

LibeRTiN Light Rail Thematic Network

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LibeRTiN is a thematic network aimed at the establishment of a truly European Internal Market for Light Rail Systems.

Its main goal is the search for a sector-wide consensus in fostering simplification, modularisation, interchangeability of light rail sub-systems.

This activity has the objective of increasing the cost effectiveness and reliability of light rail systems for Europe's citizens.

LibeRTiN is part of the EU 5th framework programme for sustainable growth and development. LibeRTiN is now in the final consensus building phase III and will end in March 2005 with a set of final recommendations for both industry and operators.



ATKINS



SEMALY
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Foreword

The EU funded LibeRTiN Thematic Network is nearing its completion. The progress of the various working groups underlines the joint efforts by manufacturers, operators and other stakeholders and has demonstrated open-mindedness, frankness and the willingness to achieve measurable results for the entire industry. The recommendations from the 10 different groups will unquestionably help to contribute to an improved business environment: simpler, harmonised solutions will increase reliability and rationalise manufacturing processes, thus resulting in more cost effective Light Rail systems and vehicles, and better profitability for manufacturers.

During this last phase of the project (January to date), the business climate of the Light Rail sector has gone through some rocky times. More often than usual, manufacturers and operators have hit the headlines of both the trade press, and the general finance media. News was nearly always alarming and rather negative and this depressed climate could also be felt during the most recent UITP Light Rail Conference in Dresden earlier this year.

This demonstrates that the premise under which the LibeRTiN initiative started was not only confirmed, but also the absolute necessity of the project was reinforced. Therefore, UNIFE and UITP are even more convinced of the relevance and usefulness of the joint LibeRTiN efforts.

UNIFE and UITP members are united in their proactive approach to producing common proposals and solutions with the goal of regaining Light Rail's attractiveness and an acceptable level of profitability in the business. This was also stressed in the opening session of the UITP Light Rail Conference in Dresden.

In order to reach this common goal, UITP and UNIFE have a "three-tier approach":

- **R&D:** LibeRTiN identified a series of areas where future research is needed. Further, UNIFE and UITP submitted to the EC an Integrated Project called MODURBAN (Modular Urban Guided Rail Systems). The consortium, which draws together all manufacturers and most large European operators will also produce tangible results.
- **Standardisation:** Another main LibeRTiN output is the provision of direct recommendations for standardisation in a series of topics, some of which will be directly and formally fed into the works of CEN/CENELEC.
- **Legislation:** For the final piece of this "trilogy" UNIFE and UITP have been very instrumental in drafting an "Urban Rail Directive" in co-operation with DG Enterprise. The aim is to achieve an EU-wide legislative framework for technical harmonisation. A public consultation process on this draft directive will be launched soon in order to receive feedback from all stakeholders before the formal Community decision-making process involving Commission, Parliament and Council is formally launched.

Beyond the concrete results and contractual output of the project, LibeRTiN has fully fulfilled the objective of a Thematic Network, i.e. providing a tool and a climate to foster dialogue in a particular sector. The work, meetings and discussions have proven extremely instrumental in helping participants to better understand each other's concerns and constraints. Some recent initiatives are an indirect result of LibeRTiN to help introduce recommendations at specific national level and help overcome regulatory obstacles. For example the UK National Audit Office reported in May 2004 into the performance of light rail schemes, and one of the recommendations was for greater standardisation. Because LibeRTiN was seen as already addressing this recommendation, it became a key topic for the public and private sector bodies recently set up in the Light Rail industry (UKTram and the LRT Forum). The result is that at least two authorities are utilising the results of LibeRTiN in planning their light rail schemes.

Detached from all the technical issues, UITP and UNIFE firmly believe that the LibeRTiN results will be beneficial to all the stakeholders, as they are based on a mutual understanding for achieving a common goal, namely to make public transportation attractive for users, reliable for operators and profitable for manufacturers and investors.



Drewin NIEUWENHUIS
General Manager
UNIFE



Hans RAT
Secretary General
UITP



LIBERTIN THEMATIC NETWORK - PHASE III

The third and final LibeRTiN phase has now started, where the consensus building across light rail stakeholders, public transport authorities and operators, is now reaching its final stage to meet the following initial objectives:

- *Simplification/harmonisation of standards and interfaces;*
- *Modularisation where possible and based on a collaborative approach;*
- *Interchangeability of components where possible and based on a collaborative approach;*
- *Common basic operational principles.*

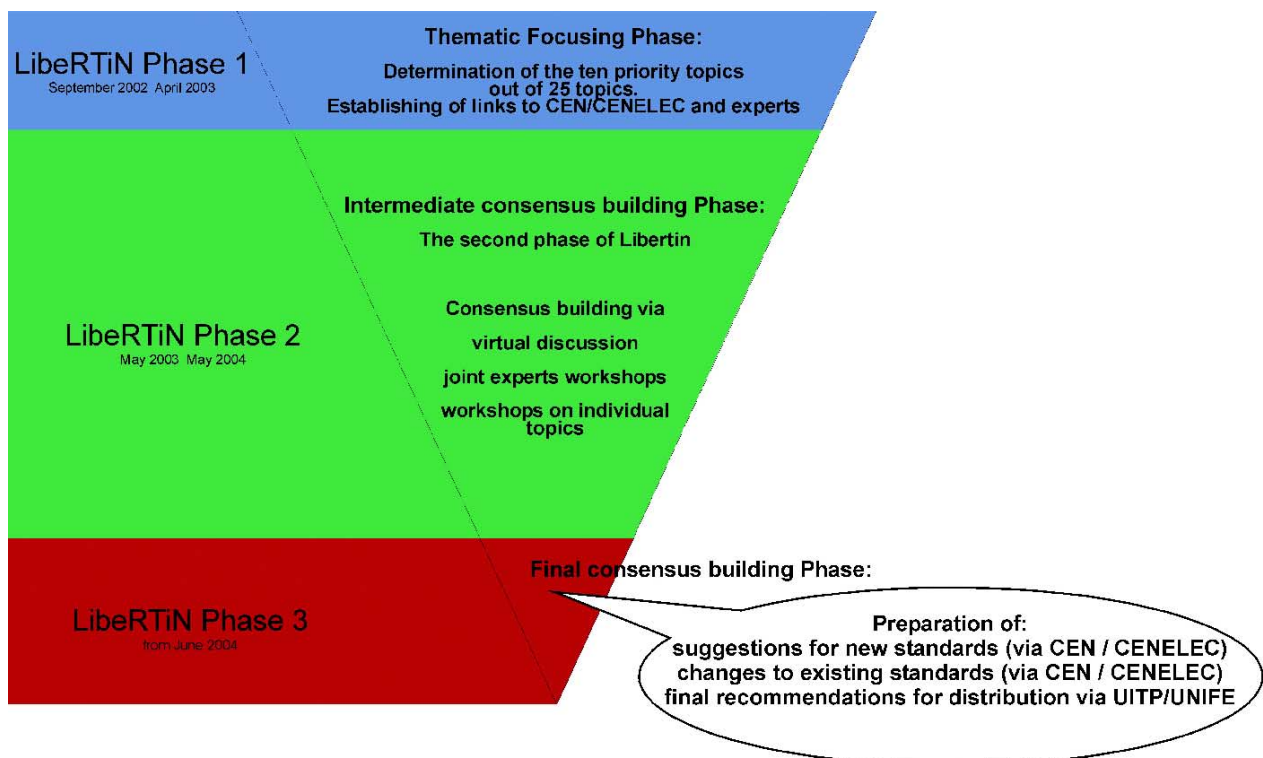
Experts, gathered in working groups, have provided the necessary inputs and feedback on the draft documents aimed at the fulfilment of these goals. In this light, the final LibeRTiN workshop held in Prague on 7 - 8 of June was a significant event, facilitating ideas and giving direction to the activities of the consortium partners.

THE MAJOR DELIVERABLES SET OUT IN PHASE II OF THE LIBERTIN PROJECT WERE:

- *Achieving consensus on possible harmonisation guidelines and amendments/revision of standards*
- *Revision of standards through the drafting of a "scope document" to be delivered to the European Standardisation bodies CEN-CENELEC-ETSI*
- *Guidelines and recommendations*
- *Providing inputs for possible EU Directives and Regulations*
- *Providing inputs for research projects in terms of modular approach and system architecture*

CONCLUSION:

LibeRTiN Phase 3 (final consensus building) will achieve all the stated deliverables.

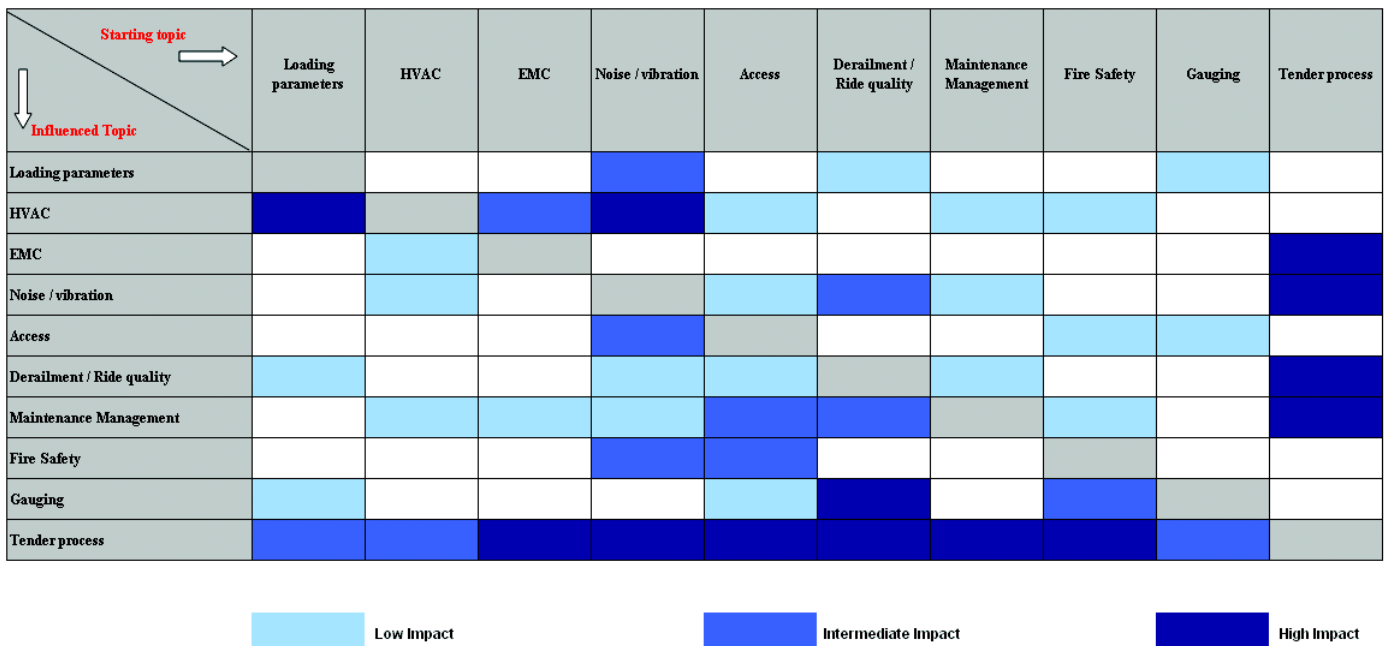


The ten LibeRTiN ‘commandments’:

TOPIC GROUPS	LEADERS
1. Fire Safety	SEMALY
2. Loading parameters	TTK
3. Derailment and Ride Quality	AEA Technology
4. Maintenance Management	DI
5. Structure Gauging	SEMALY
6. Noise and Vibration	Atkins
7. Access	TTK
8. EMC (ElectroMagnetic Compatibility)	Atkins
9. HVAC (Heating, Ventilation and Air Conditioning)	DI
10. The Tendering Process	AEA Technology

After performing an initial subsystem analysis, identifying possible requirements and standards to be revised, changed or updated in order to foster better harmonisation and provide for better cost performance at the level of tendering, a *system analysis* was performed. The result is a comprehensive matrix of interrelation. The final review of this from the Prague Workshop is produced in figure 1

Figure 1 - LibeRTiN - System Analysis Phase III - Prague, June 2004



The system analysis enables interaction of inputs from the several LibeRTiN working groups focusing on specific sub-systems.

BRIEFING ON LIBERTIN PRIORITIES

1. Fire Safety



As previously explained in the LibeRTiN newsletter no. 2, consensus was reached during the Naples workshop because prEN45545 does not clearly take into account the specifics of Light Rail vehicles.

The agreed conclusion was to ask CEN to add or amend the specific category covering the majority of light rail systems.

In order to complete this goal, a letter co-signed by UITP/UNIFE was sent to CEN to ask for a new category adapted to tramways:

"Vehicles with no on-board fuel supply, with easy passenger evacuation and good communications equipment..."

As consensus had been reached, the results of the LibeRTiN actions and the status in the acceptance process were presented in the plenary session in Prague.

To summarise, the standard prEN45545 is currently put on standby for optimisation due to negative votes from various Member States:

- Part 1: general: has been recently rejected at formal vote stage.
- Part 2: fire behaviour of materials and components: only in draft form, soon to be submitted to first formal enquiry.
- Part 3: fire barriers: has been recently rejected at formal vote stage.
- Part 4: vehicle design rules: presently under formal enquiry.
- Part 5: electrical equipment: already voted



- Part 6: fire control and management systems: draft forwarded to the CEN secretariat.
- Part 7: installations of flammable liquids and gases: presently under technical enquiry.

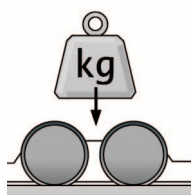
Thanks to the industry workshops with the system integrators, it was clearly established by the manufacturers that the standard in its current form is too complex to implement and prevents a positive impact on cost savings. The Fire Safety presentation in Prague was followed by a UNIFE presentation by Eric Fontanel (Technical Director, Alstom Transport), to explain the main reasons for their negative vote in the standard.

As a conclusion and quite natural continuation of the LibeRTiN action, experts, UNIFE and UITP decided to take the lead in the follow up of the improvement of the standard as one subject for future research.



Working Group Leader: Dominique Segulier - Semaly at d.seguier@semaly.com

2. Loading parameters



This topic has been finalised following the Naples workshop in November 2003. The topic group has reached agreement on the fact that the existing standard (EN 12663) should include a fixed value for loading parameters in relation to LRVs. The aim is to help planners distinguish between loading parameters for vehicle structural design (value in kg/m^2), planning of line capacity (value in pass / m^2), planning of timetables (no fixed value, allowing for passenger comfort during traffic peaks). For the planning of lines and timetables, planners should refer to the existing UITP recommendation "topic 35".

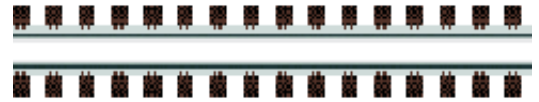
For vehicle structural design, EN 12663 has to be used and should be changed as follows: The maximum loading capacity will be calculated based on the number of available seats (mass of a passenger) and the surface of the standing area (mass per m²) of the vehicles. This first option is also in line with BOStrab standards and DIN 25008 (on calculation of rail vehicle masses).

Since the Prague workshop in June 2004 a scope document has been prepared and handed over to UITP and UNIFE for internal review. This document will then be provided to the European standardisation body CEN (TC 256 WG 2). For the masterplan for future research, the group has raised the question of the applicability of dynamic loads (as proposed for heavy rail) to LRV, which will be included in next version of standard EN 12663.

Working Group Leader: Steffen Plogstert - TTK at steffen.plogstert@ttk.de

3. Derailment and ride quality

Previous workshops identified a need for a vehicle-track interface specification, to define infrastructure limits that will be compatible with the standardised vehicle designs of the various manufacturers.



In order to complete this specification, detailed discussions have been held with the three main vehicle suppliers. Because of the time required to do this, the completed specification could not be presented to the Prague workshop, but is expected to be available by mid-September. It concentrates on track geometry limits as these are the most important for interoperability. It is less important to standardise wheel profiles as they tend to be specific to each network, and the same vehicle can easily have different wheel profiles for different networks. The specification also includes separate limits for street tramway (1000 or 1435mm gauge), 'city rail' (equivalent to the German 'Stadtbahn') and tram-train networks. Certain parts cannot be completed during the LibERTiN project as full information is not available, and further research is recommended to progress these.

The Prague expert workshop considered the questions of ride comfort and track quality. It is not possible for vehicle suppliers to offer a particular level of ride comfort on board the vehicle, unless assumptions about the track are also defined. Some networks seek to define ride comfort levels when purchasing new vehicles, but very few carry out any systematic specification or measurement of track quality. Instead they tend to rely on the judgment of experienced engineers to decide whether track is acceptable and what repair work is needed.

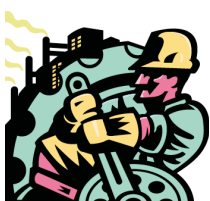
The discussion concluded that many networks will have to move away from this historic practice, as track which was previously acceptable may not be compatible with higher operating speeds or new vehicle types. It is also likely that some networks will seek to outsource more track maintenance and repair work, in which case the contract will have to include measurable track quality limits. This is a suggested topic for future research.

For similar reasons, research is also suggested into whether light rail networks need to consider the dynamic loads imposed by vehicles on the track. Dynamic behaviour is also important for other topics such as structure gauging.

The project has also commissioned an English translation of the German vehicle guidance regulations ('Spurfuerungsrichtlinien'). This is currently being revised after checking, and will be made available via the LibERTiN website.

Working Group Leader: Edwin Marks - AEA Technology Rail at edwin.marks@aeat.co.uk

4. Maintenance Management



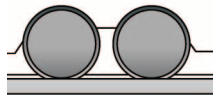
Maintenance management is a topic of common interest within the light rail business and therefore the topic group's work received a high level of feedback at the final plenary expert workshop held in Prague June 2004. Many addressed problematic or cost intensive areas will be handled within the main output of the working group: *The guidelines on «Implementation and use of maintenance management»*. These guidelines will provide relevant information regarding practical procedures, necessary tools and summarise best practices.

During the last working period before Prague input from the supply industry was gathered through interviews carried out with Alstom, Bombardier and Siemens. Furthermore infrastructural maintenance aspects were considered and will be part of the resulting document.

One example of the issues covered in the guidelines is the question of how to optimise the often too costly specified maintenance regimes. The UITP Light Rail Committee see this as being of particular interest for operators and a procedure to counter this need for optimisation will be presented in the guidelines.

Working Group Leader: Lars-Erik Walther - Die Ingenieurwerkstatt at L.walther@ingenieurwerkstatt.de

5. Structure Gauging



Since the last workshops in Naples at the end of 2003, meetings with CEN were held and discussions took place on what the specifics of light rail vehicles are and how they will and have been taken into account in the standard definition.

The Prague “Gauging Structure” workshop in June 2004 has been divided in two parts:

Firstly, a presentation of the structure of the standard, the way light rail has and will be taken into account and the results of the industry workshops were made available to the experts and can be summarised as follows:

Standard Configuration:

This future standard will be divided in 3 major parts:

- The first one will be dedicated to the generalities for infrastructure, rolling stock, profiles and the associated calculation rules,
- The second part will give the rolling stock dimensioning rules and methods (UIC rules and others with the objectives to give a common rule for all existing calculation method other than UIC),
- The third part will give the infrastructure dimensioning rules.

Targets

- To list without any modifications the different rules used in Europe (according UIC standard or not) and to define parameters,
- To introduce the principles of the (steel wheels) tramway gauge calculation (based on metros methods adapted to tram diagrams).

Schedule

- The standard will be submitted to investigation at the end of 2004.
- A delay of at least 6 month will be necessary to collect all the comments.
- Another delay, estimated between 6 months and 1 year, will allow the CEN group to take into account the comments and make the suitable improvements.
- Standard should be applicable in 2006.



Industry workshops feedback

- Major improvement will be to have a common language and interpretation,
- Will put all European manufacturers on the same level for competition,
- Significant cost savings should be achieved in the tender phase and in the design phase.

In the second part of the workshop, and with the help of the first part of the meeting, experts were asked to give their opinion and field of expertise on the question of “what should be done to further improve this standard”.

- Should one or more standard light rail gauges be defined?
- Should parameters used for the calculation be fixed or should we just give standard envelopes?

After discussions, consensus was reached that several gauging classes should be defined, ideally 2, or max 3 classes related to the insertion capacity in the urban area. Those classes should be defined by the basic parameters with an impact on vehicle architecture, such as:

- Dynamic envelope (straight track, curves)
- Hogs and sags
- Minimum horizontal radius

The clear advantage would be that any future call for tender will just have to specify which class is required for a specific line and the manufacturer will immediately know which of their vehicles can fit, thus considerably saving time and money at the tendering and design stages.

Working Group Leader: Dominique Segulier - Semaly at d.seguier@semaly.com



6. Noise and Vibration

In the earlier phases of LibeRTiN the priorities of the noise work were agreed. Apart from the obvious problems of using prEN ISO 3095 for Light Rail systems the expert panel identified curve squeal and ground borne vibration and structure-borne noise as top priorities.

From there, the noise work has been focused on the following topics:

1. Recommendations to prEN ISO 3095 for Light Rail applications using VDV 154 as basis.
2. Defining “curving noise” and set up a catalogue of techniques to eliminate or reduce curving noise.
3. Collecting information and experiences with parameters relevant for the generation and transmission of ground-borne vibrations and noise in connection with Light Rail systems.

The LibeRTiN noise expert panel has created a “position paper” recommending measurement conditions for Light Rail applications when using prEN ISO 3095 for noise measurements. This also includes a review of noise limit value which has been set up in various standards and norms.

“Curving Noise” is a phenomenon caused when vehicles travelling on rails are unable to negotiate curves of small radius by pure rolling, because of incompatibilities between vehicle dynamics and track geometry. If the noise level exceeds 5 dB(A) of that arising from rolling alone, it is Curving Noise. It can take the form of one or more pure tones (Squeal), possibly combined with a broad band sound. It should be quantified in terms of $L_{Amax,fast}$ 7.5m from the track centre line, 1.2m above the rail-head, and also by its narrow band spectrum.

Based on literature and projects such as the EU Squeal-project, LibeRTiN has set up a catalogue of techniques and reported effectiveness regarding the reduction of curving noise.

In order to collect knowledge and experiences achieved on reducing ground-borne vibrations and structure-borne noise, LibeRTiN created a questionnaire which was distributed to all experts and the industry. The questionnaire was set up according to the checklist in the ISO 14837-1. Unfortunately, the responses were sketchy at times, which led to the conclusion that the problem is too complex and that very few experts were able to answer the all questions. Therefore the hope is that the work on this topic will be continued within the ISO-work and that more research will be done in this field.

The conclusions and recommendations of the noise work will be published at the end of phase 3 part of LibeRTiN.

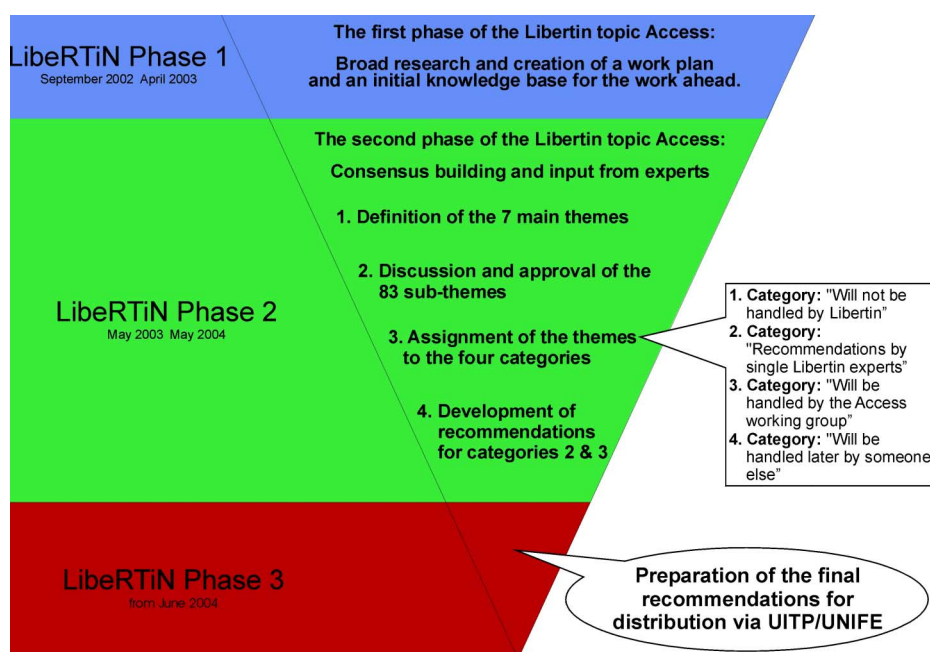
Working Group Leader: Per Finne - Atkins at per.finne@atkinsglobal.com



7. Access

This LibeRTiN Access working group also mirrors the three phases of LibeRTiN as can be seen in figure 2.

Figure 2 - Three phases of LibeRTiN as reflected in the Access topic



Phase 1 of the LibeRTiN topic Access focussed on broad research to create a work plan and an initial knowledge base for the work ahead. This included the invitation of experts to contribute to this working group as well as assembling various sources of information concerning this topic. These sources included results from European research projects, national regulations and standards from the European member states as well as additional information e.g. from the USA.

Phase 2 focussed on the input from the individual experts. In the first LibeRTiN experts workshop in Amsterdam (June 2003) the seven main themes for this topic were distinguished. These are:

1. Provision of information
2. Layout and facilities of stations or stops
3. Boarding and alighting
4. Access to the facilities and services on the vehicle
5. Circulation within the vehicle
6. Vehicle layout
7. Training of staff

These themes were then divided into 83 sub-themes. In the second LibeRTiN experts workshop in Naples (November 2003) the sub-themes were assigned to the four Access categories:

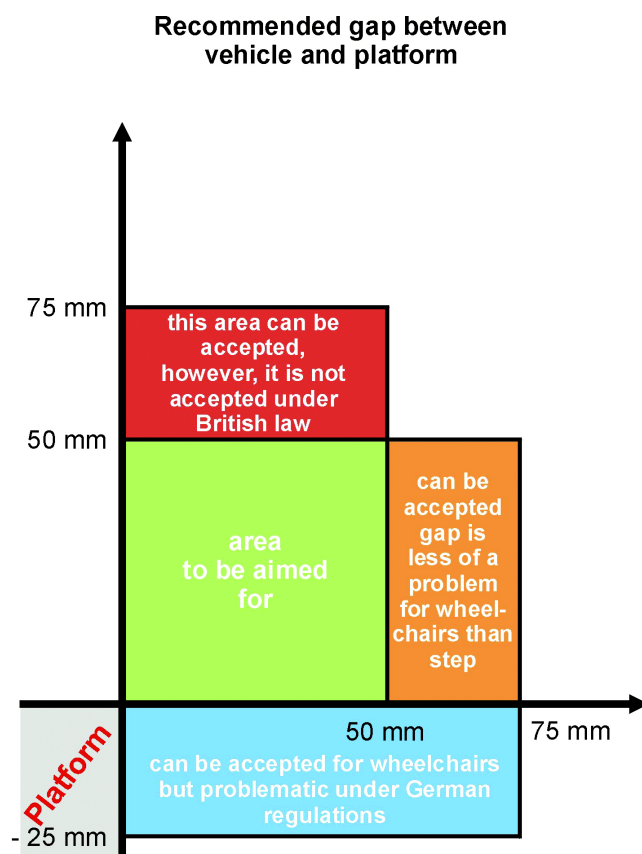
1. Category: “Will not be handled by LibeRTiN”
2. Category: “Recommendations by single LibeRTiN experts”
3. Category: “Will be handled by the Access working group”
4. Category: “Will be handled later by someone else”

Following this categorisation, recommendations were developed for each sub-theme assigned category 3 and designated experts worked on those that were assigned category 2.

In the final LibeRTiN experts workshop in Prague (June 2004) the recommendations for categories 2 and 3 were discussed and agreed. The results of this process are described in the final publication for this topic, which will be made available on the LibeRTiN website (www.libertin.info).

Figure 3 shows an example of the results provided by this working group. This diagram shows the minimum requirements for accessibility concerning horizontal gap and vertical step between vehicle and platform.

Figure 3 - LibeRTiN recommendations for horizontal and vertical step



The final phase of LibeRTiN (**Phase 3**) will provide the final document containing the recommendations of the LibeRTiN Access working group for dissemination via UITP/UNIFE.

Working Group Leader: Johan van Ieperen - TTK at johan.van.ieperen@ttk.de



8. EMC

At the first expert workshop in Amsterdam, the appropriate standards within EMC were identified and the goals for the EMC topic were set. This included an action plan to investigate the work by the CEN TC9X group and the set-up of guidelines.

In Naples, this led to a first draft of “Code of Practice” focussing on:

- Distinction between EMC and ESC (electrical system compatibility),
- Discussion of experience and solutions,
- More topology examples, and
- Refurbishment and retro-fit.

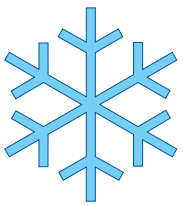
The challenges and implications in this work are:

- Plethora of power suppliers, signalling, traction equipment - it's not possible to specify 100% of all applications
- Ensure that TCX9 revision targeted at Urban Transport Study is adequate
- Code of Practice seen as the only way of dealing with potential ambiguities and 100% of applications.

The work group has had some feedback from the industry which is along the lines in the EMC action plan. But we need to know more about operator validated problems and solutions.

The next steps in LibeRTiN includes to follow up discussions with operators and to contact relevant CENELEC committee(s) for adoption and refinement of Code of Practice.

Working Group Leader: Paul Moore - Atkins at pmoore@fmaconnect.co.uk



9. “Heating & Ventilation and Air-Conditioning” - HVAC

The topic group's work on its objective to develop a standardised HVAC system / vehicle interface is well advanced. With concentrated efforts from the group members, all experts from vehicle manufacturers, HVAC subsystem suppliers and HVAC consultants, consensus was reached on the following results so far:

- Study “HVAC system classification basics” which classifies existing tramways regarding their energy consumption as a matrix taking into account exterior conditions, vehicle characteristics and passenger capacity
- Draft description of the mechanical interfaces
- Consensus about a performance calculation model differing from the prEN 14750 to avoid over dimensioned systems
- Calculation of necessary heating and cooling performances to identify “Standard HVAC units” (e.g. 15 kW, 25 kW and 35 kW)
- Boundary conditions for the electrical interface
- Basic thoughts regarding air flow channelling concepts and acoustic requirements

In the following months the work will be continued by an expanded group to guarantee European wide acceptance of the results. Next steps are a modification proposal to CEN working group on prEN 14750, detail work on mechanical interface and further necessary definitions.

Working Group Leader: Lars-Erik Walther - Die Ingenieurwerkstatt at L.walther@ingenieurwerkstatt.de

10. The Tendering Process

Following on the success of the Naples Workshop in November 2003, the Working Group co-opted a sub-group to prepare a draft set of tender template documents and associated process model. These were completed and reviewed prior to the Prague Workshop in June. The review process included direct discussions with operators in Belgium and the Netherlands, the three major European Light Rail Vehicle manufacturers as well as the regular network of LibeRTiN experts. At Prague the resulting document format and the principles by which it would be implemented were discussed - see www.libertin.info for full presentation.



The proposed template has the following features:

- Simple format
- Separate core documents - operations, vehicle and infrastructure procurement
- Can be used for each separately or for whole system procurement
- Can be used with all contract types
- Supporting documentation
- Supply to appropriate standards, only detail agreed deviations

The model works by assuming appropriate standards unless exceptions are agreed. It also manages the system and contractual interfaces.

Benefits of this approach include:

- Reduced time to prepare
- Reduced time to respond
- Improved quality of response
- Reduced process and production costs
- Reduced risk to contractors eg wheel rail interface
- Benefits new systems and renewals
- Mechanism to deliver LibeRTiN standards

Key points raised for additional consideration in Prague were:

- Intellectual Property Rights (IPR) Protection
- Compliance Checking
- Levels of Acceptance
- Test Running Period
- Incorporating Maintenance Requirements
- Responsibilities for Vehicles
- Extra Section for 'Special' Requirements
- Dynamic Document
- European Procurement Legislation Compatibility
- Evaluation Criteria
- Compliant/Non Compliant bids
- Audit Trails

The following actions were identified as part of the preparation of the group's final report:

- Tender documents will be completed and incorporated into the LibeRTiN final report
- Test robustness of model through further research and commercial application
- TfL, Centro Edinburgh and Light Rail Forum to champion in UK
- Suppliers willing to be guinea pigs
- A non UK system trial urgently required
- Workshops/documentation prepared to promote implementation

The first formal issue of the process is complete and awaiting trial.

Working Group Leader: Ian Ambrose - AEA Technology Rail at ian.ambrose@aeat.co.uk

Other Activities

Historic Tram Tour by Night



Technical Visit at DPP



<http://www.libertin.info>

Light Rail Thematic Network