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Guidance on the Application of Selective Door Operating Systems
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Documents

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Guidance on the Application of Selective Door Operating Systems

Issue Record

Issue	Date	Comments
One	April 2008	Original document
Two	June 2010	Replaces issue one Small scale change - guidance on vehicle based control added in 1.7, 2.2.3, 2.7.1.2, 2.7.2, 2.9.2, a note at the commencement of Parts 3, 4 and 5.
Three	June 2013	Replaces issue two. Small scale change – amendment to guidance in 1.5 and 2.7.1, and removal of out of date guidance in 2.4, 3.2.3, Part 4, Part 5, Appendix A section A.8, Appendix D and Appendix E.

Amended or additional parts of revised pages have been marked by a vertical black line in the adjacent margin.

Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GE/GN8577 issue two June 2010 Guidance on the Application of Selective Door Operating Systems	All	07 September 2013

Supply

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Part 1 Introduction

1.1 Purpose of this document

This document gives guidance on the selection and implementation of selective door operation (SDO) systems appropriate for specific applications. This guidance is intended to assist infrastructure managers and railway undertakings in understanding their responsibilities in relation to selection and implementation of SDO systems appropriate for specific applications. The factors which determine the level of functionality of SDO systems appropriate to a particular application are also considered, subject to further research. It does not constitute a recommended method of meeting any set of mandatory requirements.

This document contains guidance that is amended under the Railway Group Standards Code (Issue Three) as a small scale change. Reference to the amended guidance is made in the 'Issue record'. All other parts of the document are unchanged from the previous issue.

1.2 Copyright

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1.3 Approval and authorisation of this document

The content of this document was approved by:

Rolling Stock Standards Committee on 18 January 2013.

This document was authorised by RSSB on 25 April 2013.

1.4 Background to the production of this document

A Selective Door Operation (SDO) system in its most basic form is a means of enabling only those power doors which give access to platforms and inhibiting those which do not. This allows passenger trains with power doors to be used safely on platforms which are shorter than the trains.

There are various options available regarding the type of SDO systems providing differing levels of functionality and automation; this guidance note assists in the selection of a suitable system in line with cost and operational considerations.

There is a desire within the rail industry for a national framework for SDO systems to be established. This is addressed in this document by identifying both a set of generic requirements against which any SDO system can be assessed for fitness of purpose, and specific target system architectures for implementing SDO systems. Such a framework should be helpful to those extending the application of existing systems, as well as those introducing SDO systems to a route or a train fleet for the first time.

Research designated T686, titled: Production of an Industry Standard of Use of Selected Door Operation (SDO) in the UK, was commissioned by RSSB on behalf of the GB railway

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industry to identify the preferred solutions for SDO systems. It is on the output from this research that this guidance note is largely based.

Research in the context of SDO is now complete.

Case studies for existing systems are set out in Appendix A.

Typical traincrew's MMI are shown in Appendix F.

1.5 Content and structure of this document

This document identifies requirements and issues which should be considered when assessing the applicability of SDO systems to a specific route. Further guidance is then provided by defining five target systems to meet the range of requirements likely to arise.

Specifically this guidance note sets out the application of SDO systems to the GB rail network in the following structure:

- a) An overview of SDO systems focussing on the operational principles of such systems (set out in Part 2)
- b) The functions and interfaces of SDO systems in relation to train crew, passengers and the infrastructure that should be addressed in the selection of a specific system architecture (set out in Part 3)

This document has been aligned with the SDO types set out in Appendix 3 of GM/RT2473 issue two.

1.6 Vehicle Based Automatic Selective Door Operation (VBASDO)

This document has been updated to provide the revised advice that Vehicle Based ASDO solutions are viewed as acceptable particularly on retro fitment to current trains, where train based solutions (as described exclusively in Issue 1 of this guidance note) are prohibitively expensive.

The fundamental characteristic of a Vehicle Based ASDO is that the local control system on each vehicle (or doorway) determines whether that portion of the train is at an acceptable location to permit door release.

In order to provide the information to each doorway or vehicle that a door release is permitted various systems are being considered and /or developed at present including, but not limited to:-

- Platform Edge Detection System (no additional infrastructure element required)
- RFID system (passive infrastructure element required)

The intention of the industry is to select one system as the preferred system in order to have a single system with a common infrastructure interface so as to allow vehicles fitted with ASDO to be moved around the Network.

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Part 2 Overview of SDO systems

2.1 Background to SDO systems

- 2.1.1 It is not uncommon for passenger trains to stop at platforms shorter than the trains; a practice that has occurred for many years.
- 2.1.2 When slam doors were in use the passenger alone was responsible for deciding when to open the door and there was no indication given to help in the decision.
- 2.1.3 The introduction of power operated doors has given the impetus to provide a means of controlling safe access for passengers to/from the platform. This can be achieved by use of an SDO system.
- 2.1.4 SDO systems have been in use in Great Britain for several years, but to date no single system has emerged as the 'ideal' solution. The level of automation and technology utilised has varied considerably.
- 2.1.5 Demands on the passenger-carrying capacity of the railway are predicted to increase in the future. SDO systems allow improved utilisation of stations, trains and pathways to be achieved within a relatively short timescale, without waiting for expensive and time-consuming projects to extend platforms or increase the number of train movements.
- 2.1.6 There is a desire expressed within the rail industry for a national framework for SDO systems to be established. This guidance note has been written as a contribution to this framework.

2.2 Description of SDO systems

- 2.2.1 An SDO system is a means of enabling those power doors on a passenger train that give safe access for passengers to/from the platform and inhibiting those that do not.
- 2.2.2 The SDO system application is a supervisory application. It is not controlling the train to a stopping point (as in automatic train operation). It is a system that, if defined conditions are fulfilled, enables certain doors for opening.
- 2.2.3 The four basic requirements for effective implementation of SDO are:
 - a) Inhibiting those doors which do not give safe access to / from the platform
 - b) Enabling those doors which give safe access to / from the platform
 - c) Providing appropriate visual passenger information
 - d) Providing appropriate audible passenger information.
- 2.2.4 The way in which these functions are met depends on the technology chosen. The most basic (manual) system relies on a member of the train crew carrying out the function of identifying the location themselves and choosing the doors to inhibit. Passenger information is provided by a member of the train crew. The most sophisticated systems carry out the functions set out in 2.2.3 entirely automatically.
- 2.2.5 The selection of the type of SDO system is subject to a range of technical, operational and cost benefit criteria.
- 2.2.6 This document sets out guidance on the provision of manual and automatic SDO system functions.

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2.3 Relationship to door control

- 2.3.1 This document does not include guidance on door control systems. The boundaries of the SDO system are set out in Part 3. It is assumed that the basic door system is in compliance with Railway Group Standards, Technical Standards for Interoperability (TSIs) and EN 14752:2005 Railway Applications, Body Entrance Systems.

2.4 Operational considerations

- 2.4.1 Research commissioned to lead to an understanding of the limiting factors associated with the implementation of SDO systems at stations with regard to the behaviour of passengers and the occurrence of undesirable incidents (delays or accidents) is now complete.
- 2.4.2 This research provided criteria to determine where SDO systems are appropriate against the alternative of extending the platforms or of operating shorter trains more frequently.
- 2.4.3 SDO system functionality should be driven by normal safe driving practice, as set out in GE/RT8000: Rule Book, which ensures that the train crew are not overloaded or distracted by a large volume of 'secondary' workload, such as having to make routine passenger announcements. The role of the train crew's SDO system activities should be seen in this light.

2.5 Special operating scenarios

- 2.5.1 It should be recognised that not every station situation is identical or straightforward. It is important that systems should cope with specific and individual situations. The following events represent a selection of the particular situations that should be taken into account in the design of the SDO system.

2.5.2 Use of SDO on multiple unit trains without interconnecting gangways

- 2.5.2.1 Consideration should be given to the use of SDO on multiple unit trains not fitted with inter-unit gangways. This might lead to a situation where passengers in one section of the train were completely unable to move to a part of the train where doors were available for egress to the platform. This is likely to be unacceptable both in respect of customer service, and safety, since the response of passengers in such a situation cannot be assured.

2.5.3 Access for persons of reduced mobility (PRM)

- 2.5.3.1 Operators have a statutory obligation to take into account the needs of those with reduced mobility; this applies to boarding and leaving the train. It should therefore be considered important to ensure that PRM customers do not find themselves unable to egress the train at their destination because they are either unable to move through the train to a safe alighting point or, due to sensory impairment, are unaware that an SDO system is utilised on their train or are unable to recognise instructions relating to an SDO system.

2.5.4 Joining and splitting in a platform

- 2.5.4.1 A joining service should take account of a train already berthed at the platform, in particular, if the combined trains have a length longer than the platform. Attention should be given to splitting, as the newly formed train in the rear needs to operate an SDO system to ensure that doors not adjacent to the platform continue to be inhibited.

2.5.5 Reversing stations

- 2.5.5.1 A further difficulty arises at stations where trains reverse their direction of travel (due to termination or to take an onward route at certain junction stations). This affects both the selection of the doors to be enabled/inhibited and the information given to passengers.

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2.6 Impact of SDO systems on dwell time

- 2.6.1 The response time of any door control system affects the dwell time at a station platform. Dwell time depends upon the typical sequential events outlined below in Table 1 and the introduction of automation to an SDO system changes the timing of one of these events. Train crew intervention in manual SDO systems introduces a similar further delay, although the actions vary from system to system.
- 2.6.2 The volume of passengers alighting or joining also affects dwell time if a limited number of doors are available for use under an SDO system.
- 2.6.3 These effects on dwell time should be included on any assessment of the appropriateness of SDO systems, and should be understood by those manufacturing an automatic system.

Event
Train stopped
Train crew checks SDO system interface
Train crew presses door release buttons on the correct side
Door release lights illuminated
Door release system command and control
Doors begin opening, time to fully open
Passengers alight
Passengers boarding
Train dispatch – identify if it is safe to close doors
Operate door close
Communicate door close through train and response time of door system
Hustle warning
Door close phase
Door interlock communication
Driver response time to interlock, or two bells. Driver then takes traction

Table 1 Dwell time events

2.7 Degrees of automation

This section sets out the operational view of automating SDO system functions.

2.7.1 Manual SDO systems (not permitted for new applications)

- 2.7.1.1 In manual operation, a member of the train crew enables the operation of doors according to the station and platform length. The driver is responsible for stopping at the platform location that corresponds to the train formation. In the event of an excessive error, the train crew take appropriate action through the public address and the SDO system to enable passengers to disembark safely.

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- 2.7.1.2 Possible appropriate scenarios applicable to manual SDO systems include limiting door operation:
- a) To one vehicle only. (It is possible in the most restrictive operation to only release one door on a train rather than a vehicle).
 - b) To doors forward of a control point manned by the train guard.
 - c) To one or more units within a multiple unit train.
- 2.7.1.3 It is generally recommended that manual SDO systems are not used for trains utilising Driver Only Operation (DOO) and that the guard is given a role in selecting or confirming the doors to be opened.
- 2.7.1.4 It is recommended that a consistent method of operation is adopted within fleets to avoid risk of error caused by confusion of staff or customers. For example, it would generally be undesirable if at some stations, passengers are expected to alight from the front part of a train, but at other stations on the same route or network they were expected to alight from the rear.
- 2.7.2 Automatic Selective Door Operation (ASDO)**
- 2.7.2.1 The basic level of automation for an ASDO system is:
- a) If required by the SDO system in use, the train detects, by some form of positioning system, which particular station / platform it is in or approaching.
 - b) On the approach, appropriate passenger information announcements and visual indications are provided for the scheduled stop.
 - c) The train crew confirms that the correct stopping point has been achieved by observing the SDO sign on the platform.
 - d) The system inhibits those doors which do not give safe access to / from the platform.
 - e) The system enables those doors which give safe access to / from the platform.
 - f) The train crew releases the doors
 - g) The system should be inherently fail-safe.
 - h) The train crew monitor the operation of the system and, in the event of an anomaly, ensure that only doors where it is safe to alight / board the train are released by manual override, with suitable announcements over the public address to ensure that passengers can still be allowed to egress the train without excessive delay, even if the ASDO system malfunctions.
- 2.7.2.2 In certain ASDO implementations correct side door enable (CSDE) may be provided as an option without additional cost. With this option, power doors on the opposite side of the train to the platform are not enabled. The ASDO system either selects the side of the train to be opened automatically without the need for selection by the train crew or, alternatively, verifies the selection by the train crew, dependent on the design of the system.
- 2.7.2.3 It is an operating decision to determine which exceptional train movements should be accommodated within the automatic system.
- 2.7.2.4 Manual override, as required, should be included within the system to overcome fault situations.

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2.7.3 Fully Automatic Selective Door Operation (FASDO)

- 2.7.3.1 The involvement of the train crew is reduced as automation is extended to include:
- a) Verifying that the stopping point is correct within a defined tolerance, and then
 - b) Releasing the doors.
- 2.7.3.2 CSDE, as set out in 2.7.2.2, is normally inherent in any FASDO system.
- 2.7.3.3 Additional functionality can be included for exceptional cases to enable only those doors adjacent to the platform if the stopping point is incorrect.
- 2.7.3.4 As with ASDO systems, it is an operating decision to determine which exceptional train movements should be accommodated within the automatic system.
- 2.7.3.5 Manual override should be included within the system to overcome fault situations.

2.8 Reliability of operation

- 2.8.1 The introduction of an SDO system can lead to a level of complexity with the potential to cause problems. Appendix B provides a list of lessons learnt and issues arising from existing systems. This should be taken into account in the introduction of such systems.

2.9 Maintenance and testing principles

2.9.1 Role of design

- 2.9.1.1 Maintenance and testing contribute to meeting reliability targets for a system in service. These targets should be achieved by placing maintainability at the heart of the design process.

2.9.2 Built-in self-test

- 2.9.2.1 For ASDO systems it is good practice to provide a built-in self-test facility where practicable. Where provided, self test should normally be initiated automatically either at a set period (for example every 24 hours) or on 'power up' of the train.

2.9.3 Auto-diagnosis

- 2.9.3.1 For automated systems, SDO system facilities should include fault auto-diagnoses. When a fault is detected, the unit concerned should be identified and a fault code assigned. This information should be made available to the staff responsible as part of the train's standard maintenance facilities. This guidance extends to on-train detection of failures of any infrastructure equipment used for the SDO system function, such that a report is logged by the on-train system where it is possible to detect any infrastructure equipment that is missing or failed.
- 2.9.3.2 Specific information relating to testing and maintenance is set out in Appendix C.