

CEN Reference:

BT N 11824

Draft BT C222/2019

CENELEC Reference:

BT164/DG11540/DV

Simultaneous circulation to CEN and CENELEC TECHNICAL BOARDS

BT by correspondence**CENELEC Agenda item:**

5.1.8

For vote**Issue date:**

2019-11-13

According to IR2, Clause 6.1.4 (CEN)**Deadline:****2020-02-04**

SUBJECT

Establishment of a new CEN-CENELEC Joint Technical Committee on Hyperloop systems

BACKGROUND

On 2019-10-28, UNE and NEN sent CCMC a joint proposal for a new project on Hyperloop Systems to be carried out by a new joint CEN-CENELEC Technical Committee (Annex 1). The new proposed Technical Committee will be responsible for developing standardization of all systems, products, services and applications related to the Hyperloop transport system. The key work items that would constitute the work priority of the new joint TC are provided in Annex 1.

By BT 49/2017 and D157/041, CEN and CENELEC BTs respectively, decided that the following criteria are to be met for creating CEN-CLC/JTC:

- 12 weeks consultation by correspondence
- vote according to IR2 clause 6.1.4 in CEN and a synchronized 12-week BT consultation in CENELEC,
- at least 5 countries committed to participate.

As a consequence, members are requested to state explicitly whether or not they are committed to participate in the work.

PROPOSAL(S)

BT,

- having considered the proposal for a new field of technical activity submitted by UNE and NEN to CCMC on 2019-10-28, as included in Annex to BT N 11824 & BT164/DG11540/DV;
- having considered that the following members have expressed commitment to participate:
<members>
- decides to create a new CEN-CLC/JTC **XXX** (CEN lead) with the following preliminary title

and scope:

Title: CEN-CLC/JTC XXX 'Hyperloop systems'

Scope: Standardization of all systems, products, services and applications related to the Hyperloop transport system.

- allocates the Secretariat of CEN-CLC/JTC XXX to NEN which agrees to comply with the terms of CEN/CENELEC Internal Regulations – Part 2, Annex B;
- asks the new CEN-CLC/JTC XXX to submit its final title and scope for BT approval after its first meeting.

2019-11-05 – MAC



PROPOSAL for a NEW FIELD OF TECHNICAL ACTIVITY	
Date of circulation 2019-10-21	CEN/TC / SC N (where appropriate)
Secretariat	CENELEC/TC / SC (Sec) (where appropriate)
Type of technical body proposed (TC / SC / BTTF)	CEN-CENELEC Joint Technical Committee (CEN lead)

IMPORTANT NOTE: Incomplete proposals risk rejection or referral to originator.

The proposer has considered the guidance given in Annexes 1 and 2 during the preparation

Proposal (to be completed by the proposer)

<p>Title of the proposed new subject (The title shall indicate clearly and unambiguously, yet concisely, the new field of technical activity which the proposal is intended to cover.)</p> <p>Hyperloop systems</p>

Scope statement of the proposed new subject

(The scope shall precisely define the limits of the new field of technical activity. Scopes shall not repeat general aims and principles governing the work of the organization but shall indicate the specific area concerned.)

Standardization of all systems, products, services and applications related to the hyperloop transport system. Hyperloop systems as in a ground-based [1], high-speed [2] transportation system for passengers, living and/or non-living stock [3]. The vehicles of the hyperloop are for the majority [4] of a journey [5] suspended through contactless [6] means and travel inside a sealed, confined and reduced-pressure [7] environment.

The standardization will include:

- Terminology.
- Vehicle.
- Infrastructure.
- Signaling, command and control.
- Safety.
- Operations.
- Interface amongst vehicle, infrastructure and environment.
- Interoperability and safety requirements.
- Test methods.

[1] Ground-based: contains infrastructural attachment to the ground

[2] High-speed: sub- to transonic speed

[3] Non-living stock: cargo, freight, luggage

[4] Majority: over 50% of the journey

[5] Journey: commercial or test origin to destination and/or maintenance cycle

[6] Contactless means: without direct physical contact between the infrastructure parts (e.g. road/track/platform) and the moving vehicle e.g. magnetic levitation (EMS/EDS) or air-based suspension.

[7] Reduced-pressure: artificially induced low pressure, created through means of removing gas from the immediate and enclosed surroundings of the vehicle.

Purpose and justification for the proposal.

Hyperloop systems are based on a 200 years old idea, first proposed by George Medhurst in the United Kingdom. A hyperloop systems concept is that of a vehicle levitating and traveling at high speed and frequency inside low-pressure tubes, minimizing both ground and air resistance. With the advance of levitation systems, high-frequency automation and vacuum infrastructure ecosystems the technology has grown fast over the last 7 years. With the fast track developments in the field of "Hyperloop systems" the need for a unified approach becomes more and more pressing.

An increasing variety of operational principles are under development for hyperloop systems. A mismatch in interoperability is one of the industries greatest challenges. Applying standards helps to harmonize technology developments in order to avoid future incompatibility and helps to create equal market opportunities for all EU parties.

Safety is another essential element to drive the hyperloop into commercial operations. Standards will be required in order to achieve a coherent method for conformity assessment activities related to passenger and freight transport systems. Collaboration with relevant stakeholders, such as European Commission (DG Move and DG RTD and their institutions), conformity assessment bodies, Joint Research Centres and Member States will be key for this purpose.

Addressing both aspects (interoperability and safety) in an appropriate way requires close cooperation between legislative and technical standardisation efforts. It is therefore imperative to establish a CEN-CENELEC Joint Technical Committee including a dedicated focus on the legislative framework. Setting up the JTC is an important step for the successful technological development of the final system. Without appropriate standards or legislation, the European industry will lack its unified approach.

As the JTC will deal with mechanical parts, infrastructure, construction, EMC, IMC, electric and electronic equipment, etc. the proposal focusses on the creation of a CEN-CENELEC Joint Technical Committee (CEN lead).

Is the proposed new subject actively, or probably, in support of European legislation or established public policy?

Yes No

If Yes, indicate if the proposal is

- in relation to EC mandate(s):(which one(s))
- in relation to EC Directive(s)/Regulation(s):(which one(s))
- in relation to other legislation or established public policy:(give details)

Involved European parties are the EC Departments of DG Growth, DG Move, Joint Research Centres, DG RTD and a delegation of the European Hyperloop industries. Initial meetings with Hyperloop developers underline the positive attitude of the EC towards this principle of transportation.

Related existing legislations are:

- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Region - A European Strategy for Low-Emission Mobility (2016).
- EC Policy of Trans-European Network (TENs) in Transport, Energy and Telecommunications.
- Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European Transport Network.
- Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility.
- White Paper 2011, Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system.

Proposed initial programme of work

The focus of the proposed TC will address the following main topics

- Vehicle (V)
- Infrastructure, components and civil works (ICCW)
- Signaling, command and control (SCC)
- Safety (S)
- Operations (O)

More in detail, some topics that have to be addressed are:

- Signalling system (vehicle-track): common need and vehicle independent (SCC)
- Communication protocols: vehicle-vehicle, vehicle-OCC (SCC)
- Safety: Fire & smoke - allowed materials (S)
- Safety: evacuation time (requirements), emergency procedures (in cabin) (S)
- Safety: emergency evacuation, tunnelling (S)

- Environmental conditions on passenger cabin: temperature, ventilation, lighting, noise... (V)
- Passenger external forces: acceleration limits, jerk... (V/ICCW)
- Design for environment (ICCW/M)
- Earthing systems (V/ICCW)
- On board electronics and electrical equipment (V)
- EMI/EMC (V/ICCW)
- Infrastructure and materials requirements needed to meet alignment requirements, weather or geological condition (ICCW/M)
- Airlocks (V/ICCW)
- Station requirements & standards (ICCW)
- Maintenance depot requirement & standards (O)

The key work items that have priority since they affect interoperability and are vital to ensure the system can be scalable are:

1. Pressures of operation:

Because different pressure levels greatly determine the vehicle and the safety mechanisms. For example, fire and smoke behave differently in low tube pressure environments. Re-pressurising tubes during evacuation will create challenges. In this regard re-pressurization protocols have to be standardized. During normal operations, however, the tube pressure is a performance point in the sense that the vehicles are exposed to a certain flow choke and therefore friction over the exterior of the vehicle, which has a direct effect on the power usage or performance of the vehicle. A standardize "normal mode of operation" would benefit the development of hyperloops systems.

3-year timeframe.

Deliverable: EN

2. Door sealing:

Linked to the pressure of operation, prior research criticality analysis the possible failures of Hyperloop pods. The sealing around the door has been identified to be the most key point to watch out for, as failure in this sealing would be of high severity and the probability of occurring due to the frequent cycle of the doors would also be significant. The doors are operated more than anything else in the system: especially in their exposure not only to pressure loads, but also to humidity changes, which tend to wear the sealing more.

3-year timeframe.

Deliverable: EN

3. Vehicle-tube interfaces:

Because different technologies will need to be used within one system. It is important to ensure that all vehicles can operate within the same tubing and prevent big variations in infrastructure. For example, attractive versus repulsive levitation affect track specifications, energy exchange vehicle-tube affect the design of the whole system, and tube diameter affect vehicle dimensions.

3-year timeframe.

Deliverable: EN

4. Communication protocols (vehicle-vehicle, vehicle-OCC):

It will be essential to develop a common communication system. This will ensure that the highest levels of safety can be met.

3-year timeframe.

Deliverable: EN

5. Emergency evacuation:

For the evacuation along the length of a route countless options currently exist. One unified approach would greatly increase hyperloop development in the future. With no feasible legislation and a direct need by the industry the most feasible option is the standardization. These items directly relate to optimizing frequency in other aspects of interoperability. For example, the exit routes directly relate to the frequency of support pillars (which are above ground presumably part of the evacuation process), power supply locations, or even to the curvature of the tube at various locations. In order to cross borders and operate on an EU level standardization or at least one unified approach is essential.

3-year timeframe.

Deliverable: EN

Taking all the above into account, and the priority of works, the creation of four initial working groups are proposed:

- **WG 1 Vehicle**
- **WG 2 Tube infrastructure and components**
- **WG 3 Civil works**
- **WG 4 Communications**

A statement from the proposer as to how the proposed work may relate to or impact on existing work, especially existing CEN, CENELEC, ISO and IEC deliverables.

The proposer should explain how the work differs from apparently similar work, or explain how duplication and conflict will be minimized. If seemingly similar or related work is already in the scope of other committees of the organization, or in other organizations, the proposed scope shall distinguish between the proposed work and the other work. The proposer shall indicate whether his or her proposal could be dealt with by widening the scope of an existing committee or by establishing a new committee.)

The aim of the proposed Joint Technical Committee is to develop new standards in a new field of activity. Due to the innovative nature of the technology the impact on currently existing standards is expected to be minimal. Though the link/analogy to other existing technologies such as: rail, space, tunnelling, construction and aviation is clear. These existing technologies can help on partial aspects of the hyperloop systems, however the combination into one system is unique.

As references, at European level, the experience from CEN/TC 256, CENELEC/TC 9 will be of great value. In addition, the experience from international committees ISO/TC 269, ISO/TC 20, IEC/TC 9 will be an important input.

A listing of relevant existing documents at the international, regional and national levels. Any known relevant documents (such as standards and regulations) shall be listed, regardless of their source, and should be accompanied by an indication of their significance.

Formal regulatory documents on hyperloop systems are not yet available. Our first review on existing standards resulted in a listing of over 100 related standards. The standards vary in their applicability and their significance.

Further development of the review of relevant documents will be one the first task of the new Joint Technical Committee.

Known patented items

Yes No If "Yes", see CEN-CENELEC Guide 8 and provide full information in an annex

A simple and concise statement identifying and describing relevant affected stakeholder categories (including small and medium sized enterprises) in particular those who are immediately affected from the proposal (see Annexes 1 and 2) and how they will each benefit from or be impacted by the proposed deliverable(s)

Hyperloop will affect the continental way of high-speed passengers and goods transportation, incorporating a low carbon footprint. The development and realization of the system will stimulate technology development and large infrastructural construction works. The main stakeholder's categories are:

- **European industry:** The proposal relates to the development of a new transport system, which means new opportunities for the industry. The implication of both manufacturers and suppliers is essential to harmonize the requirements from the very beginning, and they will also obtain the benefits in resources and cost from the publication of consensus documents. This will especially be profitable for small companies that will be the main suppliers of the hyperloop components.
- **European trade:** Transport is one of the pillars of both national and international trade. The standardization of hyperloop systems will benefit trade by creating new business opportunities for the manufacturers, builders and suppliers of this transport system and, during the operational phase of the system, by enabling the incorporation of new models of intermodal transport and logistics management possibilities for the companies.
- **European and national authorities:** Transport is one of the main political policy areas of all governments and it is in the European Union agenda from its very beginning. Governments will be responsible for preparing the infrastructure and maintaining the services that hyperloop will provide to citizens. The authorities will benefit from European standardization as safety and conformity assessment is essential for the achievement of the single market and interoperability is essential to ensure the free transport of people and goods within the EU.
- **Consumers:** Consumers, as users of this means of transport, are a key player for its success. Their safety and comfort are essential for the deployment of this new technology. Having standards is a guarantee to strengthen trust and acceptance. Consumers, as the last link in the supply chain, will also benefit from the new business models that this ultra-fast transport system can generate.
- **Academic and research bodies:** The hyperloop is a new transport system and as such is based on a new technology. Universities, academic centers, research bodies, start-ups etc. are developing new models and prototypes that shall be harmonized and unified. Their experience will be of great value as an input for standardization works, and the development of standards will help to bring innovative solutions from research to market.
- **Testing laboratories:** Conformity assessment is necessary both to place a product on the market and for the subsequent market surveillance actions. Inspection and testing, together with safety and interoperability requirements, are the basis of the Single Market and the free movement of persons and goods. As consequence, laboratories and testing bodies are key participants and clear beneficiaries of the development of standards.
- **Service providers:** The hyperloop will be a transport system that will require service providers for infrastructure management as well as operations. These are basic topics that need the participation of the relevant actors that provide these services. The publication of normative documents in this area will also help optimize the management of these services.

Liaisons:

A listing of relevant external European or international organizations or internal parties (other CEN, CENELEC, ETSI, ISO and/or IEC committees) to which a liaison should be established (in the case of ISO and IEC committees via the Vienna or Dresden Agreements).

- CEN/TC 256 'Railway applications'
- CEN/TC 250 'Structural Eurocodes'
- CENELEC/TC 9X 'Electrical equipment and systems for railways'
- CEN/TC 278 'Intelligent transport systems'
- ISO/TC 269 'Railway applications'
- ISO/TC 20 'Aircraft and space systems'
- ISO/TC 204 'Intelligent transport systems'
- IEC/TC 9 'Electrical equipment and safety systems for railways'
- CEN/TC 138 'Non-destructive testing'
- CEN/TC 121 'Welding and allied processes'
- CEN/TC 231 'Mechanical vibrations'
- CEN/TC 211 'Acoustics'
- ISO/TC 108 'Mechanical vibrations, shock and condition monitoring'
- ISO/TC 43 'Acoustics'
- ASD-STAN (Aerospace)

Coordination and/or liaisons with Technical Committees will be of most importance. Also, with those dealing with materials as steel, plastic, concrete, electric material, etc.

Joint/parallel work:

Possible joint/parallel work with:

- CEN (please specify committee ID)
- CENELEC (please specify committee ID)
- ISO (please specify committee ID)
- IEC (please specify committee ID)
- Other (please specify)

Name of the Proposer
(include contact details)

UNE and NEN

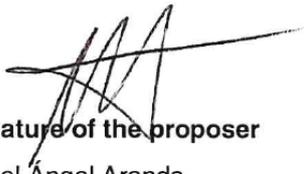
(Do not hesitate to contact in case of consultation or questions).

An expression of commitment from the proposer to provide the committee secretariat if the proposal succeeds.

In case of acceptance of the proposal, UNE and NEN are willing to:

- NEN to undertake the Secretariat of the new Joint Technical Committee for 'Hyperloop' standardization.
- UNE to undertake the Secretariat and Convenorship of WG 1 "Vehicle", WG 2 "Tube infrastructure and components", WG 3 "Civil works" and WG 4 "Communications", providing all the necessary technical expertise to manage the working groups.

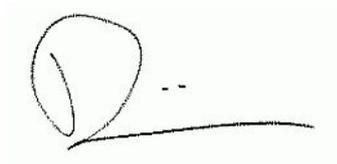
UNE and NEN have consulted nationally and ensure that adequate resources are provided to carry out the work without delay.



Signature of the proposer

Miguel Ángel Aranda

Spanish BT Member, UNE



Jelte Dijkstra

Dutch BT Member, NEN

Annex(es) are included with this proposal (give details)