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Hyperloop Transport Services

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English version

Hyperloop Transport Services

Services de transport Hyperloop

Hyperloop-Transportdienstleistungen

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European foreword

This document (EN 17929:2024) has been prepared by Technical Committee CEN/CLC/JTC 20 “Hyperloop systems”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2024, and conflicting national standards shall be withdrawn at the latest by October 2024.

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Introduction

The purpose of this document is to describe and define the transport services provided by the hyperloop system. The hyperloop is a new mode of transportation for passengers and cargo. As such there are two main types of hyperloop transport services: one for transporting passengers and the other one for transporting cargo. These services are having fundamentally different characteristics from each other. These characteristics impose different requirements on the hyperloop system. Different aspects of each service in relation to the hyperloop system are analysed and specified. A standardized method to clearly distinguish between those by specifying the attributes that characterize each of these services is used for the concept of operation of the hyperloop system.

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1 Scope

Hyperloop transport services are designed to support passenger transport and cargo transport. For each of the transport service passengers/cargo requirements and expectations are different. This document specifies the hyperloop transport services supported by a hyperloop system and provides means for characterization and description of these services. The characterization considers the technical as well as operational/commercial features of each transport service. This document provides a framework for defining the transport services of the hyperloop system and its operational concept(s).

The following are within the scope of this document:

1. the high level description of the hyperloop system and its operating principles for both passenger and cargo transport;
2. system boundaries and interfaces;
3. the classification of the key stakeholders and users of the hyperloop system for hyperloop transport services;
4. the definition of the key service characteristics and requirements of the hyperloop transport services;
5. the identification of related services and their characteristics;
6. common high-level scenarios for different hyperloop transport services from the passenger/ cargo transport point of view.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
hyperloop
mode of land transportation capable of high speed and driverless operations, in which a vehicle is guided through a low pressure tube or system of tubes, for passengers and/or cargo

3.2
customer
organization or person that receives a product or service

EXAMPLE Consumer, client, user, acquirer, buyer, or purchaser.

Note 1 to entry: A customer can be internal or external to the organization.

Note 2 to entry: this definition is adopted and further modified from ISO 9000:2015.

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3.3
customer experience
customer's perceptions and related feelings caused by the one-off and cumulative effect of interactions with a supplier's employees, systems, channels or products

[SOURCE: Gartner Glossary [7]]

3.4
capacity
capability of a hyperloop to handle a certain level of throughput for passengers and / or cargo

3.5
person with disabilities
person with reduced mobility (PRM)
any person who has a permanent or temporary physical, mental, intellectual or sensory impairment which, in interaction with various barriers, may hinder their full and effective use of transport on an equal basis with other passengers or whose mobility when using transport is reduced due to age

[SOURCE: Commission Regulation (EU) No 1300/2014, modified]

3.6
stakeholder
individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

EXAMPLE End users, end user organizations, supporters, developers, producers, trainers, maintainers, operators, disposers, acquirers, supplier organizations and regulatory bodies.

Note 1 to entry: Some stakeholders can have interests that oppose each other or oppose the system.

[SOURCE: ISO/IEC / IEEE 15288:2015, and ISO/IEC/IEEE 12207:2017, 3.1.5]

3.7
user
individual or group that interacts with a hyperloop or benefits from a hyperloop during its utilization

Note 1 to entry: As defined in ISO/IEC 25010:2011 the role of user and the role of operator are sometimes vested, simultaneously or sequentially, in the same individual or organization.

[SOURCE: ISO/IEC 25010:2011]

3.8
safety
freedom from unacceptable risk to the outside from the functional and physical units considered

[SOURCE: IEC 60050]

3.9
security
freedom from unacceptable risk to the physical units considered from the outside

Note 1 to entry: In many other languages than English there is only one word for safety and security

[SOURCE: IEC 60050]

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4 Hyperloop System

The hyperloop is an electrically powered mode of land transportation with vehicles travelling through a network of low-pressure tubes, capable of high-speed and driverless operations, offering continuous service for transporting passengers and cargo towards their destinations.

The hyperloop system uses magnetic forces for levitation, guidance and propulsion. Magnetic levitation is one the key features of the hyperloop system. This eliminates the direct contact between the moving and static parts of the system. The pressurized hyperloop vehicles operate inside a low-pressure tube. The low-pressure environment reduces both air resistance and energy consumption. The body of the tube lowers noise emissions towards the direct environment.

The hyperloop linear infrastructure enables controlled traffic flow of vehicles through a low pressure tube or system of tubes that are either elevated on columns above the ground, at ground level, or go underground/underwater. The spatial constraints need to be taken into account when designing the hyperloop transport service.

5 System Goals and Objectives

5.1 General

The hyperloop transport system defines the goals and objectives for the system through the range of services offered to its users in two main areas:

— Passenger transport;

— Cargo transport.

The range of the services either for passengers, cargo or combined passengers – cargo transport are offered in a hyperloop network.

5.2 Passenger transport

The passenger transport system defines the goals and objectives for the system through the range of services offered to its users:

— Fast travels enabled by speed exceeding high-speed transport modes (see Annex A);

— Controlled closed environment;

— Continuous operations not affected by weather and other external factors typically affecting operations of ground-based transport such as accidents, crossing traffic;

— Energy efficient travels with low direct greenhouse gas emission levels;

— Enable flexible scheduling based on the capacity required;

— High frequency of arrivals/departures;

— Seamless interfaces with other transport networks for door-to door travel through integration with inter-modal physical and digital Mobility as a Service (MaaS) infrastructure;

— Accessibility to person with disability and person with reduced mobility by enabling them to access and use, embark, disembark and occupy their place in the vehicle without assistance. No system decisions shall be made that subsequently restricts accessibility, especially with regard to people with reduced mobility

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(PRM). Commission Regulation (EU) No 1300/2014] [6], EN 17161:2019 [10] should be used as informative and directional for PRM related design requirements and decisions

5.3 Cargo transport

The cargo transport system defines the goals and objectives for the system through the range of services offered to its users:

— Controlled closed environment;

— Continuous operations not affected by weather and other external factors typically affecting operations of ground-based transport such as accidents, crossing traffic;

— Enable flexible scheduling based on the capacity required;

— Transportation of standardized, and configurable shipment units;

— Short transit times enabling up to same-day delivery within hyperloop;

— Seamless interfaces with other transport networks and last/first mile services;

— Fully traceable shipment;

— Infrastructure enabling easy integration into production, distribution and demand centres;

— Energy efficient travels with low direct greenhouse gas emission levels.

6 System boundaries and interfaces

The hyperloop system and its environment consists of a wide range of systems, entities, organizations, each with their own set of services. Subsequently each system/entity/organization within the hyperloop environment can have an array of system that themselves offer a set of services depending on their functionality.

The boundary of the system in this document is defined by the hyperloop systems (infrastructure, vehicles and operating system) providing the hyperloop transport services.

Key enabling systems for hyperloop are energy infrastructure and communication systems infrastructure. The service characteristics of these systems such as power supply services, communications service for voice and data transmission, etc are well defined in their corresponding standards. As such they are not to be specified in this document.

In this document only a set of services specific to the hyperloop system focusing on technical design development are to be defined. The following hyperloop features define the basis of the service design of the hyperloop:

— The hyperloop is a primarily public mode of transportation, private applications are not excluded;

— The hyperloop is capable of very high-speed transport;

— The hyperloop vehicles operate in a closed environment;

— The hyperloop vehicles operate in a low pressure environment;

— The hyperloop is scalable in capacity for passenger transport and cargo operations.

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