INTERNATIONAL STANDARD

ISO 37169

First edition
2021-08

Smart community infrastructures — Smart transportation by run-through train/bus operation in/between cities

Reference number
ISO 37169:2021(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 268, *Sustainable cities and communities,* Subcommittee SC 1, *Smart community infrastructures*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Many cities are improving their transportation systems to provide greater accessibility, mobility and environmental benefits and to promote sustainable economic growth in their communities. Cities currently operating older transit systems, which require many transfers in multiple city centres and transportation hubs, are developing new rail and bus lines that offer more direct, frequent services with a one-seat ride. These services reduce the number of transfers within a city centre and outlying metropolitan areas. They offer through train or bus services in high quality transit corridors, defined as smart transportation.

This document describes how to organize run-through train or bus corridors using smart transportation in city centres, greater metropolitan areas and regions. This concept includes reprioritizing operations, management, organizational plans and agreements between multiple carriers so that new transit services can be provided while still maintaining the current rail and bus infrastructure and existing transit service within local communities and city centres.

Smart community infrastructures — Smart transportation by run-through train/bus operation in/between cities

1 Scope

This document specifies a procedure for run-through train operations, identified as smart transportation. This concept provides direct, one-seat ride services in high quality corridors connecting cities and transportation hubs without forcing transfers. Improved operations planning, greater use of interchange or rental use arrangements are described so that these services can be implemented without constructing major infrastructure improvements in existing transportation corridors and right-of-way.

This document also describes the application of run-through operation in bus services that are strictly licensed to bus carriers using public roads, ending the inconvenience of forcing passenger transfers between routes or service territories.

NOTE Smart transportation by run-through operation is applicable to other transportation modes besides rail and bus services, if applied in services operated in the same mode. Refer to ISO 37154 for applicable transportation modes.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Concept of smart transportation by run-through operation

4.1 City development process with transportation organization

A large city has been developed by extending transportation services from the city centre to the outside in order to expand city areas for citizens' lives and work. In old cities, they had gates to inspect visitors to a city to protect their citizens. The places where the gates were placed have been developed to have the function of sub-city centres. By following such historical culture, some old cities have rail terminals in sub-centres where trains are not allowed to directly come into the metropolitan area beyond sub-centres. This manner avoids traffic congestion caused in the area by trains rushing into one point with their large number of passengers. Bus and streetcar or tram systems have been organized for the local transport in the metropolitan area to connect the city centre and sub-city centres. The subway was then introduced when the ground transportation does not provide sufficient capacity to meet demand. Thus, transportation services are often terminated in sub-centres where all passengers are forced to change trains whenever coming to/going out from a metropolitan area.

Even if a city does not have such a historical background, many cities began investing in grade separated urban rail systems such as subways or "over ground" systems on aerial structures within crowded metropolitan areas to reduce surface congestion. These systems also grew rapidly, where vast

networks were developed, serving more transportation hubs within and outlying city centres while forcing customers to make multiple and inconvenient transfers between hubs.

Newer rail and bus services such as commuter rail and regional bus were developed to increase access and mobility in expanding cities and metropolitan areas. Many of these services were still hub and spoke based, where transfers were necessary to connect customers to their final destinations. These services were later extended to connect multiple city centres and metropolitan areas to serve larger regional areas with very long routes. The services were known as interurban lines. They were subject to crowding at terminals receiving customers arriving from long routes requiring additional transfers to local transport services.

To alleviate crowding and inconvenient transfers at outlying terminals and city centres, hybrid versions of commuter and interurban rail are created so that city centres and outlying areas are both served by one-seat ride, corridor-based rail services. These corridor-based services are known as through rail services. The concept described in this document is defined as smart transportation. These through rail services are similar to interurban and regional rail services, operating in high quality corridors. Through rail services do not terminate in the city centre. They operate from one outlying metropolitan area through a city centre or multiple city centres to another outlying metropolitan area.

Greater access and mobility are achieved through rail services because of direct, frequent, one-seat ride operations that minimize or eliminate forced transfers in outlying metropolitan areas and city centres. They offer greater transit coverage with faster, more convenient service in addition to existing rail services in corridor. The combination of through rail services with current urban rail services is expected to stimulate economic development within city centres and outlying metropolitan areas. A typical case successfully organized is shown in Annex A, which created dynamic passenger flows on the largest scale in the world.

Run through bus operations can also be applied to bus services using the smart transportation concept, where a one-seat ride using the same bus can be developed. In this concept, a bus route or service territory is licensed to two or more different bus carriers connecting to transportation hubs. The use of interchange or rental use agreements would allow a bus driver from one carrier to drive a bus owned by a different carrier for use in licensed routes or service territories while passengers remain on-board the same bus.

4.2 Solutions to transport service termination

4.2.1 Rail services

To overcome the rail service termination forced transfers, new corridor-based rail services can be created. The concept of smart transportation utilizes improved operations planning to implement through rail services without constructing expensive major infrastructure improvements such as new trackwork, tunnels, aerial trains on railroad tracks inside and outside a metropolitan area and extending beyond into a greater metropolitan area with one or more different rail carriers that own their rolling stock and tracks. This concept can be used in conjunction with maintaining existing transit services in the same corridors or within hub and spoke networks. Implementation of these services involves greater use of interchange or rental use agreements for different carriers operating in a target rail corridor.

Run-through services are expected to provide increased fare revenue by dispatching more trains in smart transportation corridors. The expected revenues will provide financial support for the operations and maintenance costs of these services in the rail corridor.

4.2.2 Bus services

In this transportation mode, all bus carriers are licensed to operate their routes on public roads and streets within their service territories. When a bus carrier develops new routes and extensions beyond their service territories, they apply for licenses in a very competitive market along with many other bus carriers. The application process includes a reallocation of current carrier licenses to other carriers, causing a reorganization within their companies, which makes the process almost impossible to

coordinate. Thus, most bus carriers prefer not to develop new routes extending outside of their current service territories. This type of service forces customers to make many inconvenient transfers from one bus carrier to another between service territories.

Through bus services eliminate inconvenient forced transfers between service territories through the use of interchange or rental use agreements. These agreements would allow a bus driver from one carrier to drive a bus owned by a different carrier for use in licensed routes or service territories while passengers remain on-board the same bus. What bus routes or service territories licensed to different carriers are to run-through bus operation, railroad tracks owned by different rail carriers are to run-through train operation.

Through bus services also streamline a carrier's bus operations by reducing the number of dispatch offices in different service territories, thus lowering a carrier's bus operations and maintenance costs. This operation also works when extending bus services for a long distance on licensed routes or territories. Normally, a bus driver should change to another whenever driving for 200 to 300 km. By applying run-through operation, a bus carrier can dispatch a vehicle serviced to a distant destination by changing its own driver to those attached to other local carriers, even when the entire operation routes or territories are licensed to the vehicle-owner carrier.

4.3 Applicable city issues and advantage acceptors

When the issue is a difficulty for citizens and city visitors in commuting between a metropolitan area of a city and the greater metropolitan area, who are forced to change trains due to rail service termination at terminals, this smart transportation can be applied. When the same situation occurs in bus services, smart transportation is still applicable.

Smart transportation provides convenient transit for people in a city and travellers passing through hub-functioned cities, while it is also beneficial for the elderly, people with disabilities, and those accompanied by small children or travelling with heavy or voluminous luggage.

4.4 Satisfaction of SDGs by smart transportation

Smart transportation satisfies the UN-Sustainable Development Goals, especially goal 3 'Good health and well-being', goal 7 'Affordable and clean energy', goal 8 'Decent work and economic growth', goal 9 'Industry, innovation and infrastructure', goal 10 'Reduced inequalities', goal 11 'Sustainable cities and communities', goal 12 'Responsible consumption and production', goal 13 'Climate action' and goal 15 'Life on land'.

5 Adoption of smart transportation by run-through operation

5.1 Objectives

As discussed in 4.1, smart transportation solves city issues of rail service termination in a city and a city zone by providing citizens and city visitors with one-seat ride services by run-through train operation beyond terminals where rail services are terminated due to different rail carriers. Smart transportation is still applicable in bus services, the service license for which is normally strictly enforced.

Through operation is not inter-modally but in the same transportation mode or by rail to rail or bus to bus operation.

NOTE Run-through train operation is organized by using rolling stock on railroad tracks individually owned by different rail carriers, which is rented from other carriers, while run-through bus operation uses bus vehicles on routes/territories on public roads individually licensed to different bus carriers, which are also rented from other carriers. Normally, transportation carriers joining run-through operation services lend/rent rolling stock and vehicles to/from other carriers that also mutually join the services. By applying smart transportation, long distance-serviced bus can be dispatched, which is operated by other carriers on part of entire service route even within licensed routes/territories.

5.2 Target area

A city holding transportation hubs that terminate rail services between a city centre and the surrounding areas, where citizens and city visitors are forced to change trains while communication. A city serviced with bus transportation is also a target of smart transportation, since bus services are normally terminated at many places in a city and a city zone. In a word, smart transportation is applicable in any area and route where services are terminated between different rail carriers or bus licensed routes/territories.

5.3 Requirements for smart transportation

5.3.1 General

Run-through train operation is carried out between different rail carriers by using rolling stock that are common to technical specifications. Other technical conditions besides rolling stock shall also be adjusted therebetween. For successful run-through train operation, all the conditions designated in the following sub-clauses shall be achieved.

When applying smart transportation to bus services, the procedure is the same as when applying to rail services, however bus vehicles owned by different bus carriers are run mainly on public roads where technical and traffic-regulatory conditions are already common including vehicle performance and structures, road civil engineering structures as well as traffic signals and signboards. When performing run-through bus operation by partly using private or exclusive roads and lanes, such conditions should be adjusted to those of public roads.

Run-through operation shall be arranged by fully understanding and fixing special conditions for the operation between carriers as described in 5.3.2 to 5.3.4.

5.3.2 Arrangements for run-through operation

5.3.2.1 Trackage or service route/territory right operation

Trains/buses are dispatched or driven on railroad tracks owned by other rail carriers or on service routes or territories licensed to other bus carriers.

5.3.2.2 Track or service route/territory boundaries

Passenger, delivery item and freight services are provided over an interface between railroad tracks owned by different rail carriers or between bus service routes/territories licensed to different bus carriers.

5.3.2.3 Track or service route/territory boundary stations and stops

Stations and stops at a track or service route/territory boundary are managed specially for run-through operation.

5.3.2.4 Service operation and facilities control

Passenger services, train/bus dispatching, rolling stock adoption as well as powering, signalling and rail track facilities work are controlled for run-through operation.

5.3.2.5 Crew dispatching

Allocation of train/bus crew in crew courses and dispatching of the crew to designated train/bus services are scheduled and controlled.