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Deliverable lead beneficiary	UITP	**Deliverable responsible person**	Yves Amsler
Email	Yves.amsler@uitp.org		

Other contributors to the deliverable	UNIFE

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[1] Dissemination level: **PU** = Public, **PP** = Restricted to other programme participants (including the JU), **RE** = Restricted to a group specified by the consortium (including the JU), **CO** = Confidential, only for members of the consortium (including the JU)

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1. Executive Summary

The FOSTER RAIL project is addressing the challenge to strengthen and support research and innovation cooperation strategies in the European rail sector. The project's work plan foresees to enhance coordination among main stakeholders and actors in the European rail sector and rail industries and integrate the work done so far by ERRAC and its working groups. Starting with the already published ERRAC-ROADMAP, the FOSTER RAIL project will continue to coordinate the research and innovation agenda and priority setting process among the wide range of relevant stakeholders in the rail sector. The outcome of FOSTER RAIL will be a Rail Business Scenario as basis for new Strategic Rail Research and Innovation Agenda (SRRIA) and specific Rail Technology & Innovation Roadmaps aimed at 2050. The output will among others be used to advise the European Commission, Shift2Rail and other research programmes on their content.

Legislation is a useful tool at both EU and national level in order to bring order and harmony to the various technical and operational aspects in the economic life. However, in addition to legislation there are other 2 tools that have been consecrated at the EU level to bring similar results: standardization and R&I activities that bring about not just progress, but also cooperation and mutual understanding between the various actors in a given field. And (urban) rail is a good example of it.

Starting in 1991, the European Union has adopted rail legislations promoting the emergence of a single railway market throughout the Community and targeting three objectives: market liberalisation, physical interoperability, and market improvement through technical harmonisation. The legislation scope has been gradually extended and from 2008 has been covering all urban, suburban and regional passenger rail systems: however Member States were allowed to exclude some local rail systems from the measures they adopt in implementation of the directives.

The urban rail systems operators (members of UITP) and manufacturers (members of UNIFE) developed from 2007[3] a joint initiative – the Urban Rail Platform (URP) – to convince the Commission, EU Parliament and Member States that interoperability between networks is not a target for local, urban and suburban rail, given the diversity of the networks and their local character. As regard market liberalisation, urban rail is operated in almost all cases under public service contracts under Regulation (EC) 1370/2007, so market liberalisation is not an issue.

The major stake for urban rail is therefore market improvement through standardisation. Indeed, achieving on a voluntary basis an appropriate level of urban rail technical harmonisation can allow the market working more efficiently if economies of scale are achieved, if cross acceptance of products is facilitated and if some non-transparent rules are clarified or removed. Standardisation can help expanding public transport market share, and as the European rail industry is a world leader it is also beneficial for European competitiveness.

Standardisation in Europe can be achieved through actions at the European level through the European Standardisation Organisations (CEN, CENELEC and ETSI) and at international level (through ISO, IEC, IEEE). Standardisation can also be prepared by major European Research projects as long as these projects involve a critical mass of operators and manufacturers.

[3] Joint initiatives for promoting Urban Rail at EU level started in fact in 1997.

The current report describes:

- first the action of the Urban Rail Platform towards the European institutions for recognising Urban Rail as a specific rail market segment and developing a standardisation initiative focusing on Urban Rail at EU level,
- then some other coordinated actions of EU urban rail operators and manufacturers at international level:
  - the "Spectrum User Group" initiative on the use of specific bandwidths for the operation of automated urban rail systems, which outcomes impacts a wider area than EU only (EU actions in the Telecommunications domain are indeed coordinated at ECC and CEPT levels[4]);
  - the standardisation of Communication Based Train Control systems – CBTC systems at IEC and IEEE levels.

As regard European level, the "Urban Rail Platform" (URP) adopted in November 2008 a position "Urban Rail - Towards a better harmonised market" which convinced the European Commission to agree with Member States (represented in the Railway Interoperability and Safety Committee - RISC) on the following two steps:

- Firstly, Member States were invited, when transposing the directive, to exclude the rail systems mentioned in Article 1(3)(a) and (b) of the Interoperability Directive 2008/57/EC[5];
- Secondly, the Commission would issue a Mandate to the relevant European standardisation bodies in order to develop voluntary standards for rail systems referred to under article 3(1) (a) and (b).

Later on, **the EC proposed in the 4th Railway Package to exclude urban rail systems from the scope of the new Interoperability and Safety Directives. This exclusion has been ratified on 11 May 2016 with the adoption of the technical pillar of the 4th railway package[6]**.

All the topics proposed and endorsed for standardization can be translated into or linked to R&I actions at the EU level, with financial support from EU funds and other national and international sources of funding.

This report shows the current state of play regarding standardization in (European) urban rail. It is the

[4] Two bodies take decisions for allocating spectrum in Europe:
- the ECC, Electronic Communications Committee, which considers and develops policies on electronic communications activities in European context, taking account of European and international legislations and regulations;
- the CEPT, European Conference of Postal and Telecommunications Administrations. Established in 1959 by the monopoly-holding postal and telecommunications administrations of 19 countries, it gathers today 48 countries. CEPT's activities include co-operation on commercial, operational, regulatory and technical standardisation issues.

[5] Rail systems as of Interoperability Directive Article 1.3 (a) and (b):
a) metros, trams and other light rail systems;
b) networks that are functionally separate from the rest of the railway system and intended only for the operation of local, urban or suburban passenger services, as well as railway undertakings operating solely on these networks;

[6] **Interoperability Directive (EU) 2016-797**: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.138.01.0044.01.ENG&toc=OJ:L:2016:138:TOC

Safety Directive (EU) 2016-798: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.138.01.0102.01.ENG&toc=OJ:L:2016:138:TOC

'twin' deliverable of the D4.8, which deals with the same aspects for mainline rail. Moreover, it is also linked with the WP6 deliverables, which have looked into the standardization potential of past EU-funded R&I projects. However, the investigated projects have not shown significant potential for standardization in urban rail, mostly because the main focus was mainline rail.

2. Urban rail standardisation: an alternative to mandatory EU legislation

2.1. The Mandate M/486 on Urban Rail

The Mandate M/486 EN has been issued on 04/02/2011 as "Mandate for programming and standardisation addressed to the European standardisation bodies in the field of Urban Rail". The European standardisation bodies (CEN, CENELEC and ETSI) - supported by the URP – accepted in spring 2011 to carry out the work in two phases:

- Phase A, drawing up in eight months a Standardisation Programme to be accepted by the competent Commission services, and presented for opinion to the Committee on Standards and Technical Regulations after consultation of the RISC.
- Phase B, development of standards, to be carried out according to the programme and the timetables as agreed in the previous phase.

In parallel the URP had been asked by the EC to define a set of "Fundamental requirements" to be used as a basic reference for the execution of the Mandate M/486.

The work of Phase A started in December 2010, before the official delivery of the Mandate, when CEN-CENELEC and ETSI created a working group called "Urban Rail Survey Group" – URSG. This Group and its "Task Forces" - made of experts Mandated by the National Standardisation Bodies or by the URP - met over two days every month in 2011 for developing a **coherent minimum set of standards for voluntary use in the field of urban rail**.

The results of the URSG works had been summarized in a report endorsed by CEN-CENELEC BTs (boards) on 19 September 2012 and transmitted to the European Commission on 9 October 2012 by a letter signed by CEN and CENELEC Director General and ETSI Director General. The letter had in appendix the final M/486 Phase A report. Both are presented in the report 797[7] sent by UITP to its members on 30 October 2012. ***The report 797 is part of the current FOSTER RAIL document (*****see annex I):** ***the M/486 report includes hyperlinks with all the detailed information produced by the URSG and URP.***

After acceptance by DG MOVE, the M/486 Phase A report had been presented end of 2012 for opinion to the Committee on Standards and Technical Regulations (98/34 Committee) after consultation of the RISC. This process developed over 2013 and did not change the proposed standardisation program, but

[7] UITP_797-en_with_Final_Report_Phase_A_Mandate_486.

the acceptance took more time than initially expected due to the fact that the new Regulation on standardisation[8] adopted in October 2012 had created a new Committee (Article 22) replacing the 98/34 Committee and that several months had been required for it to be fully running.

The official approval on the 5th of March 2014 of the standardisation program phase (Phase A) of the Mandate M/486 by the Committee for Standardisation allowed for the start of the phase B, the development of standards, which is still underway.

It has to be noticed that, in parallel to the works of CEN and CENELEC, the URP also made an action towards first ETSI (since 2011) and later EC (from 2014), through a dedicated Working Group called the "Spectrum User Group - SUG", in order to address the spectrum needs of Urban Rail Communication Based Train Control systems used for running safely automated urban rail networks – the so-called CBTC systems. The SUG initiative is described in this deliverable. The action towards EC (DG MOVE, DG CONNECT and ECC/CEPT) started when it became clear at the end of 2014 that the Mandate M/486 did not involve DG CONNECT and that actions at ETSI level were not sufficient to guarantee a proper level of safety for urban rail applications (in particular driverless metros).

2.1.1. Fundamental requirements for Urban Rail

The railway legislation has defined in the Interoperability Directive 2008/57/EC "essential requirements" for the European railway system which are a high level of mandatory requests which have to be strictly respected in any technical development. According to Mandate M/486: "As the essential requirements set out in Annex III to that Directive were not intended to cover urban and local rail systems and even if a majority of those essential requirements are applicable as well to urban and local rail systems due to the fact that they were expressed in very generic terms, there is a need to assess the essential requirements of the interoperability directive against the scope of this Mandate. The representative rail associations of the sector UITP and UNIFE (coordinated through their joint Urban Rail Platform, URP) are currently defining a set of "fundamental requirements" which shall be used as a basic reference for the execution of this Mandate."

The URP works for producing the "fundamental requirements" had started as of February 2010, using as basis:

- a previous document originally prepared by the joint UITP-UNIFE Working Group called "Draft Urban Rail Directive" which had been presented in a European Consultation organised at the end of 2004 and early 2005;
- the Appendix III of the interoperability Directive 2008/57/EC.

Twenty full day meetings organized by the URP for drafting the text (URP Writing Team) or commenting it (URP Plenary) have been held mostly in Brussels each time with the participation of 8 to 20 people coming from Germany, France, UK, Italy, Belgium in 2010 and 2011. After each meeting a new version of the draft has been produced.

[8] Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council Text with EEA relevance.

Many of these meetings have been complemented by meetings of “mirror groups” of the URP set up in Germany (by VDV), in France (by FIF, the “Fédération des Industries Ferroviaires”), in UK (by UKTram, Tramlink, LUL), which were including representatives of the Ministries in charge of urban rail matters.

The information about the works of the URP has been delivered in 2010 and 2011 during all meetings of UITP European Union Committee (UITP EUC) and of UITP rail Committees (Metro Committee; Light Rail Committee; Suburban and Regional Rail Committee).

Four UITP Euroteam[9] reports concentrating of the “Fundamental requirements” and asking for comments on the successive drafts have been sent to all members of UITP European Union Committee and to European members of UITP Rail Committees in 2010 and 2011. All members of UITP and UNIFE had been informed that the agreement achieved during the 5 October 2011 meeting would be the final version to be sent to the European Commission.

Following a request of DG MOVE that the Urban Rail Platform produces a “cover letter” explaining the background of the document and the way it had been achieved, a letter and the final versions of the "Fundamental Requirements" in English, French and German have been officially sent by UITP and UNIFE to DG MOVE on the 7th of November 2011. DG MOVE, DG TREN and Member States acknowledged the document at the end of November 2011 as a basic reference for CEN-CENELEC-ETSI for their future standardisation works during the phase B of the Mandate M/486.

The documents have been transmitted to CEN and CENELEC, to the members of the Urban Rail Survey Group, to the JPC-R (Joint Programming Committee for Rail), and to the GRB (Group of Representative Bodies).

Along 2012 and the first half of 2013, alternatives were discussed on the better way to give a visible status to the “Fundamental Requirements” document which could not be a legal act since no specific urban rail legislation is expected. Eventually, CEN-CENELEC agreed to make it the official CEN-CENELEC Guide 26 “Railway applications — Preparation of standards for urban rail systems design, construction, manufacture, operations and maintenance” which has been published on June 2013:

CEN-CENELEC Guide 26

Other language versions of Guide 26 are available:

Guide 26 - FR

Guide 26 - DE

This document is used as a reference for the execution of the Mandate M/486. It is intended to serve as a recommendation for Competent Authorities responsible for design, construction, operation and maintenance of Urban Rail systems.

[9] Now “UITP European Department”.

2.1.2. Mandate M/486 Phase A: Standardisation Programme

According to the structure of “Fundamental Requirements” and the Technical Committees - TC’s - of CEN and CENELEC the work of URSG had been structured into different task force groups:

- System and Operations
- Stations and Guideway
- Rolling stock (mechanical)
- Rolling stock (electrical)
- Traction Power Supply
- Signalling, Train Control System, Operations Control System

Using as input various documents produced by the URP, the first task of the URSG experts had been in 2010 and 2011 a gap analysis of the more than five hundreds CEN, CENELEC and ETSI as well as ISO and IEC standards already existing and under development, including the assessment of their revision.

In a second step each task force drafted in 2011 and 2012 “fiches of needs” for Urban Rail systems. Each fiche of Urban Rail needs had been referenced either against a specific existing standard to be modified or to be extended or against a request for a new standard, in order to close identified gaps by taking into account the expected benefits for the Urban Rail sector as addressed by the Mandate and the “Fundamental Requirements”.

While developing the standards, experts made use, where appropriate, of principles, elements, concepts and technical specifications applied for conventional rail, as well as of results of major European research projects such as "LibeRTiN" (FP5), "MODURBAN" (FP6), "URBAN TRACK" (FP6) and "MODSAFE" (FP7). Additional references to existing rules and recommendations used in Member States had been provided.

Priorities for standardisation had been defined by the URSG in coordination with JPC-R[10] which had been analysed by CEN and CENELEC at TC256 and TC9X level, with a consultation of National Standardisation Bodies (NSBs), between October 2011 and August 2012[11] before submission of the final URSG report to the EC in October 2012.

[10] The Joint Programming Committee for Rail set up at CCMC – CEN-CENELEC Management Committee – level between CEN-CENELEC-ETSI and the rail representative associations.

[11] The draft final URSG report had been presented to the JPC-R on 12 March 2012, and sent to DG MOVE on 20 March 2012 as an important milestone of the phase “A” of the Mandate. On 2 April 2012, the EC had transmitted the report to the RISC for information. CEN, CENELEC and ETSI had processed the URSG recommendations under the usual CEN-CENELEC procedures, with National Committees invited to send comments to CEN TC256 and CENELEC TC9X. These comments had been analysed during the plenary meetings of TC256 on 15-16 May 2012 and of TC9X on 14-15 June 2012, where several decisions had been adopted regarding the priorities for the phase “B”. Based on these decisions, the draft final report for phase 1 had been amended and sent by the CCMC to the Technical Board (“BTs”) members of CEN, CENELEC and ETSI for consultation by correspondence in August 2012. New comments have been produced by several National Committees, and the final version of the report has been produced.

2.1.2.1. Gap Analysis

For each standard its applicability in the Urban Rail sector had been checked with regard to the defined Urban Rail categories:

- Tram and Light Rail,
- Metro,
- Other Urban Rail systems ("Category IV").

The gap analysis had screened all available information and quoted each standard existing or under development with the following key regarding the scope:

- 0 applicable to heavy rail only (High Speed and Conventional Rail)
- 1 or 1G directly applicable to Urban Rail systems (1G is not limited to rail)
- 2 applicable with adaptations to all or some categories of Urban Rail systems
- 3 developed for Urban Rail systems only
- 4 not suitable or not important for Urban Rail systems

Furthermore, existing national legal technical rules applicable to the various categories of Urban Rail systems had been identified and listed as far as there was an input provided by the knowledge of participating members.

2.1.2.2. Standardisation topics and priorities

After the Gap Analysis the URSG Task Forces prepared so-called "Fiches of need" under an iterative process involving first the relevant task force and subsequently the Urban Rail Survey Group plenary.

As a whole, **54** fiches were eventually produced as part of the proposed Standardisation Programme.

One of these fiches, defined at the "***System***" level, intends to provide generic hazard analysis on system level and assignment of possible safeguards and recommendations for the application of the life-cycle process for Urban Rail.

One fiche, proposed at the ***"Sub-system" Signalling*** level, intends, in order to support operations, to specify functional requirements for signalling and other safety systems, for Trams and Light Rail systems (non-metro) as well as for category IV of railway applications.

All other **52** fiches are proposed at the "***component***" level:

Rolling Stock (Mechanical) covers ***37*** fiches addressing components including, but not limited to, brakes, wheelsets & bogies, electrical lighting, test for acceptance of Rolling Stock characteristics, air conditioning, under-run protector and obstacle deflector for tram and Light Rail. **Three** other fiches are shared with Guideway and Stations: on acoustics, on rules for calculating gauges and on similarities with bus.

Apart from the three fiches shared with Rolling Stock (Mechanical), the Task Force Guideway and Stations produced **11** fiches focusing on track standardisation (including one on acceptance of works for non-ballasted tracks), and the Traction Power Supply Task Force produced **one** fiche on electric traction overhead contact lines for trams, Light Rail and metros systems...

A Table accessible through the hyperlink: Table_1_Standardisation_Needs_September_2012.xls summarizes the proposed topics for standardization agreed at URSG level. It includes:

- the Task Force(s) producing the proposal
- the proposed title of the future standard
- the proposed scope
- the systems covered (Metro/Tram/Light Rail/Other Urban Rail)
- the priority (High: start the standardisation works as soon as possible; Medium: start within the next two years; Low: start at the occasion of a revision of the standard)
- the reference of the "Fiche of needs". The column "reference of the Fiche of needs" includes:
    - the file name, mentioning the reference of the standard to be modified except when a "NEW" indicates that no existing standard addresses the topic;
    - the proposed CEN-CENELEC Working Group for developing the standard Table 1 is also available as EXCEL file2 through the following link:

All "fiches of needs" are accessible through a hyperlink of the final URSG report (in Appendix 1 of the URSG report). Each specific "fiche" includes the following items (when relevant):

- reference to the requirements of the document "Fundamental Requirements"
- reference to the existing standards
- reference to the relevant national legal or technical rules across Europe
- the standardisation body concerned
- a proposed title for the standard
- a proposed scope for the standard
- justifications of the need

2.1.2.3. Cost drivers for technical harmonisation

In additions to the works of the URSG, and following a request of several URSG members, the Urban Rail Platform had organised in 2012 a meeting with representatives of manufacturers and operators focusing on the "cost drivers" to be taken into account for further joint action focusing on technical harmonisation. The "top cost drivers" which have been agreed upon (which are presented in the STRATEGIC ASPECTS AND BENEFITS OF STANDARDISATION of the URSG report) are as follows[12]:

- Approval & Acceptance
    - Cross acceptance
    - Generic hazard analysis
- Clear/ clarification of scope and content of standards
- Clarification of operational conditions
- Clear functional requirement specifications
- Interfaces between subsystems (e.g. Platform-vehicle interface):
    - Interdependencies based on preferred performance values
    - Technical interface specifications
- Basic documentation for maintenance, operation and safety
- Calculation principles, methods and assumptions

[12] Note: all further action should use the 'Fundamental Requirements' as a basic reference; all recommendations should be for voluntary use; based where relevant on a system view.

2.1.3. Mandate M/486 Phase B: Standardisation Works

The standardisation works of the phase B of the Mandate M/486 started in 2014. The current status of the works is presented in the second column of table 2 below.

Among the 54 fiches, 16 fiches had been given the highest priority by URSG, among which 14 had been under the CEN responsibility. CEN Working Groups had reduced the number of High Priority fiches from 14 to 9, and CENELEC had given only a Medium Priority to the fiches under its responsibility.

New Work Items proposals have been prepared for the CEN TC256 Plenary meeting of 4-5 November 2014.

The High Priority topics for URSG and CEN on which works are underway are as follows:

- **Under-run Protectors for trams/light rail (WG2) (High Priority)**
- **Obstacle Deflector/Lifeguard for trams/light rail (WG2) (High Priority)**

  For these two fiches on new topics, a decision has been taken to produce a technical rule for both fiches under the title: "**Vehicle end design for trams and light rail vehicles with respect to pedestrian safety**". Experts from 5 MS are interested. Among the 27 experts, 5 are representing Urban Rail –UR, and the kick-off was organised on 1 June 2015 in Vienna.
- **Wheelsets & bogies - Powered axles – Design Methods (WG11) (High Priority)**
- **Wheelsets & bogies – Non- powered axles – Design Methods (WG11) (High Priority)**

  For these two fiches related to respectively EN13103 and EN13104, it has been decided to merge them in a new 13103 in three parts:

  - Part 1 External journal – modifications shall be brought in future revision
  - Creation of a Part 2 for Internal journals including UR
  - Creation of a Part 3 on Independent wheels including UR

  Answering the call of experts of 5 September 2015, 9 experts from 5 MS registered, among which 2 UR experts (RATP and SWM), and the works have started.

Therefore only 4 of the high priority topics have been successfully covered up to now. The status of the 5 other High Priority topics for both URSG and CEN is as follows:

- **Track-Switches & crossings (WG18) (High Priority).** The fiche relates to EN13232. The focus on standards for grooved rail shall not start before September 2016.
- **Braking – Mass transit brake systems – Part 1: Performance requirements (WG47) (High Priority)**
- **Braking – Mass transit brake systems – Part 2: Methods of test (WG47) (High Priority)**

  These two fiches relate to EN13452-1 and EN13452-2. A WG 47 Braking meeting has been organised in Brussels on 15 April 2015. The call for experts closed on 26 November 2015 received positive answer from 2 MS only (France and Germany). More experts are required.
- **Track - Track-geometry quality (WG28) (High Priority).** The fiche relates to EN13848-1 to-5 (+6) and to prEN13848-4. The call for experts was unsuccessful (2 MS answered, Austria and France). No activity is planned before September 2016.
- **Gauges. New Part: Rules for calculating in urban rail (WG32) (High Priority).** The fiche relates to EN15273-1. Activities have been postponed due to the huge on-going technical work.

The status of the 7 other fiches which had received a High Priority for URSG and a lower (Medium) Priority level from CEN or CENELEC is as follows:

- **New fiche: Safety Requirements for Urban Rail (High Priority for URSG, Medium Priority for CENELEC)**. Works are still waiting the completion of the EN50126 series before starting.
- **Signalling and other safety systems for trams, light rail and other non-metro Urban Rail Systems (High Priority for URSG, Medium Priority for CENELEC).** The fiche is related to EN62290. A CENELEC Survey Group (14A) prepared the scope for a new EN complementing EN62290 for non-metro urban rail systems. A decision to start a WG has been taken on the 27 November 2025.
- **New topic: Recommendations regarding technical harmonization between bus and tram/Light Rail (High Priority for URSG, Low Priority for CEN)**. Nothing has been done.
- **Track alignment design parameters - Track gauges 1435 mm and wider (WG15) (High Priority URSG and Medium Priority CEN-CLC).** The fiche relates to EN13803-1 and -2. Following a call for experts on 3 July 2015 answered by 5 MS (9 experts named), a survey group with Raymond Jünger as convener kicked-off on 19 November 2015[13]. The next meeting was held on 9 May 2016. Switzerland proposed an amendment concerning Urban Rail definition in CEN-CENELEC guide 26).

- **Rescue coupler-Safety requirements (WG33) (High priority for URSG, Low Priority for CEN).** The fiche relates to EN15020. A call for experts was launched on 21 May 2015, and only 1 MS proposed 3 experts. No urban rail operator was nominated. The kick-off meeting planned for 16 September 2015 has been cancelled and the Work Item is frozen.

- **Braking-Wheel slide protection (WG47) (High Priority for URSG, Medium Priority for CEN).** The fiche relates to EN15595. A WG 47 Braking meeting has been organised in Brussels on 15 April 2015, and decided to postpone the works.

- **Driver's cab for urban rail vehicles – Visibility, layout, access (WG37) (High Priority for URSG, Medium Priority for CEN).** The fiche relates to prEN16186-1. Works are supposed to start after the publication of the EN. A call for experts planned for March 2016 has been delayed.

In addition, CEN has started addressing 8 other topics - 5 with a Medium and 3 with a Low Priority – as follows:

- **New topic "Bonding for railway applications" (Low Priority)**: a new WG (WG52) has been established, and the works started in June 2015.
- **Air conditioning for urban and suburban rolling stock – Part 1: Comfort parameters (WG8) (Low Priority)**
- **Air conditioning for urban and suburban rolling stock –Part 2: Type tests (WG8) (Low Priority)**

  These two fiches relate respectively to EN14750-1 and EN14750-2. The works have started in December 2015, with no UR experts.
- **Front windscreen for tram and metro application (new WG49) (Medium Priority)**
- **Side windows (for tram and metro application) (new WG49) (Medium Priority)**

[13] The nomination from Belgium failed because « De Lijn » is not member of the Belgian national standardization body. The nominated French expert (RATP) canceled his activities. A new nomination from Italy (Metro Milano) was registered.

These two fiches relate to EN15152 – the second one for an additional part. Activities are to start in a new SC3 WG (WG49 instead of former WG2/WG37), following a call for experts of 17 September 2015.

- **External visible and audible warning devices for urban rail applications (WG9) (Medium Priority).** The fiche relates to EN 15153. The kick-off meeting was organised on 9-10 November 2015. The works are supported by 5 MS, but with currently no UR expert.
- **Fixed installations - Electric traction overhead contact lines (TC9X SC9XC WG C13) (Medium Priority).** The fiche relates to EN50119. Works are on-going and UR requirements have been introduced.
- **Electrical lighting for rolling stock in urban rail applications (WG9) (Medium Priority).** The fiche relates to EN13272. The kick-off meeting was organised on 9-10 November and 12 December 2015. The works are supported by 5 MS, but with currently no UR expert.

There are 6 other topics for which initiatives have been taken to start working, and which have not been successful yet:

- **Axle boxes - Rolling Bearings/ Lubricating Greases/ Performance testing (WG12)** (**Medium Priority**)**.** These three work items are bound to EN12080/EN2081/EN12082. They are waiting for the release of the relevant ENs for heavy rail by the end of 2016.
- **Track - Performance requirements for fastening systems (WG17) (Low Priority).** The fiche relates to EN13481-1. SC1 decided on 9 October 2015 to prepare a prEN on “Railway applications – Infrastructure – Performance requirements for rail fastening systems for tramways”. However no official call for experts has been launched, and there is a need for urban rail experts representing operators.
- **Passenger Alarm System- System requirements (WG36) (Medium Priority for URSG, Low Priority for CEN).** The fiche relates to EN15327-1 repealed by EN16334. A call for experts closed on 30 October 2015 was not successful, no Urban Rail expert registered. Works are stopped.
- **Emergency call – Functional requirements (WG36) (Medium Priority for URSG, Low Priority for CEN).** The fiche relates to WI00256579. A call for experts closed on 30 October 2015 was not successful, no Urban Rail expert registered. Works are stopped.

Therefore, information on the current status of the Mandate M/486 Phase B Work Programme is available for 30 fiches over the 54 selected as a conclusion of Phase A. It would be worth checking the status of the others – most of which had a Low Priority for both URSG and CEN in 2013.

Table 2: LISTE OF NEEDS FOR STANDARDISATION IN THE FIELD OF URBAN RAIL ACCORDING TO MANDATE M/486

Status of Phase B works as of May 2016

Blue: start after 2016 Green: on-going Orange: call for experts planned Grey: call not successful Red: TC decided to freeze works	**TF: Task Force** **SYS**: Systems & Operations **SIG**: Signalling **RSMech**: Rolling Stock Mechanical **G&S**: Guideway & Stations **TPS**: Traction Power supply	**Systems covered** **M**: Metro **T**: Tram **LR**: Light Rail **O**: Other Urban Rail	**Priority** **H**: High, start asap **M**: Medium, start within the next 2 years **L**: Low, start at the occasion of the review	**ESO Working Group (from TC256 if no other)**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L	Priority H/M/L	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								URSG	CEN-CLC			
3	TR Planned on "Vehicle end design for trams and light rail vehicles with respect to pedestrian safety". Next meeting 1/06/2016		0	RS Mech	**Under-run Protector for Trams/Light Rail**	Specify functional requirements for a device which deflects pedestrians away from the front of a tram and prevents them from being drawn into the gap between the tram body and the road surface/embedded track	**T/LR**	**H**	***H***	***janv-14***	NEW: URSG_underrun-protector_TF_RSMECH_120109_V04.doc	**SC 3 WG2**
4			0	RS Mech	**Obstacle Deflector/ Lifeguard for Trams/Light Rail**	This device is in addition to the Under-run Protector for tram/Light Rail Definition of minimum functional requirements for the Obstacle deflector/lifeguard device	**T/LR**	**H**	***H***	***janv-14***	NEW: URSG_obstacle_deflector_lifeguard_TF_RSMECH_120109_V04.doc	**SC 3 WG2**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L	Priority H/M/L	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
1	Wait for EN50126	New fiche	0	SYS	**Safety Requirements for Urban Rail**	Generic hazard analysis on system level and assignment of possible safeguards and recommendations for the application of the life-cycle process according to **EN 50126** for Urban Rail. Need to clarify the scope and take into account MODSafe deliverables. **Note: CLC/TC9X decision D46/04: With respect to the urban rail fiche related to system safety, TC9X decides to postpone its decision until the work carried out by WG 14 on EN 50126 series of standards is achieved**	**M/T/ LR/ O**	**H**	***M***	**Jan 2015**	NEW: URSG_SystemSafety_SYS_111117_V05.doc	**Joint Working Group Urban Rail systems**
2	Work started following CLC Dec. 27/11/ 2015	New fiche complementing EN62290	0	SIG	**Signalling and other safety systems for trams, light rail and other non-metro Urban Rail systems**	Specify functional requirements for signalling and other safety systems for Trams and Light Rail systems as well as category IV of railway applications to support train operations. **Note CLC/TC 9X decision: "CLC/TC9X decision D46/03: With respect to the urban rail fiche related to signalling (non metro), TC9X decides to circulate a questionnaire to seek approval from national committees either not to carry out any work, to start work now or to set up a survey group to refine the scope of the future standard."**	**T/L R/O**	**H**	***M***	**Jan 2015**	NEW: URSG_Signalling (non-metro)_TF_SIG_111117_V05.doc	**TC9X SC A**

39	New EN. Work started 06/2015	New fiche	0	RS Mech	**Bonding for railway applications**	Requirements for the bonding process with regard to railway specifics	**M/T/ LR/ O**	**L**	***L***	**janv-16**	NEW: URSG_Bonding_TF-RSMECH_111107_V04.doc	**Working Group to be defined**
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Stan-dard Num-ber**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/l**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								URSG	**CEN-CLC**			
41	?	New fiche	0	RS Mech & G&S	**Recommendations regarding technical harmonization between bus and tram/Light Rail**	Address elements facilitating at least compatibility between bus and tram/Light Rail. Check functional requirements of the Bus directive and analyse their transferability for tram and Light RailAnalyse the potential need for a new standard on stations and stopping places design applicable to both bus and tram/Light Rail systems. With different values for the various modesSpecial attention should be given to the requirements for technical devices facilitating PRM access. **Need further clarification from UITP (particularly in the Bus domain field of expertise)**	**T/LR**	**H**	***L***		NEW:URSG_Similarities_with_bus_TF_G&S_&_RSMech_120109_V03.doc	**Working Group to be defined**
42	?	prEN ISO 3095	3095	RS Mech & G&S	**Acoustics - Measurement of noise emitted by railbound vehicles**	Influence of the track characteristics in the noise levels	**M/T/ LR**	**L**	***L***	Realised	URSG_prEN_ISO 3095_TF_RSMech+G&S_111107_V04.doc	**WG3**
27	?	EN ISO 3381	3381	RS Mech	**Acoustics - Measurement of noise inside railbound vehicles**	Influence of the internal vehicle characteristics in the noise levels	**M/T/ LR**	**L**	***L***	On going	URSG_EN_ISO 3381_TF_RSMech_111107_V03.doc	**WG3**

12	First draft Heavy Rail end 2016	EN 12080	12080	RS Mech	**Axle boxes - Rolling Bearings**	Include axle boxes and bearings for vehicles/bogies with independent wheels	**M/T/ LR**	**M**	***M***	**oct-13**	URSG_EN 12080_TF_RSMech_ 111107_V05.doc	**SC 2 WG12**
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Stan-dard Num-ber**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/L**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								UR SG	**CEN-CLC**			
13	First draft Heavy Rail end 2016	EN 12081	12081	RS Mech	**Axleboxes - Lubricating Greases**	Include axle boxes and bearings for vehicles/bogies with independent wheels	**M/T/ LR**	**M**	***M***	**oct-13**	URSG_EN 12081_TF_RSMech_ 111107_V05.doc	**SC 2 WG12**
14		EN 12082	12082	RS Mech	**Axle boxes - Performance testing**	Include axle boxes with internally mounted axle boxes and axle box bearings for independent wheels	**M/T/ LR**	**M**	***M***	**oct-13**	URSG_EN 12082_TF_RSMech_ 111107_V06.doc	**SC 2 WG12**
28	?	EN 12299	12299	RS Mech	**Ride comfort for passengers - Measurement and evaluation**	Revision of the ride comfort levels characterization levels according to the category of vehicle or exposed people (passengers, driver…)	**M/T/ LR**	**L**	***L***	**janv-15**	URSG_EN 12299_TF_RSMech_ 111107_V03.doc	**WG7**
5	Merged. Part 2: Internal journals including UR Part 3: UR - works started	EN13103	13103	RS Mech	**Wheelsets and bogies – Non Powered axles - Design method**	Include axle boxes with internally mounted axle boxes and axle box bearings for independent wheels	**M/T/ LR**	**H**	***H***	**Apr 2014** Start after the current revision of the standard	URSG_EN_13103_T F_RSMech_111107_ V07.doc	**SC 2 WG11**
6		EN13104	13104	RS Mech	**Wheelsets and bogies – Powered axles - Design method**	Include axle boxes with internally mounted axle boxes and axle box bearings for independent wheels	**M/T/ LR**	**H**	***H***	**Apr 2014** Start after the current revision of the standard	URSG_EN_13104_T F_RSMech_111107_ V05.doc	**SC 2 WG11**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L	Priority H/M/L	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
46	?	prEN 13146 parts 1 to 9 & EN 13146 parts 1 to 8	13146	G&S	**Track - Test methods for fastening systems**	Consider smaller axle load. Check the lateral forces on tighter curves. Possibly new part for enlarging the scope to embedded rail and to continuously supported rail. Consider the potential for twist where rails are fixed in embedment…	**M/T/ LR/ O**	**L**	***L***	**avr-15**	URSG_ EN_13146-parts-1to9_TF_G&S_111027_V03.doc	**SC 1 WG17**
47	?	EN 13230 parts 1 to 5	13230	G&S	**Track - Concrete sleepers and bearers**	Check the real applicability of the standard to urban rail	**M/T/ LR/ O**	**L**	***L***	**juin-13**	URSG_ EN_13230-parts-1to5_TF_G&S_111027_V02.doc	**SC 1 WG16**
48	?	prEN 13231 -1 & EN 13231 -1 & -2	13231	G&S	**Track - Acceptance of works – Part 1: Works on ballasted track - Plain line, switches and crossings**	Extend the scope to ballasted tracks with narrow gauge, smaller speed, smaller chord lengthConsider the geometric design limits of the vehicle with regard to the track geometryDevelop a new standard for non-ballasted track	**M/T/ LR**	**L**	***L***	**avr-15**	URSG_ EN_13231-parts-1&2_TF_G&S_120109_V03.doc	**SC 1 WG21**
49	?	prEN 13231-3 & EN 13231-3	13231	G&S	**Track - Acceptance of works - Part 3 (prEN): Acceptance of reprofiling - Part 3 (EN): Acceptance of rail grinding, milling and planing work in**	Extend the scope to other rail than vignole. Consider lighter rail than 40kg/m. Develop acceptance criteria for urban rail systems	**M/T/ LR**	**L**	***L***	**avr-15**	URSG_ EN_13231-3_TF_G&S_111027_V03.doc	**SC 1 WG21**

					track							
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Standard Number**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/L**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								UR SG	**CEN-CLC**			
43	No UR until SCI 09/2016	EN 13232 -1 to -9	13232	G&S	**Track - Switches and Crossings**	Check relevance of technical boundaries for tram/LRT and metro systems and applicability to other rail than vignole, consider introduction of sub-categories...	**M/T/ LR**	**H**	***H***	**janv-13**	URSG_ EN_13232-parts1to9_TF_G&S_ 111027_V02.doc	**SC 1 WG18**
15	?	EN 13260	13260	RS Mech	**Wheelsets and bogies - Wheelsets - Product requirements**	Include wheelsets with internally mounted axle boxes and/or brake disks mounted on the end of the axle	**M/T/ LR**	**M**	***M***	**avr-14**	URSG_EN 13260_TF_RSMech_ 111107_V05.doc	**SC 2 WG11**
16	?	EN 13261	13261	RS Mech	**Wheelsets and bogies - Axles- Product requirements**	Include wheelsets with internally mounted axle boxes and/or brake disks mounted on the end of the axle	**M/T/ LR**	**M**	***M***	**avr-14**	URSG_EN 13261_TF_RSMech_ 111107_V04.doc	**SC 2 WG11**
17	?	EN 13262	13262	RS Mech	**Wheelsets and bogies - Wheels - Product requirements**	Include wheels for urban applications, especially resilient wheels	**M/T/ LR**	**M**	***M***	**avr-14**	URSG_EN 13262_TF_RSMech_ 111107_V04.doc	**SC 2 WG11**

18	Kick-off 9/11/ 2015 and 12/15/ 2015. More UR experts needed	EN 13272	13272	RS Mech	**Electrical lighting for rolling stock in urban rail applications**	Clarify the scope and add a new chapter or a new standard for external lighting	**M/T/ LR/ O**	**M**	***M***	**avr-15**	URSG_EN 13272_TF_RSMech_ 120905_V04.doc	**SC 3 WG9**
7	Call closed 26/11/ 2015 no success (2 MS only)	EN 13452-1	13452	RS Mech	**Braking - Mass transit brake systems - Part 1: Performance requirements**	Complement the existing standard	**M/T/ LR**	**H**	***H***	**Jan 2014** Start after publication of the current revision of the standard	URSG_ EN 13452-1_TF_RSMech_1111 07_V03.doc	**SC 3 WG47**
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Stan-dard Num-ber**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/L**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								UR SG	**CEN-CLC**			
8	Call closed 26/11/ 2015 no success (2 MS only)	EN 13452-2	13452	RS Mech	**Braking - Mass transit brake systems - Part 2: Methods of test**	Complement the existing standard	**M/T/ LR**	**H**	***H***	**Jan 2014** Start after publication of the current revision of the standard	URSG_ EN 13452-2_TF_RSMech_1111 07_V04.doc	**SC 3 WG47**

50	SC1 decided on 9/10/ 2015 a prEN. No official call, UR experts needed.	EN 13481-1 **New prEN: "Railway Applications - Infrastructure - Performance requirements for rail fastering systems for tramways".**	13481	G&S	**Track - Performance requirements for fastening systems**	Extend the scope of limiting parameters (minimum radius, axle load, twist), extend to other rail than vignole (parts 2 to 5) and to embedded and continuously supported rail	**M/T/ LR/ O**	**L**	***L***	**avr-15**	URSG_ EN_13481-parts1to7_TF_G&S_ 111018_V03.doc	**SC 1 WG17**
29	?	EN 13715	13715	RS Mech	**Wheelsets and bogies - Wheels – Tread profile**	Jointly focus on the standardization of the wheel profile and possibly the rail profile	**M/T/ LR**	**L**	***L***	**avr-14**	URSG_EN 13715_TF_RSMech_ 111107_V04.doc	**SC 2 WG11**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L UR SG	Priority H/M/L CEN-CLC	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
44	A SG (RaJ) to prepare a new WI proposal (NWIP) , kick-off 19/11/ 2015 . new SG meeting 09/05/ 2016	EN 13803 parts 1 & 2 **Amendment from Switzerland concerning urban rail definition**.	13803	G&S	**Track alignment design parameters - Track gauges 1435 mm and wider**	Extend the scope to narrow gauges, low speed, low axle load, small curve radius.	**M/T/ LR/ O**	**H**	***M***	**Apr 2017** Start could be anticipated if appropriate experts made available	URSG_ EN_13803-parts1&2_TF_G&S_111027_V04.doc	**SC 1 WG15**
45	Call closed 10/01/ 2016 no success. No UR activities until SC1 in 09/2016	EN 13848-parts 1 to 5 (+6) + prEN 13848-4	13848	G&S	**Track - Track geometry quality**	Extend the scope to narrow gauges, low speed, low axle load, small curve radius. Analyse further the relationship between speed, axle load and curve radius. Check applicability to open track and maintenance depot.	**M/T/ LR/ O**	**H**	***H***	**juin-13**	URSG_ EN_13848-parts1to5_&new_part6_TF_G&S_111027_V04.doc	**SC 1 WG28**
19	?	EN 13979-1	13979	RS Mech	**Wheelsets and bogies - Monobloc wheels - Technical approval procedure - Part 3: Resilient wheels**	Include approval procedures associated with resilient wheels and the requirements for the use of noise mitigation measures	**M/T/ LR**	**M**	***M***	**avr-14**	URSG_EN 13979-1_TF_RSMech_111107_V04.doc	**SC 2 WG11**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L URSG	Priority H/M/L CEN-CLC	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
20		EN 14363	14363	RS Mech	**Testing for the acceptance of running characteristics of railway vehicles - Testing of running behaviour and stationary tests**	Cover the testing for acceptance of the running characteristics of metros, trams and light rail	**M/T/ LR**	**M**	***L***	**Apr 2017** Could be anticipated if appropriate experts made available	URSG_EN 14363_TF_RSMEch_111107_V4.doc	**WG10**
31		EN 14531-(6, future -2)	14531	RS Mech	**Brakes - Methods for calculation of stopping and slowing distances and immobilization braking - Part 2: Step by Step calculation for train sets or single vehicles**	Clarify applicability for urban rail Check back-to-back consistency between EN 14531 and EN 13453	**M/T/ LR/ O**	**L**	***L***	**Jan 2018** Start after publication of current version	URSG_ EN 14531-6 (2)_TF_RSMech_111107_V03.doc	**SC 3 WG47**
30		EN 14531-1	14531	RS Mech	**Brakes - Methods for calculation of stopping distances, slowing distances and immobilization braking - Part 1: General algorithms**	Clarify applicability for urban rail Check back-to-back consistency between EN 14531 and EN 13452	**M/T/ LR/ O**	**L**	***L***	**Jan 2018** Start after publication of current version	URSG_ EN 14531-1_TF_RSMech_111107_V02.doc	**SC 3 WG47**

51	?	EN 14587 Parts 1 & 2 and prEN 14587 -3	14587	G&S	**Track - Flash butt welding of rails**	Extend the scope to cover grooved rail, considering profile standard/hardness, of EN 14811 dedicated to grooved rail	**T/L R**	**L**	***L***	**End 2012** Start after publica-tion of current draft	URSG_ EN_14587-parts1to3_TF_G&S_ 111027_V03.doc	**SC 1 WG4**
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Stan-dard Num-ber**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/l**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								UR SG	**CEN-CLC**			
52	?	EN 14730-parts1&2	14730	G&S	**Track - Aluminothermi c welding of rails**	Extend the scope to cover grooved rail, considering profile standard/hardness of EN 14811 dedicated to grooved rail	**T/L R**	**L**	***L***	**End 2012** Start after publica-tion of current draft	URSG_ EN_14730-parts1&2_TF_G&S_1 11027_V04.doc	**SC 1 WG4**
32	Kick-off 15/12/ 2015 with UR experts	EN 14750-1	14750	RS Mech	**Air conditioning for urban and suburban rolling stock - Part 1: Comfort parameters**	Introduce a separation of the existing "category B" into two distinct ones, separating metro from tram/light rail and compare with bus	**M/T/ LR/ O**	**L**	***L***	**janv-14**	URSG_ EN 14750-1_TF_RSMech_1111 07_V06.doc	**SC 3 WG8**
33		EN 14750-2	14750	RS Mech	**Air conditioning for urban and suburban rolling stock - Part 2: Type tests**	Introduce a separation of the existing "category B" into two distinct ones, separating metro from tram/light rail and compare with bus	**M/T/ LR/ O**	**L**	***L***	**janv-14**	URSG_ EN 14750-2_TF_RSMech_1111 07_V05.doc	**SC 3 WG8**
34	?	EN 14865-1	14865	RS Mech	**Axlebox lubricating greases - Part 1: Method to test the ability to lubricate**	Clarify the real applicability of the current standard to the various categories of urban rail systems	**M/T/ LR**	**L**	***L***	**oct-13**	URSG_ EN 14865-1_TF_RSMech_1111 07_V05.doc	**SC 2 WG12**

35	?	EN 14865-2	14865	RS Mech	**Axlebox lubricating greases - Part 2: Method to test the mechanical stability to cover vehicle speeds up to 200 km/h**	Clarify the real applicability of the current standard to the various categories of urban rail systems	**M/T/ LR**	**L**	***L***	**oct-13**	URSG_ EN 14865-2_TF_RSMech_111107_V05.doc	**SC 2 WG12**
N° RaJ	**Status May 2016**	**Standard number**	**Filter: Stan-dard Num-ber**	**TF**	**Proposed title**	**Proposed scope**	**Systems covered**	**Priority H/M/L**	**Priority H/M/L**	**Start date CEN-CLC**	**Reference of the "Fiche of needs"**	**Proposed WG**
								UR SG	**CEN-CLC**			
10	Decision 51/04: lack of UR experts under WI 00256786 on Rescue coupler for UR	EN 15020	15020	RS Mech	**Rescue coupler – Safety requirements**	Define all the safety and testing requirements in case adaptor coupler is required for rescue operation by urban rail systems	**M/T/ LR/ O**	**H**	***L***	**oct-13**	URSG_ EN 15020_TF_RSMech_111107_V04.doc	**SC 2 WG33**
21	17/09/ 2015 call for experts. Nothing started yet	EN 15152	15152	RS Mech	**Front windscreen for tram and metro application**	Adapt performance requirements and test conditions for metro and tram. Compare with bus	**M/T/ LR**	**M**	***M***	**janv-15**	URSG_EN 15152_TF_RSMech_120905_V03.doc	**SC 3 / WG2 WG37**
22		EN 15152 additional part	15152	RS Mech	**Side windows (for tram and metro application)**	Include performance requirements for side windows making reference to existing requirements for safety glass used in the automotive industry	**M/T/ LR**	**M**	***M***	**Jan 2015** Link with EN 15152, the revision of which is under-way	URSG_EN 15152_side-windows_TF-RSMech_120905_V04.doc	**SC 3 / WG2 WG37**

23	Kick-off 10/11/ 2015	prEN 15153	15153	RS Mech	**External visible and audible warning devices for urban rail applications**	Adapt Head, marker and tail lamps and audible warning devices for metro and tram. Compare with bus for tram	**M/T LR/ O**	**M**	***M***	**Jan 2015** Start after publica-tion of current revised version	URSG_pr EN 15153_TF_RSMech_ 111107_V03.doc	**SC 3 WG9**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L URSG	Priority H/M/L CEN-CLC	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
40	**Postponed**	EN 15273 part 1	15273	RS Mech & G&S	**Gauges New part: Rules for Calculating Gauges for Urban rail infrastructure and rolling stock**	Define a calculation method for the gauge of urban rail systems. Consider defining a dynamic gauge for the rolling stock, completely independent of the infrastructure and introducing a gauge for the fixed obstacles built from the dynamic gauge and from margins depending of the type of infrastructure and of the location of the obstacle (in tunnel, in a station, etc.). Draft a guide of the broad/main principles used in the determination of gauges	**M/T/ LR**	**H**	***H***	Ongoing (huge technical work – scope to be re-viewed)	URSG_EN_15273-1_TF_RSMech_&_G&S_120109_V05.doc	**WG32**
24	?	EN 15313	15313	RS Mech	**Wheelsets and bogies – maintenance of resilient wheels**	Jointly focus on the standardization of maintenance of wheelsets and independent wheels equipped with resilient wheels used on metro, tram and light rail	**M/T/ LR**	**M**	***M***	**Apr 2014** Start after publica-tion of current revised version	URSG_EN 15313_TF_RSMech_111107_V04.doc	**SC 2 WG11**
25	EN 16334 Call closed 25/10/2015 unsuccessful. New call 28/01/2016	EN 15327-1 **Repealed by EN 16334**	15327	RS Mech	**Passenger Alarm System - System requirements** Note: title changed according to that of EN16334	Enlarged scope should cover Urban Rail systems and their needs Note: URSG reference was EN15327-1 which shall be repealed by EN16334 (see updated fiche)	**M/T/ LR**	**M**	***L***	**Jan 2018** Start after publica-tion of EN16334	URSG_EN 15327-1_&_EN 16334_TF_RSMech_120905_V05	**SC 3 WG36**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L	Priority H/M/L	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
36		prEn 15328	15328	RS Mech	**Braking - Brake pads**	Include requirements for brake pads typical in size and geometry for urban rail systems and adapt performance requirements and test conditions	**M/T/ LR/ O**	**L**	***L***	**Jan 2018** Start after publication of current draft	URSG_pr EN 15328_TF_RSMech_ 111107_V03.doc	**SC 3 WG47**
53		EN 15594	15594	G&S	**Track - Restoration of rails by electric arc welding**	Extend scope in order to cover grooved rail, considering profile standard/hardness of EN 14811 and rail profiles defined in EN 13674	**M/T/ LR/ O**	**L**	***L***	**janv-17**	URSG_ EN_15594_TF_G&S_ 111027_V02.doc	**SC 1 WG4**
9	**Postponed**	EN 15595	15595	RS Mech	**Braking - Wheel slide protection**	Describe requirements for tram, light rail and metros and include wheel slide protection systems for hydraulic brake systems	**M/T/ LR**	**H**	***M***	**janv-15**	URSG_prEN 15595_TF-RSMECH_111107_V 03.doc	**SC 3 WG47**
37	?	EN 15827	15827	RS Mech	**Requirements for bogies and running gears**	Extend the scope to urban guided transit after adaptation of other relevant standards	**M/T/ LR**	**L**	***L***	**oct-13**	URSG_EN 15827_TF_RSMech_ 111107_V04.doc	**SC2 (WG13)**
38	?	Became EN 15892 in 2011	15892	RS Mech	**Noise Emission - Measurement of noise inside driver's cabs**	Add a paragraph, annex or new part for metro, light rail and tramway and adapt test requirements	**M/T/ LR**	**L**	***L***	**janv-15**	URSG_ EN 15892_TF-RSMECH_111107_V 02.doc	**WG3**
11	Start after publication of EN16186-1	prEN 16186-1	16186	RS Mech	**Driver's cab for urban rail vehicles- Visibility, layout, access**	Design rules for Driver's cab for metro, tram and light rail	**M/T/ LR**	**H**	***M***	**janv-15**	URSG_prEN 16186-1_TF-RSMECH_111107_V 05.doc	**SC 3 WG37**

N° RaJ	Status May 2016	Standard number	Filter: Standard Number	TF	Proposed title	Proposed scope	Systems covered	Priority H/M/L	Priority H/M/L	Start date CEN-CLC	Reference of the "Fiche of needs"	Proposed WG
								UR SG	CEN-CLC			
54	UR requirements introduced	EN 50119	50119	TPS	**Fixed installations - Electric traction overhead contact lines**	Consider using overhead conductor rail in Light Rail and trams and metros systems Consider covering Light Rail operation with multiple LRVs with more than one operating pantograph and operations speed lower than 100km/h Consider building fixings, insulators GRP (Glass Reinforced Plastic), loop insulators	**M/T/ LR**	**M**	***M***	**Jan 2015** Start revision of EN 50119 after publication of the Amendment to EN50119 and finalisation of IEC 60913	URSG_ EN50119_TF_TPS_120109_V02.doc	**(TC9X) SC9XC WG C13**
26	With EN16334 See RaJ 25	WI 00256579	256579	RS Mech	**Emergency call - Functional requirements**	Take into account the operational characteristics of tramways and metros, especially automatic metros.	**M/T/ LR/ O**	**M**	***L***	**Jan 2018** Start after publication of current version	URSG_WI00256579_call-for-aid_TF-RSMech_1111107_V03.doc	**SC 3 WG36**

The table for Mandate M486 from the previous pages not only provides a good and up-to-date overview of the standardization work currently on-going, but also shows some of the topics that would be most relevant for R&I activities at the EU level, with support from both EU and national funding.

2.2. Urban Rail actions at ETSI level: THE SPECTRUM USER GROUP initiative coordinated by UITP

2.2.1. Action towards ETSI from 2010 to 2012

The FP6 European research project called MODURBAN (2005-2009) coordinated by UNIFE with a large participation of manufacturers, Urban Rail operators and UITP (see www.modurban.org) had concluded that an action would be useful to reserve a frequency spectrum for the safe operation of Urban Rail Communication Based Train Control Systems - CBTC Systems[14].

Due to the fact that several Urban Rail operators were and are still benefiting of an exclusive use of bandwidths in the 5,9 GHz spectrum for the operation of fully unattended operation of CBTC metro lines[15], UITP created in 2011 a dedicated working group called the Spectrum User Group (SUG) to address the specific issue of the reservation of a bandwidth for safety-related applications in the field of Urban Rail. The initiative was supported by 26 metro operators and 5 rail manufacturers[16].

The EC Mandate M/486 on Urban Rail had not explicitly taken into account Urban Rail CBTC needs which were not clearly expressed at the moment it was written, but a SUG action towards ETSI has been developed during the Phase A of the Mandate M/486 which is reported in the final Phase A report (see Annex I of the current report).

The SUG prepared a « System Requirement Document » - SRDoc[17]- which has been transmitted to ETSI in 2012.

ETSI considered this SRDoc as a draft and as part of the works performed under the **ITS mandate M/453** (see below), so it **officially adopted a slightly revised version on 10 October 2014** (SRdoc TR 103 111). Indeed, two mandates had been issued at the European level regarding the use of the 5,9 GHz spectrum:

[14] Metro lines which are operated at a high level of performance and short intervals between successive trains are now installing Communications-Based Train Control systems, in short CBTC.

[15] Some national telecommunications regulators (Denmark, Finland France, Spain and Sweden) have awarded licenses for an exclusive use of part of the bandwidth by local rail operators for the safe operations of metro type lines using CBTC systems: either for 5,915-5,935 GHz (Paris, Lille, Rennes, Lyon, Malaga, Stockholm), or 5,925-5,975 GHz (Helsinki, Copenhagen).

[16] As of 2011:

- OPERATORS : Amsterdam (IVV) and the Netherlands (GVB), Athens (STASY), Berlin (BVG), Brussels (STIB/MIVB) and Belgium (DeLijn), Barcelone (TMB) and Catalunya (FGC), Copenhagen (Metroselskabet), Hamburg (Hochbahn AG), Lisbon (CARRIS & MetroLisboa), London (LU), Malaga (MetroMalaga), Madrid (MM & Metroligero-Oeste), Milano (MM), Munich (SWM GmbH), Nuremberg (VAG), Paris (RATP), Marseille (RTM) and France (KEOLIS & VEOLIA), Stockholm (SLL), Stuttgart (SBB-AG), Valencia (FGV).
- MANUFACTURERS: Alstom, Ansaldo STS, Areva, Bombardier Transportation, Siemens.

[17] "Electromagnetic compatibility and Radio spectrum Matters (ERM); Spectrum requirements for Urban Rail Systems".

- the **EC Mandate M/453 to CEN, CENELEC and ETSI**[18], following the ECC Decision (08)01[19] and the EC Decision 2008/671/EC[20]. The purpose of these Decisions was to harmonise the conditions for the availability and efficient use of the frequency band **5875-5905 MHz for safety-related applications of Intelligent Transport Systems (ITS) in the Community**. The ECC Decision (08) 01 also decided "that CEPT administrations shall consider within a future review of this Decision the designation of the frequency sub-band **5905–5925 MHz for an extension of ITS spectrum** noting that protection of ITS cannot be ensured in this band".
  The ECC Working Group on Frequency Management – WG FM - had set up a dedicated task force, the SRD/MG task force[21]*, to which the SRdoc TR 103 111 has been presented in October 2014.*
- the **EC Mandate RSCOM13-32rev3 to CEPT**, following the Commission Decision 2005/513/EC as amended by Decision 2007/90/EC on the harmonised use of radio spectrum in the 5 GHz frequency band (5150-5350 MHz and 5470-5725 MHz) for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs)[22]. The Commission Recommendation 2003/203/EC on the harmonisation of the provision of public RLAN access to public electronic communications networks and services in the Community invited Member States to allow the provision of such services in the available 2,4 GHz and **5 GHz** bands to the extent possible **without sector specific conditions**. In this regard, the use of the bands for the operation of WAS/RLAN systems shall be subject only to general authorisation and not to the grant of any individual right. *The recommendations from the ad-hoc working group have not yet been finalized and should be known in 2019 only.*

2.2.2. SUG actions towards EC and ECC from 2014

Due to the fact that the ETSI recommendations adopted in October 2010 did not fully fit into the expectations of the SUG, the SUG contacted DG MOVE and DG CONNECT, which proposed that SUG members participate in some meetings of the ECC Working Group (WGFM-SRD/MG) in order to prepare the decisions to be taken in the WG FM#82 mid-February 2015 meeting (see below).

On 17 February 2015, the WGFM sent a Liaison Statement – LS – to ETSI ERM[23] **"to consider Urban Rail Systems as part of ITS"**, as follows:

[18] DENTR/D4, 6 October 2009: M/453 EN. Standardisation mandate addressed to CEN, CENELEC and ETSI in the field of Information and Communication Technologies to support the interoperability of Co-operative systems for Intelligent Transport in the European Community.

[19] ECC/DEC/(08)01: ECC Decision of 14 March 2008 on the harmonised use of the 5875-5925 MHz frequency band for ITS, and subsequent amendments.

[20] EU/EC 2008/671/EC-2008: EC Decision of 5 August 2008 on the harmonised use of radio spectrum in the 5875-5905 MHz frequency band for safety related applications of Intelligent Transport Systems (ITS).

[21] SRD/MG: Short Range Devices/Maintenance Group.

[22] The parts of the 5 GHz range that are currently used in the EU for WAS/RLAN systems are subject to different usage conditions which reflect the results of previous coexistence studies. These conditions include the restriction of the use to indoor use only as well as the implementation of mitigation techniques, such as Transmitter Power Control (TPC) and Dynamic Frequency Selection (DFS). Pursuant to Art. 4(5) of Decision 2005/513/EC Member States shall keep mitigation techniques under regular review and report to the Commission thereupon. In this regard the Commission services are monitoring the investigations that are on-going in CEPT on the current status of DFS in the 5 GHz frequency range.

[23] ERM: Radio Spectrum Matters.

"*During its 82nd meeting in Antalya, WGFM endorsed the analysis provided by SRD/MG based on the requests set out in ETSI SRDoc TR 103 111 for Urban Rail Systems. The analysis paper is attached to this request*[24].

In summary, WGFM requests ETSI to consider:

- *that the existing ITS regulation (amended ECC Recommendation (08)01 and amended ECC Decision (08)01) is proposed to be considered also for Urban Rail Systems;*
- *shared use of the current ITS spectrum also for Urban Rail CBTC in 5875-5905 MHz as well as CBTC shared use with future ITS applications in 5905-5925 MHz;*
- *whether urban rail systems can potentially use ITS standards and specifications, possibly with some extensions. EN 302 571 seems acceptable for CBTC communication systems;*
- *that in order to share common frequencies/channels, a Detect-And-Avoid functionality should be applied to all Urban Rail and ITS users of these frequencies guaranteeing the highest priority to the most critical services;*
- *that guidance and information to national administrations on how to deal with Urban Rail systems in general may be provided in an ECC Report in the future;*
- *the mandates M/453 for ITS and M/486 for programming and standardisation addressed to the European Standardisation Bodies in the field of Urban Rail. M/486 has not taken into account Urban Rail CBTC at the time it was written. A better co-ordination inside ETSI is recommended between urban rail systems and ITS.*

WGFM encourages ETSI to find common technical solutions for urban rail and ITS applications. CEPT Reports 14 and 44 recommend that whenever possible, foster the equal access to spectrum, avoid fragmentation of the spectrum use, bundle applications within the transportation sector and having similar requirements. Only in case of valid reasons consider a dedicated spectrum solution. A technical solution with ITS needs therefore to be studied as an alternative to the provision of dedicated spectrum, and may be a more spectrum efficient solution than a dedicated solution for urban rail systems.

In relation to other proposed applications in the 5 GHz frequency bands; in its Mandate to CEPT (RSCOM13-32rev3), to study and identify harmonised compatibility and sharing conditions for Wireless Access Systems including Radio Local Area Networks in the bands 5350-5470 MHz and 5725-5925 MHz, the Commission required that the operational sharing conditions for WAS/RLANs should in particular ensure that protection is guaranteed for priority systems supporting EU policies, such as Intelligent Transport Systems (in 5875-5905 MHz).

WGFM has not requested WGSE to conduct compatibility studies for Urban Rail systems in addition to on-going studies under the 5 GHz mandate."

Following the WG FM decision of 17 February 2015, the two ETSI Committees for Rail Technology – ETSI RT – and for Intelligent Transport Systems – ETSI ITS, established a joint Task Force ETSI JTFIR for proceeding the works.

2.2.3. Outcomes of ETSI JTFIR works

The ETSI JTFIR produced in May 2016 a document submitted to ETSI as ETSI TR 103442 which has been approved as version 1.1.1[25].

[24] FM(15)094 Annex 41 and FM(15)094_Annex 42 LS to ETSI on Urban Rail Systems.

[25] http://www.etsi.org/deliver/etsi_tr/103400_103499/103442/01.01.01_60/tr_103442v010101p.pdf

2.2.3.1. ETSI JTFIR conclusions

The TR 103442 concludes by proposing four scenarios for future works as follows:

The present document has showed different solutions for achieving sharing between CBTC and ITS application which are summed up in the tables 6 and 7.

All the proposed solutions need additional investigation in order to better understand the practical feasibility. In the meantime, while developing the sharing solutions mentioned above and to ensure continued operation of existing and future deployment of CBTC, it is recommended that mass transit operators should be allowed to use the spectrum from 5 905 MHz to 5 925 MHz in the limited CBTC areas according to national regulations.

Table 6: Possible mitigation methods

	Changing the ITS transmit parameters when inside a mitigation area			**Harmonized access layer protocol**
	Stop transmitting	***Reduce fixed duty cycle limit***	***Reduce duty cycle limits based on the channel load***	
Technical implementation	ITS G5 stop transmitting.	ITS G5 reduce duty cycle.	ITS G5 : Measure the channel load. Change the duty cycle according to channel load.	CBTC implement ITS G5 access layer protocol and encapsulate its messages.
CBTC channel definition	Free channelization within 5 905 MHz to 5 925 MHz.	Free channelization within 5 905 MHz to 5 925 MHz.	Free channelization within 5 905 MHz to 5 925 MHz.	Same as ITS with 10 MHz channels.
Impact on CBTC	Compatible with existing systems.	Compatible with existing systems.	Compatible with existing systems.	Implement harmonized protocol Not compatible with existing systems.
Impact on ITS	ITS not allowed to use shared channels in the mitigation area.	Always use of very low duty cycle in the mitigation area.	Use of very low duty cycle when high channel load.	Use of lower priority level in shared channels. No detection needed.
Work to be done	Specification, test and implementation.	Specification, test and implementation.	Investigate if necessary and how to measure CBTC channel load. Specification, test and implementation.	Specification, test and implementation.

Table 7: Methods to detect a mitigation area

	Geographical data base	Detection of CBTC signal	CBTC warning beacon
Technical implementation	A data base in the ITS devices specifying CBTC areas.	ITS radio device detects a CBTC signal.	Informs ITS devices about their entry into a CBTC area by using ITS messages.
Impact on CBTC	Provide updated areas information.	None.	Deploying the beacon.
Impact on ITS	Implement data base and geolocation checking. Download updated database.	Implement a CBTC receiver. Depending on detector implementation, there is a risk for false alarms.	Decoding the warning message.
Work to be done	Specification, test and implementation.	Specification, test and implementation.	ITS warning beacons to be adapted for CBTC protection areas. Specification, test and implementation.

2.2.3.2. Next steps at ETSI level

In order to address the sharing scenarios and mitigation methods techniques mentioned in the TR, the JTFIR members agreed to rename the task force as "SURITS - Spectrum Urban Rail ITS", so that the future documents produced by the task force do not require to be approved by ETSI RT and ETSI ITS.

The next step is that ETSI TC RT has to get an agreement of the TC ERM that the TR 103442 is transmitted by the ETSI Liaison Officer to WG FM. The document will then be forwarded to SRD/MG and discussed in detail in London on 7-9 September 2016.

2.2.4. UITP Position Paper of 23 November 2015

While waiting for the SRD/MG and WG FM decisions, the UITP SUG got in touch with DG MOVE and DG CONNECT and several letters have been exchanged between UITP and DG Connect[26] in 2015. Indeed UITP's concern is to get the highest priority required for safe operation of automated metros known outside of ETSI.

This is the reason why on 23 November 2015, UITP produced a Position Paper supported by 22 important members of UITP[27] and UNIFE:

[26] Letter from UITP (Alain Flausch) to DG CONNECT (Andreas Geiss) dated 10 April 2015. Answer from DG CONNECT(Andreas Geiss) on 30 April. Second letter from UITP dated 18 May. Answer from DG Connect dated 27 May 2015 (signed Giuseppe Rizzo on behalf of Andreas Geiss).

[27] Alstom; BKV (Urban rail operator in Budapest); Bombardier; DPP (Urban rail operator in Prague); FGC (Urban rail operator in Barcelona); Keolis (International Urban rail operator); MTR (International Urban rail operator); RATP & RATP Group (Paris area and International Urban rail operator); RET (Urban rail operator in Rotterdam); Siemens; Société du Grand Paris (Contracting authority in Paris); Sporveien (Urban rail operator in Oslo); Stasy (Urban rail operator in Athens); STIB – MIVB (Urban rail operator in Brussels; TMB (Urban rail operator in Barcelona); Transdev (International Urban rail operator); UITP; London Underground

"The automation of existing urban rail lines and the development of fully unattended metro operation (no staff on board) are booming and represent tomorrow's challenges in this sector. Millions of passengers use urban public transport every day (in Europe, 31,6 million daily passengers in 45 cities only for metro), and the European Union's modal shift objective means more people using public transport.

As urban or suburban rail operators, manufacturers, contracting authorities and their official representatives, we express our need to deploy and operate Communications-Based Train Control systems (CBTC) with protected frequency channels. Through Automatic Train Operation and Supervision, CBTC allows achieving very high performance and safety of urban rail systems, making it ready for answering tomorrow's mobility needs.

Several European operators had already obtained reserved frequencies in the 5.9 GHz band for CBTC application from their national authority. The systems proved successful and have been operating for many years. Exclusive or prioritized protected use of this bandwidth is of paramount importance because safety and reliability of train operation is at stake. CBTC allows for metro trains to run with headways as short as 80 seconds and even below. This generates high line throughput (80,000-100,000 passengers per hour on a single line). With such demanding operating conditions, it is easy to understand that competitive access, interference and deny of service absolutely have to be avoided to guarantee safe and reliable operation.

However, the development of new technologies such as ITS (Intelligent Transport Systems) will generate new needs for broadband communication and frequency bandwidth, and they apply for the same 5.9 GHz band.

European bodies in charge of standardization and frequency regulation are doing substantial work in order to mitigate the risks of sharing a common band between CBTC and ITS. DG CONNECT (Spectrum) confirmed UITP that "It is clear that whichever solution will be identified for urban rail applications (in particular driverless metros) it will need to guarantee a proper level of safety."

We emphasise the need to guarantee at European level the highest priority for rail safety-related applications even if the channels are shared with other modes like ITS.

The return on investment in rail infrastructure is in the medium/long term and regulatory framework stability is a pre-condition for allowing new developments as well as refurbishments. Then Europe can also become an example followed in other parts of the world."

2.2.5. Next steps for the SUG

The SUG had been given a mandate from UITP members for a period of 5 years which is now over. There is now a need for UITP to issue a new mandate for the SUG addressing the following issues:

- Involvement of SUG members in the ETSI SURITS works on the four scenarios proposed in TR 103442;
- Possible action outside ETSI focusing also on a bandwidth beyond 5,925 GHz which cover the uplink SATCOM channels not yet allocated while downlink in the 3,6GHz has already been discussed[28] (e.g. at EC level – DG CONNECT, or by asking the national regulators to provide 10MHz beyond 5925MHz as proposed by The Netherlands regulator on the 10th of December 2015).

(LUL) (Urban rail operator in London); UNIFE; UTP (Official representative of French public transport operators); VDV (Official representative of German public transport).

[28] See ECC Report 173. The use of the bandwidth 5925MHz to 5945MHz is different from country to country (e.g. France uses it a lot for fixed equipment) and would not be easier to handle than the bandwidth below 5925MHz.

- Up to now, focus has been given on safety related applications for data management. What about Voice over IP and CCTV applications for safety related applications or not (after replacement of TETRA), and with a scope potentially enlarged to other local public transport modes (bus)?

- For mainline, GSM-R is expected to be no longer effective after 2018. On mainline the current trend for replacing GSM-R is a specific LTE operated by a Carrier in the 700 MHz band (freed by the analogic TV). But some mainline rail stakeholders have shown an interest in the 5,9 GHz bandwidth. Could some kind of cooperation between UITP and CER, UIC and ERA be suitable?

The information outlined in relation to the SUG show the topics that urban rail operators want to address, and could be supported by R&I activities, as well as standardization – on a case-by-case basis, also depending on the possibilities and involvement of the other relevant stakeholders.

2.3. Standardisation in the field of CBTC systems

2.3.1. The market/competitiveness of CBTC systems

Metro systems are very successful. There are currently 180 metro networks in 160 cities and 55 countries in the world, among which 48 networks in 46 cities and 21 countries in Europe. From the 1970s to the year 2000, there were approximately 25 new metro systems every decade. Since the start of the new millennium, more than 45 cities have been added to the list.

Urban rail systems have used a variety of train control systems since the 1960s:

- Automatic Train Protection systems – ATP systems - with continuous supervision based on information transmitted through the rails, or using inductive loops;
- Intermittent ATP systems based on balises or magnetic trip stops;
- Automatic Train Operation systems - ATO systems completely independent from the ATP system, e.g. London Victoria line and RATP.

The first Communication Based Train Control (CBTC) systems were implemented in the 1980s. Originally implemented on greenfield lines without secondary detection, some were driverless. The first re-signalling projects with CBTC were developed in the 1990s, e.g. London Dockland Light Rail and San Francisco MUNI. CBTC began using radio communication in the 1990s, e.g. Singapore NEL, Las Vegas

Since the beginning of the 21st century the CBTC market (with various functionalities of ATP, ATO, ATS) increased very quickly. CBTC has been chosen for re-signalling in numerous cities, e.g. in New York, London (Jubilee Line), Paris (5 lines), Copenhagen S-Bahn (400 km), and is most often the choice for new & expanding networks worldwide.

CBTC has become the technology of choice for urban rail systems in the last 15 years: the CBTC share of urban signalling increased from 25% to 85% from 2000 to 2013.

CBTC is also the preferred choice for Unattended Train Operation (UTO) systems: CBTC serves 80% of the fast growing market of fully automated metros.

The UTO Atlas, UITP Observatory of Automated Metros, provides detailed information on the growth of UTO systems across the world summarised as follows:

- 1980-1990: 7 cities, 83 km;
- As of 2000: 14 cities, 196 km;
- As of 2013: 32 cities, 674 km, 48 lines, 700 stations[29];
- Expected total length 2025: 1888 km[30].

The growth factor of UTO compared with previous decade is as follows:

- 2000/1990: x2
- 2010/2000: x2,5
- 2020/2010: x3,5

[29] Asia 40%; Europe 32%; North America 19%; Middle East 12%; Other 1%.

[30] Growth distribution % of new km 2014-2025: Europe 37%; Asia: 27%; Middle East: 21%; South America: 10%; North America 4%; Australia: 2%

The most important part of the UTO growth shall be in Europe.

Current leadership of European rail manufacturers in the CBTC market is an important advantage in the rail industry global competition.

In terms of innovation, adoption of high capacity radio by most suppliers has provided the base for add-on functionality, and significantly more sophisticated on-board diagnostics, contributing to the reduction of metro LCC and increasing significantly the quality of service provided to metro customers.

2.3.2. CBTC systems standardisation

The definition of CBTC has been standardized by the IEEE in IEEE-1474 (1999), which gives the following definition[31]:

A CBTC system is a continuous, automatic train control system utilizing:

- high-resolution train location determination, independent of track circuits;
- continuous, high-capacity, bidirectional train-to-wayside data communications;
- and trainborne and wayside processors capable of implementing automatic train protection (ATP) functions, as well as optional automatic train operation (ATO) and automatic train supervision (ATS) functions.

The IEEE had been involved in standardization activities for CBTC, but without covering all the aspects, and without being the only organization to address this subject

In the 1990s, initiatives have been taken in Europe to standardise the CBTC systems: these initiatives were developed at IEC[32] level and supported by the works developed in EU projects. The first of them was UGTMS, standing for "Urban Guided Transport Management and Command/Control Systems", an EU FP5 project developed in 2002-2004.

The UGTMS global objectives were to:

- analyse the transfer of ERTMS ATP requirements (directive 96/48 on high speed rail);
- define the relevant functional and system requirements specification for all types of urban transport management systems in order to improve interoperability and intermodality;
- define open system standards, to allow gradual change towards harmonised systems, to foster the European market and to reduce Life Cycle Costs (LCC);
- propose a common approach for safety and conformity assessment in order to improve the consistency of existing regulations taking into account IT systems;
- initiate the premises of a 'centre d'excellence' for safety by a Network of Universities.

UGTMS lead to the adoption at IEC level of the IEC standard 62290-1 (updated in 2014) [33] which provides an introduction to the standard and deals with the main concepts, the system definition, the principles and the basic functions of UGTMS for use in urban guided passenger transport lines and networks. It defines CBTC in almost identical terms as in IEEE 1474.

[31] IEEE Std. 1474.1-2004 (R2009) IEEE standard for Communications-Based Train Control (CBTC) Performance and Functional Requirements.

[32] The International Electrotechnical Commission is the international standards and conformity assessment body for all fields of electrotechnology: www.iec.ch

[33] IEC 62290-1: 2014. "Railway applications - Urban guided transport management and command/control systems - Part 1: System principles and fundamental concepts".

A follow-up project of UGTMS has been the MODURBAN FP6 project. MODURBAN - Modular Urban Guided Rail System project - was launched at the beginning of 2005 and was officially completed in March 2009. It intended to develop common functional specifications for operators and a common technical architecture for manufacturers that looked to produce a standard set of functional requirements for Urban Guided Transport System including CBTC systems. MODURBAN led to the adoption of the IEC standard 62290-2 (updated in 2014)[34] which specifies the functional requirements of UGTMS. This part of IEC 62290 is applicable for new lines or for upgrading existing signalling and command control systems using:

- continuous data transmission;
- continuous supervision of train movements by train protection profile;
- localisation of trains by external wayside equipment or reporting trains.

Unfortunately, MODURBAN could not achieve the target of fully standardising the interface between on-board and wayside components of CBTC systems.

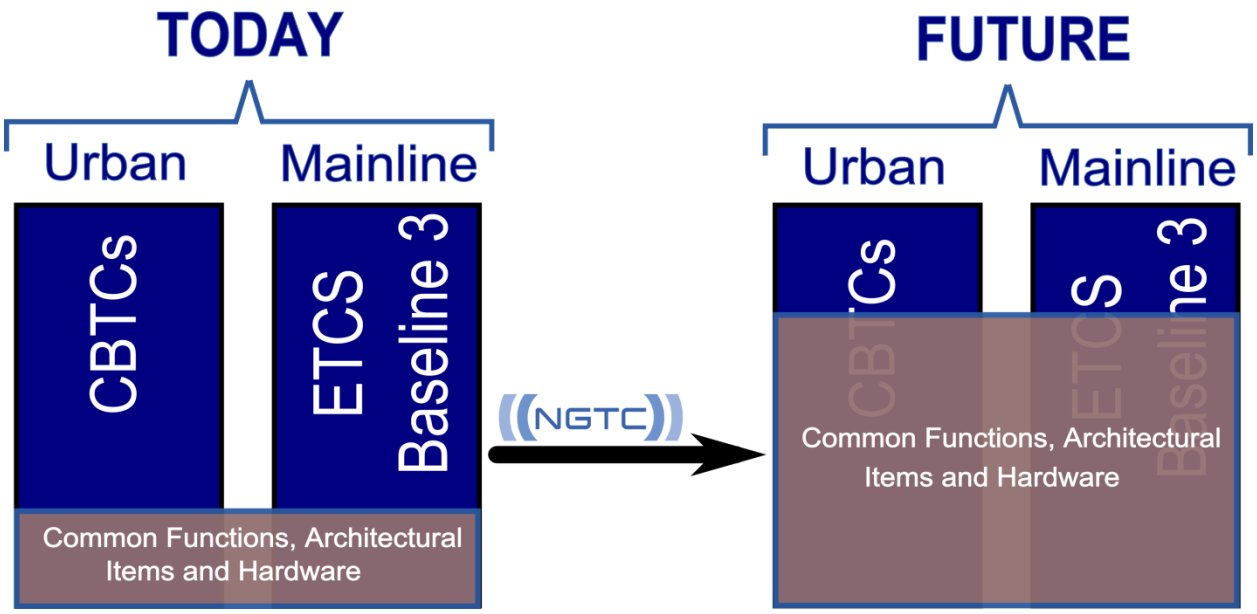
A new attempt has been launched through the still on-going FP7 NGTC project. NGTC – Next Generation of Train Control – started in July 2013 for three years and has been recently extended until February 2017. The objective of NGTC is to develop specifications for train control systems for urban and mainline domains increasing the convergence of both ETCS and CBTC systems. It is expected that the results of the project will be used by the respective IEC WG developing IEC 62290-3 standard.

The project has finalized the ETCS/CBTC investigation of operational and functional consistencies and differences. It consisted of:

- comparing the existing functional requirements of the main line and the urban domains, in order to identify current synergies and opportunities for new approaches;
- identifying new functional requirements for both the mainline domain (intended to complement the existing ERTMS Baseline 3) and urban domain (addressing CBTC system enhancements and future operational scenarios). The system functional requirements cover all grades of automation, to create a greater convergence between the two systems where possible;
- producing the NGTC Functional Requirement Specifications (FRS) by combining common mainline and urban functional requirements, also specifying the functional requirements specific for each railway domain. These FRS shall be updated at the end of the project.

The NGTC objective is illustrated below. The proposed solution(s) will build on the experience of ETCS and its standardised train protection kernel and use the experience suppliers have gained by having developed sophisticated and innovative CBTC systems around the world.

[34] IEC 62290-2:2014. Railway applications - Urban guided transport management and command/control systems - Part 2: Functional requirements specification.



Based on the NGTC FRS the project is now developing the system architectures, functional allocation, and interfaces (FIS) for a next generation of train control systems for the mainline and urban markets. These new architectures will utilise a common ATO, while maintaining the separate urban and mainline ATPs. Work on the common ATO are using as an input the results from the: MODURBAN project (a previous FP6 project); and the ATO over ETCS project (part of TEN-T program).

"Moving Block principles" is another major NGTC topic that has a potential to improve the transport capacity of railway lines, reduce the cost of the signalling installation and maintenance and increase the reliability of service. The project has finished defining the Moving Block concepts and principles in a generic way, applicable to different railway types, and is currently validating the concepts through the defined operational scenarios.

A Work Package of NGTC is focusing on Radio-based communication technologies, which can provide rail control systems with better data throughput and quality of service for decreased installation and operational cost. With the long-term vision of the bearer independency, NGTC has defined the requirements' specifications (Throughput and Quality of Service) and has identified the potential technologies that should be further investigated as the possible candidates for the future applications: LTE, G5 or Satcom, depending on the actual needs of railway applications. A set of recommendations for external stakeholders has also been produced.

NGTC outputs will feed into Shift2Rail (S2R), a public-private joint undertaking under Horizon 2020 focused on the breakthrough of European rail research and innovation in rail, with the budget of €920 million. The objective of this program is to increase the competitiveness and attractiveness of the rail transport and to support the completion of the Single European Railway Area.

NGTC shall contribute to various research topics, most notably to the S2R Innovation Platform 2 - IP2 - dealing with the Advanced Traffic Management and Control Systems. Further, the NGTC project results will be directly integrated into the S2R technology demonstrators (TD), showing the maturity of the newly developed concepts for the Adaptable communication (TD2.1), ATO up to the GoA4 (TD2.2), Fluid Moving Blocks (TD2.3) and Advanced fail safe train positioning (TD2.4).

Unfortunately, neither NGTC nor SHIFT2RAIL shall succeed in producing the fully detailed functional specifications (FFFIS: Form Fit Functional Interface Specification) required to standardize the interface between the on-board and wayside components of CBTC systems, as the full completion of this task was not foreseen within the former initiative and the subsequent project developments have reduced this aspect even further, while the latter does not address this in any way. Additional Research and Innovation works based

on the urban rail operators' needs and future developments shall be necessary to achieve the targeted level of standardisation for Urban Rail CBTC systems.

3. Conclusion

From the information provided above, and when compared to the FOSTER RAIL deliverable for standardisation in mainline, it can be noted that, unlike the mainline rail system(s), the urban rail is less dependent or in a need of legislation and standardization. Moreover, not all the standards and legislation applicable to the mainline rail is applicable to urban rail – or the other way around – given the inherent differences in operations, infrastructure, etc. In the urban sector, due to its more complex environment, requirements and legacy systems, legislation and standardization has a more limited scope, and many aspects are solved by 'best practices' in the extended definition of the term.

However, this does not mean that the urban rail sector has no legislation and standardization applicable. As this document proves, the mandate M/486 has ample activities that are on-going and that promise to help facilitate a number of aspects within this rail sector. Other activities are done at the ETSI level, in order to offer the urban rail system the best solutions given the fast pace of technological progress and the ever complex urban environment in which operators perform their activities. And all these standardization activities can be translated into or linked to various R&I activities at the EU level, in order to reinforce both technical and operational progress and standardization activities – the same or other standardization activities that stem from the initial ones - thus creating a virtuous circle

Furthermore, some standardization activities are also proposed by the operators themselves, as in the case of SUG, or receive considerable support, as in the case of signalling (CBTC) systems. R&I activities in this sphere are also needed, due to the importance of the topic and the interest of the urban rail stakeholders.

The review of previous EU-funded research projects, done in FOSTER RAIL WP6, also shows that many of the projects have addressed only mainline rail and/or do not produce relevant outputs for standardization for urban rail, which shows that the urban sector needs a specific approach and the involvement of its stakeholders in order to achieve successful results – both in R&I and in standardization.

All in all, the document thus proves that urban rail does have a number of standardization needs and potential, and would require more support and national and European level to address them, including through R&I projects. However it needs a specific approach in order to address the various topics at stake. Otherwise the main risk is that standardization will be done but will only address a small part of the urban rail needs.

4. Annex

As described in the deliverable, in the Annex there is the Final report of the Phase A of the mandate M/486, attached.

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