic accompanying documents.").
Indeed, the term "Telematics Applications" covers too wide a range of issues not applicable to urban rail.

[11] See previous footnote.

1. General requirements

1.1 Safety

1.1.1. Urban Rail systems shall be so constructed that their use compliant with regulations will not cause harm to anybody or endanger anybody more than is deemed acceptable by regulations.

1.1.2. The design, construction, operation and maintenance of Urban Rail systems shall be carried out in such a manner as to maintain their operation as intended, including in specified degraded situations, and assure the level of safety required by the responsible body. This shall include consideration of all persons likely to interact with the system, including the case of a Tram or of a Light Rail system operated on a public road not segregated from general road and pedestrian traffic.

1.1.3. The safety risk of any foreseeable hazard shall be limited by appropriate means.

1.1.4. Infrastructure, rolling stock and other subsystems shall be so constructed that they withstand the highest mechanical, electrical and thermal stresses foreseen, without endangering operation.

1.1.5. The design and construction of infrastructure, rolling stock and other subsystems and choice of materials used shall be aimed at limiting the generation, propagation and consequences of fire and emission of harmful fumes or gases.

1.1.6. Any device in infrastructure, rolling stock and other subsystems intended to be handled by users shall be clearly visible, reachable, its purpose easily recognisable or clearly explained, and so designed that it does not impair the safe operation of the device itself or of the system or the health and safety of users.

1.1.7. Infrastructure, rolling stock and other subsystems shall be so constructed that devices and equipment which could endanger persons cannot be touched - as far as their access is not prohibited - either on purpose or inadvertently except by authorised staff.

1.1.8. Infrastructure, rolling stock and other subsystems shall be so designed and constructed that passengers and public - as far as their access is not prohibited - are not endangered by touch voltages, especially between rolling stock and wayside localities (e.g. platforms).

1.1.9. Access to infrastructure or specific areas of rolling stock which is not intended for use by passengers or the public shall be restricted by appropriate means.

1.2 Health

Materials, equipment and procedures used for construction, operation and maintenance of infrastructure, rolling stock and other subsystems shall be selected in such a way as to mitigate risks to health.

1.3 Environmental protection

1.3.1. Materials, equipment and procedures used for construction, operation and maintenance of infrastructure, rolling stock and other subsystems shall be selected in such a way as to mitigate risks to the environment.

1.3.2. The environmental impact of the establishment and operation of Urban Rail systems shall be assessed and taken into account at the design stage of the system in accordance with the European Community provisions in force.

1.3.3. The materials used in the rolling stock and infrastructure shall be chosen in such a way as to limit the emission of fumes or gases which are dangerous to the environment, particularly in the event of fire.

1.3.4. Infrastructure, rolling stock and other subsystems shall be designed and manufactured in such a way as to be electromagnetically compatible with any existing installations with which they could interfere in accordance with the European Community provisions in force.

1.3.5. Infrastructure, rolling stock and other subsystems shall be so constructed, operated and maintained that noise emission and ground vibrations are restricted to defined acceptable levels in accordance with the European Community provisions in force.

1.4 Reliability and availability

Urban Rail Systems (including rolling stock) shall be designed with specified reliability and maintainability and shall be operated and maintained properly in order to achieve the required availability (enabling also to continue operations in specified degraded conditions).

1.5 Technical compatibility

1.5.1. The technical characteristics of infrastructure, rolling stock and other subsystems shall be compatible with each other on any given section of a line.

1.5.2. Infrastructure, rolling stock and other subsystems intended for public use shall be so constructed that access to them by persons with reduced mobility is facilitated and not restricted more than is unavoidable due to the intrinsic characteristics of the system.

1.6 Procedural requirements

1.6.1. The conditions for safe and orderly operations and maintenance shall be defined in a way allocating the responsibilities clearly. They shall ensure that infrastructure, rolling stock and other subsystems are in a safe condition and that operations are conducted in a safe way and do not constitute a danger to health nor harm the environment.

1.6.2. In case operations are shared between different entities (e.g. rolling stock is operated by a different Transport Company than operations facilities) these entities shall come to an agreement on the split of responsibility for the entire operations process.

1.6.3. Any construction or modification to infrastructure, rolling stock or other subsystems which might interfere with operations shall be subject to the agreement of the entity responsible for operations.

1.6.4. Setting infrastructure, rolling stock and other subsystems into operation for passenger service shall be subject to a process for approval and/or acceptance allocating the responsibility clearly between the involved entities. In order to ensure safe and orderly operations, adequate documentation shall be provided by all parties involved.

2. Requirements specific to operations and subsystems

2.1 Operations

2.1.1. The transport company shall operate its urban rail system under clear and explicit rules.

2.1.2. The operational rules shall cover all activities necessary for:

- *train operations under normal and degraded modes,*
- *assignment of tasks to dedicated and qualified operations staff as well as their formal and practical training,*
- *taking care of passengers in cases of operations disturbances or emergencies and their rescue in cooperation with external emergency services,*
- *setting up safety and security plans in cooperation with external safety and security agencies (fire brigade, police, etc.).*

2.1.3. The observance of established operational rules shall be supervised by qualified persons appointed by the transport company.

2.1.4. Failures and malfunctions of equipment in infrastructure, rolling stock and other subsystems shall be reported inasmuch as required for appropriate operations decisions in staffed locations (e.g. driver's cab, control centre…).

2.1.5. Non-functioning or malfunctioning equipment in installations and rolling stock which could lead to unsafe operations shall be taken out of operation and secured if necessary.

2.1.6. It shall be ensured that the staff in charge of operations and supervision of train operations is authorised and available to carry out appropriate actions even in case of emergency situations.

2.1.7. Depending on the system environment, train operations shall be conducted as follows:

- *operations of Trams and Light Rail sharing right-of-way with general road and pedestrian traffic shall be carried out in accordance with the relevant prevailing regulations (e.g. highway code).*
- *Trams and Light Rail trains sharing right-of-way with general road and pedestrian traffic are allowed to be driven following the principles of train operation on sight. In such a case, it is the responsibility of the train driver to keep a safe distance from trains ahead, to respect the permitted speed limit and to observe the given regulations for general road and pedestrian traffic.*

2.1.8. Light Rail shall be operated independently from general road and pedestrian traffic whenever possible, particularly through the implementation of a partially or fully segregated guideway.

2.1.9. In the case of operations of Trams or Light Rail in interaction with general road and pedestrian traffic, traffic lights shall provide priority to Trams and Light Rail as far as possible in order to allow for fluent operations.

2.1.10. Urban rail systems operated in areas where operation on sight is not allowed shall be operated with Signalling and/or Automatic Train Control systems depending on the grade of automation.

2.2 Maintenance

2.2.1. Urban rail sub-systems (including rolling stock) shall be maintained in order to preserve pre-defined safety and availability levels.

2.2.2. The maintenance rules of urban rail sub-systems including rolling stock shall be established by entities in charge of maintenance taking into account specifications provided by manufacturers and the specific experience of the entity in charge of operations.

2.3 Infrastructure

2.3.1. Stopping places or stations

2.3.1.1. In the area intended for passenger boarding and alighting to/from trains, appropriate measures shall be put in place to minimise the risk that persons are endangered by trains entering or leaving.

2.3.1.2. Appropriate measures shall be put in place to minimise the risk that persons are endangered during boarding and alighting to/from trains taking into account rolling stock parameters and stopping positions of trains.

2.3.1.3. Stations which are not located in close proximity to the public environment shall be equipped with a public address system allowing operations staff to inform the persons present in the stations.

2.3.1.4. Staircases, ramps, escalators and moving walkways shall allow for the safe movement of people, and sufficient space shall be provided at entries and exits to absorb peak traffic flows.

2.3.1.5. Areas designated for use of passengers shall always have a sufficient lighting level in order to ensure the safety of passengers even for cases of emergency.

2.3.2. Guideway

2.3.2.1. The guideway shall be able to absorb the static and dynamic forces resulting from train movement at the maximum permitted speed with regard to rolling stock characteristics without leading to fatigue failure or permanent deformation.

2.3.2.2. The characteristics of the guiding elements shall be such that for permitted speeds and loads, safe train guidance and acceptable comfort is ensured even if guiding elements and rolling stock are both at their maximum permitted wear limits.

2.3.2.3. A clearance of guideway (i.e. space around guiding elements to be kept free of any fixed or movable obstruction to train movement) shall be defined and provided along the guideway. The dimensions of the clearance shall be so matched with the characteristics of the rolling stock authorised on the guideway that a contact between a train and fixed objects or other trains on neighbouring tracks is not possible. In the specific cases where for any reason devices allowing such contact are installed they shall not harm the passengers. Where the above requirements cannot be achieved, specific measures shall be adopted to avoid conflicting train movements.

2.3.2.4. For each guideway segregated from the public environment, sufficient safety space for a person to stand without being endangered by moving trains shall be accommodated along the clearance of guideway. In case the safety space cannot be provided, this area shall be clearly marked.

2.3.2.5. Tunnels, bridges, viaducts and other structures shall be so designed as to provide for safe operation, a safe environment for people and for safe evacuation.

2.3.2.6. For each guideway segregated from the public environment, a safety space shall be defined and provided for safe evacuation of persons from stranded trains or in case of emergency, leading to the next station or to the wayside emergency exits. Safety spaces are not required if alternative means or procedures for safe evacuation of persons are provided.

2.3.2.7. Guideways in tunnels shall be equipped either with emergency exits leading from the safety space of the guideway to the public environment or with other emergency evacuation paths allowing evacuation of passengers and access of rescue staff in cases of emergency.

2.3.2.8. Where guideways are crossed by public roads or walkways, warning means shall be implemented in order either to attract attention to train movements as long as no other provisions are defined by the relevant prevailing regulations (e.g. highway code) or to provide priority for safe train operations clearly marked as such.

2.3.2.9. Sufficient lighting shall be provided in tunnels and at emergency exits in case of evacuation or rescue, and to enable operations staff to fulfil their duties.

2.4 Traction power Supply

2.4.1. Safety

2.4.1.1. The traction power supply shall endanger neither operations of trains nor persons (passengers, operations staff, nearby residents and third parties) more than is unavoidable.

2.4.1.2. The traction power supply system shall not impair - in particular due to electromagnetic incompatibility and stray currents - third party installations located in the vicinity (pipes, etc.).

2.4.1.3. In areas where road traffic coexists with Tram or Light Rail systems, the overhead contact line shall provide sufficient clearance for road traffic.

2.4.2. Environmental protection

The functioning of the power supply systems shall not interfere with the environment beyond the specified limits.

2.5 Signalling, Automatic Train Control and Operations Control Systems

2.5.1. Signalling, Automatic Train Control and Operations Control systems shall ensure the safe operations of Urban Rail systems.

2.5.2. The implementation of Signalling, Automatic Train Control and Operations Control systems for a given Urban Rail system should be made under regard of the type of automation and the prevailing environment of train operations, which includes operational rules and conditions such as the segregation or not from the general road and pedestrian traffic.

2.5.3. Signalling Systems shall be provided:

- *if signals are required for operations needs and especially if movement instructions shall differ from those which are provided by road signalling systems. They shall also provide warning information to general road and pedestrian traffic or prevent conflicting use of the guideway where partially segregated guideways are crossed by public roads or walkways, as far as they are not covered by road signalling*
- *where movement authorities and additional information need to be provided to train drivers in order to:*
  - *ensure safety of routes to be set,*
  - *ensure safe separation between trains,*
  - *provide movement instructions to trains.*

2.5.4. Automatic Train Control Systems shall be provided to supervise the movement of trains by technical means and control train movements in the case of hazardous deviations from permitted movements.

2.5.5. Operations Control Systems shall be provided if required by operations needs in order to:

- *supervise and manage train operations*
- *receive emergency calls from passengers if there is no staff on trains or in stations available for this purpose.*

2.5.6. The Signalling, Automatic Train Control-and Operation Control Systems shall continue to enable the passage of trains under defined degraded conditions.

2.6 Rolling stock

2.6.1. *The structure of rolling stock and links between vehicles or units of rolling stock shall be designed in such a way as to protect passengers and onboard operations staff in the event of collision, taking into account the operational conditions.*

2.6.2. *Tram and Light Rail rolling stock - participating in general road and pedestrian traffic - shall be equipped with means which allow operations in accordance with prevailing highway legislation (e.g. dipped headlights, brake lights, direction indicators).*

2.6.3. *Tram and Light Rail rolling stock - participating in general road and pedestrian traffic - shall be equipped with a braking system which provides a high braking performance in order to mitigate the risk of collisions with other participants in general road and pedestrian traffic.*

2.6.4. *Tram and Light Rail rolling stock - participating in general road and pedestrian traffic - shall be designed in such a way as to mitigate the risk that persons are run over in the case of collision.*

2.6.5. *The braking system shall be designed and operated in such a way that trains shall be stopped within the required braking distances under defined conditions of operations.*

2.6.6. *The braking system shall be designed in order to allow the train to remain at a standstill under worst case conditions to be defined and on the maximum gradient of the network on which the train is foreseen to be operated.*

2.6.7. *Facilities shall be provided inside the vehicle to allow standing passengers to maintain their balance during rapid changes of direction and speed.*

2.6.8. *Rolling stock intended for passenger service shall be equipped with emergency call devices in order to provide communications between passengers and on board operations staff or with relevant staff in staffed locations.*

2.6.9. *Rolling stock doors used for passenger transfer shall be closed and held in the closed position during movement between stations/stopping places.*

2.6.10. *Opening of rolling stock doors for passenger transfer shall not be allowed outside stations/stopping places under normal conditions. Safe evacuation of the train shall always be possible under specified conditions in an emergency.*

2.6.11. *Closing rolling stock doors shall not harm passengers.*

2.6.12. *Rolling stock interiors shall be sufficiently lit in order to ensure passengers safety on board and during passenger transfer. Emergency lighting which is activated automatically and which remains working under specified conditions shall be provided in case of failure of normal lighting.*

2.6.13. *Rolling stock intended for passenger service shall be equipped with a public address system allowing the provision of information to passengers from on board train operations staff or from relevant staff in staffed locations.*

2.6.14. *Rolling stock shall be so constructed that passengers can always be evacuated from a stranded train.*

2.7 Passenger information systems

2.7.1. Passenger information systems shall provide information as follows:

- *the planned transport services of Urban Rail lines and conditions of carriage shall be published by appropriate means (e.g. timetable booklet, internet, mobile phone) and posted in stations and stopping places;*
- *stations and stopping places shall be clearly identified by indication of their name and shall provide indication of the line numbers and destinations of the Urban Rail lines which serve them;*
- *trains intended for the use of passengers shall be clearly identified on the outside (e.g. line identification, terminus) and on the inside (line identification and stations/stopping places served).*

2.7.2. Where appropriate, stations shall be equipped with line and destination indicators displaying dynamically the next train to be expected and where appropriate also the expected departure time (or the waiting time), possibly supported by audio announcements of line and destination when the train is approaching the station/stopping place.

2.7.3. Where appropriate, trains shall be equipped in the passenger compartment with line and destination indicators dynamically displaying the next station to be expected, supported by audio announcements when the train is approaching the station.

2.8 Ticketing systems

2.8.1. Devices of ticketing systems installed in stations or in trains shall allow passengers:

- *to buy tickets ("tickets" may include passes, smartcards etc.)*
- *to validate tickets at the start of their journey*
- *where appropriate, to access and leave the area for which the ticket is valid.*

2.8.2. Urban rail ticketing systems are governed by rules and procedures which may cover all means of public transport within specific integrated fare systems. They are therefore not specific to Urban Rail systems and shall be specified by the entities in charge of public transport within this fare system.