BS ISO 37169:2021

BSI Standards Publication

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

bsi.

National foreword

This British Standard is the UK implementation of ISO 37169:2021.

The UK participation in its preparation was entrusted to Technical Committee SDS/2, Smart and sustainable cities and communities.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2021

ISBN 978 0 539 12379 1

ICS 03.220.01; 13.020.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2021.

Amendments/corrigenda issued since publication

Date	Text affected

BS ISO 37169:2021

INTERNATIONAL STANDARD

ISO 37169

First edition
2021-08-18

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

Reference number
ISO 37169:2021(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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.

This page deliberately left blank

INTERNATIONAL STANDARD ISO 37169:2021

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

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.

5.3.3 Agreements for run-through operation

5.3.3.1 Safety

Securing safety in run-through train/bus operation is the top priority to be achieved. All rail/bus carriers joining run-through operations shall cooperate with one another by fully communicating, to establish, organize, arrange, manage, control and maintain safety on all technical matters with mutual respect.

5.3.3.2 Number of rolling stock/bus vehicles applied in run-through operations

Rolling stock and bus vehicles are provided and installed, the number of which still enables rail/bus carriers to dispatch train/bus services completed in sections on their own railroad tracks or bus routes/territories for their own service besides run-through operation.

5.3.3.3 Service scheduling

Train and bus scheduling for run-through operation shall be thoroughly discussed and determined with all carriers joining through operation services with mutual respects but also with compromises.

5.3.3.4 Renting and lending of rolling stock/bus vehicles

Rolling stock and bus vehicles applied in run-through operation are rented from other carriers when they run the rolling stock and bus vehicles, which are not owned by themselves, on their own railroad tracks and bus routes/territories. The rental fee depends on the distance to run rolling stock and bus vehicles rented. The carriers renting rolling stock and bus vehicles pay their owners the rental fee and the cost imposed for repair of damages by collisions and accidents while renting.

NOTE The fees to rent rolling stock from its owners are adjusted normally at a fixed interval (e.g. every month). To make it easy to pay the rental fee mutually between a rolling stock renter and a lender, the amount of the fee can be off-set by adjusting the total distance of running rolling stock rented when scheduling run-through operation. In run-through bus operations, bus vehicle rental fees can be off-set in the same way.

5.3.4 Technical specification adjustment between different rail/bus carriers

5.3.4.1 Passenger services

The rules on passenger services in run-through train/bus operations shall be agreed between rail/bus carriers joining run-through operation, which designate the following services and management at least:

a) Passenger service regulations and rules

— interline transport;

— ticketing for interline transport;

— fare adjustment for interline transport passengers;

— pay-off on run-though operation cost between carriers;

— arrangements for operation at emergency;

— run-though operation termination at train/bus schedule disturbance;

— run-though operation restarts at train/bus schedule recovery.

b) Information for passengers

— transport system maps including run-though operation;

— information provision and indication (e.g. announcement in stations and coaches);

— station/stop numbering.

c) Special services for the elderly and those with disabilities

— assistance in entering and exiting coach;

— space for wheelchairs;

— priority seats.

5.3.4.2 Civil engineering and track structures

The specifications of civil engineering and track structures used in run-through train operations shall be adjusted between rail carriers joining run-through operation (e.g. station structures, tunnels).

In run-through bus operations, normally, civil engineering structures to be used for the operation are already of the same specifications. In case private and exclusive roads or lanes are used partly in the operation, the civil engineering specifications thereof shall be adjusted to those of the public road.

5.3.4.3 Powering and signalling systems

The specifications of powering and signalling systems used in run-through train operations shall be adjusted between rail carriers joining run-through operation (e.g. catenary voltages, safety installation for signalling and wireless communication).

In run-through bus operations, specifications are already fixed when using common vehicles.

5.3.4.4 Rolling stock/bus vehicles

The specifications of rolling stock used in run-through train operations shall be adjusted between rail carriers joining run-through operation (e.g. rolling stock weights, acceleration/deceleration performance, devices equipped in rolling stock which are used by train crew).

In run-through bus operations, specifications are already fixed when using common vehicles.

5.3.5 Specific application of run-through train operation

5.3.5.1 General

Normally, run-through train operation is applied to commuter rail in a metropolitan area of a city and the greater metropolitan area. The service distance outside the metropolitan area beyond a terminal is not so far, or commonly maximum 50 km, as it takes over 1 h to travel for 50 km by train. Beyond this distance, few people want to travel every day to an office in the metropolitan area from home in the greater metropolitan area by spending such a long time that is stressful for commuters. However, when smart transportation is applied by using express trains, the travel time can be reduced and possible or acceptable commuting distances to the metropolitan area can be extended. This application effectively works when smart transportation is adopted on a commuter rail where express trains are usually serviced. If well-accommodated trains are installed, this will make the ride more comfortable and financially support the services by inviting more customers. The application will make commuting distances longer at least than 50 km but the commuting time still reminds 1 h or a bit longer. The service is helpful in developing the greater metropolitan area for residential purposes. In contrast, the service also works to convey people living inside the metropolitan area to the greater metropolitan area whose area is expanded. If the greater metropolitan area holds leisure places, namely, parks, large shopping malls and amusement centres, the service invites more customers from the metropolitan area. This specific application of smart transportation is, thus, important when rail carriers in the greater metropolitan area are already situated in such rail service conditions or able to achieve them.

5.3.5.2 Requirements for application

Applications of smart transportation designated in this subclause will work, when the following conditions are enabled. Even in this case, all requirements designated in 5.3.2 to 5.3.4 shall be satisfied:

— express train operation on commuter rail outside a metropolitan area of a city;

— availability for rail carriers inside the metropolitan area to make arrangements for express services.

5.3.5.3 Additional services supporting application

To promote smart transportation with specific applications designated in this subclause, the following efforts will bring successful results:

— seat reservation services (e.g. in ticket offices, at ticket vending machines, by smartphone, through the internet);

— train reservation services (e.g. in ticket offices, at ticket vending machines, by smartphone, through the internet);

— seat/train reservation ticket sale at departure (e.g. at ticket inspection gates, on platforms, at train doors);

— season seat/train reservation services (e.g. weekly, monthly);

— enhanced accommodation performance and quality (e.g. reclining seats, wide size seats, high-quality seat materials, noise isolation, vehicle vibration reduction, no cold draft, infrared absorbing glass windows);

— bathroom furnishing;

— free magazines/newspapers offer;

— minibar/buffet services.

5.4 Installation of smart transportation

A system of smart transportation shall be established in accordance with the requirements described in 5.3.

To securely install smart transportation, the arrangements for the following matters shall be completed in advance of starting the operation as well:

— agreements on train/bus run-though operation (e.g. fare amounts, fare collection, train/bus and crew dispatching, management of track or bus route/territory boundary stations);

— transportation capacity required for target sections;

— establishment of run-through train/bus operation management and direction;

— enforcement of training for staff working on the operation.

6 Maintenance of quality of smart transportation by run-through operation

6.1 General

To maintain the intended performance of smart transportation, and to confirm its effectiveness, periodically observe the following parameters.

6.2 Parameters to be observed

The parameters for comparing smart transportation performance are as follows (use appropriate units for observation):

— number of passengers boarding run-through trains/buses operated;

— passenger flows in and from/to the target area;

— total amount of fare/fees received by run-through train/bus operation;

— operation cost;

— the required capacity of smart transportation;

— characteristics of city/city zone axes of the target area;

— parameters developed based on proven measures for transit performance.

6.3 Modification of smart transportation

When no change is found in the value of parameters designated in 6.2, change the conditions of smart transportation in 5.3. To correct the transportation conditions, confirm anything unexpected at planning or anything irregular due to the specific situation of the area where smart transportation was installed. Modify the current conditions of the smart transportation system operated by making sure that the irregular conditions are acceptable.

Annex A
(informative)

A large scale run-through operation enabling a large number of people to easily travel in a huge area and enjoy the benefit of saving time

Table A.1 — In the Tokyo Metropolitan Area in Japan, five rail carriers offer seven service lines as run-through train operations to move a large number of people in such an extensive region. In this area, Japan Railways has already organized rail networks serving frequent and long-distance inter-line operations transporting millions of passengers every day. Even with this background, the new run-through operations by the five rail carriers created other passenger flows and changed the axes of the city zone or the Tokyo Metropolitan Area. Table A.2 — This Table shows how effectively and advantageously run-through train operations work in the area. By using the services, citizens can easily travel for long distances across the area without any changes, resulting in drastically reduced savings in travel time.

Table A.3 — In the Tokaido Megalopolis, Japan, that holds Tokyo Metropolitan and large cities or Kyoto, Osaka and Kobe, these cities are connected by high-way bus services licensed to different bus carriers. To provide citizens travelling in the megalopolis with a one-seat ride, the carriers dispatch bus services by run-through operation. Kochi, which is isolated from the megalopolis, is also connected to Tokyo by extending the bus service to Kochi, the vehicle of which is received and driven by another bus carrier outside the megalopolis.

Table A.1 — Network performance by run-through train operations serviced individually by two rail sectors in the Tokyo Metropolitan Area

Network	Network features			
	Number of lines in the network	Network length (km)	Number of stations	Total service area (km^2)
Japan Railways	11	824,7	191	2,399
Five private rail carriers	5	129,1	81	22,7

Table A.2 — Typical cases where easy travel is achieved by using run-through train operations across the Tokyo Metropolitan Area

Network	Travel course	Travel distance (km)	Not by using run-through operation services		By using run-through operation services	
			Number of changes	Travel time	Travel time	Time saved
Japan Railways	From Ofuna to Utsunomiya	156,9	3	3 h 12 min	2 h 33 min	39 min
Five private rail carriers	From Yokohama-Chuk-agai to Shinrinkoen	88,8	3	2 h 31 min	1 h 49 min	42 min

Table A.3 — Run-thorough bus operation in the Tokaido Megalopolis and to isolated cities

Run-through bus operation route and length (km)								
Tokyo – Kyoto, Osaka and Kobe			Tokyo – Nara and Oji			Tokyo – Tokushima and Kochi		
Bus station	Bus carrier		Bus station	Bus carrier		Bus station	Bus carrier	
	JR Bus Kanto	West Japan JR Bus		JR Bus Kanto	West Japan JR Bus		JR Bus Kanto	JR Shikoku Bus
Tokyo	0	---	Tokyo	0	---	Tokyo	0	---
Tomei-Mikkabi, driver change	267	0	Tomei-Mikkabi, driver change	267	0	Tokushima, driver change	660	0
Kyoto	---	207	Kyoto	---	207	Kochi	---	147
Osaka	---	251	Nara	---	252			
Kobe	---	295	Oji	---	275			
Entire service length		562	Entire service length		542	Entire service length		807

Bibliography

[1] ISO 37154, *Smart community infrastructures — Best practice guidelines for transportation*

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than one device provided that it is accessible by the sole named user only and that only one copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than one copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright and Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member.**

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email cservices@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services
Tel: +44 345 086 9001
Email: cservices@bsigroup.com

Subscriptions
Tel: +44 345 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK