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Railway infrastructure — Rail mounted construction, maintenance and inspection machines — Explanation of machine type

Infrastructure ferroviaire — Machines de construction, de maintenance et d'inspection montées sur rail — Explication du type de machine

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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
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Foreword

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This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 1, *Infrastructure*.

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Introduction

This document is intended to provide information on machines that are fitted with rail wheels. The purpose of this document is to clarify the complex variety of machines that are used for the construction, maintenance, inspection, repair and renewal of railway infrastructure. It is intended to be used as an introduction to the various types of rail mounted maintenance and infrastructure inspection machines. It is also intended as an aid to clarify the complexity caused by machines which are designed and intended for a specific working purpose but also have the ability to operate as a railway vehicle as an additional function.

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Railway infrastructure — Rail mounted construction, maintenance and inspection machines — Explanation of machine type

1 Scope

This document describes the different modes of operation and the classification of machine types.

This document covers machines fitted with rail wheels that are used for the construction, maintenance, inspection, repair and renewal of railway infrastructure. These include:

— on-track machines (OTMs), which are specially designed for construction and maintenance of the track and infrastructure;

— infrastructure inspection vehicles, which are utilised to monitor the condition of the infrastructure;

NOTE Inspection of the infrastructure includes measurement.

— environment vehicles, which are designed for clearance of the track from environmental conditions such as snow clearance machines;

— emergency vehicles, which are designed for a specific emergency use such as evacuation, firefighting and recovery of trains (including breakdown cranes);

— road-rail machines, which are able to move on railway track and on the ground;

— trolleys and portable machines that are manually moved along the railway track.

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 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 https://www.electropedia.org/

3.1 Machine type

3.1.1
rail mounted machine
generic term for the collection of all machines which have wheels suitable for running on railway tracks and are intended for the construction, maintenance, inspection, repair and renewal of railway infrastructure

Note 1 to entry: It is also applicable to machines used for emergency rescue purposes on railway infrastructure.

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3.1.2
railbound machine with running mode
machine intended to operate track signalling and control systems which only has wheels suitable for running on railway tracks and is intended for the construction, maintenance, inspection, repair and renewal of railway infrastructure

3.1.3
on-track machine
OTM
railbound machine with running mode specially designed for construction and maintenance of the track and infrastructure, running on its own rail wheels and designed and intended to operate signalling systems

Note 1 to entry: Such machines have running mode and travelling and working modes.

Note 2 to entry: Such machines are either self-propelled in running mode or hauled in running mode (hauled machines are permitted to have a self-propelled option in working/travelling mode).

3.1.4
infrastructure inspection machine
self-propelled or hauled railbound machine with running mode used to monitor the condition of the infrastructure, running on its own rail wheels, and designed and intended to operate signalling systems

Note 1 to entry: These machines are considered to be OTM unless they are intended to be incorporated in passenger or freight trains.

3.1.5
railbound machine without running mode
machine that can travel and work only on rail and which is not intended to operate track signalling and control systems, but is not able to travel on the ground

Note 1 to entry: Such a machine is permitted to work on the railway only under special operating conditions and travel under special conditions, i.e. it does not have a running mode.

3.1.6
non-demountable machine
self-propelled railbound machine without running mode that is not designed to get on and off track by its own means nor by other lifting equipment

3.1.7
demountable machine
self-propelled railbound machine without running mode that is designed to get on and off track by its own means or by other lifting equipment

Note 1 to entry: In the case of demounting by its own means, these are not intended for operating on the ground.

3.1.8
trailer
non-self-propelled railbound machine without running mode that can be towed on rail wheels and is not intended to operate track signalling and control systems

Note 1 to entry: Trailers are not designed to have a running mode.

Note 2 to entry: Trailers are hauled by *railbound machine without running mode* (3.1.5), *non-demountable machine* (3.1.6) or *road-rail machine* (3.1.9).

3.1.9
road-rail machine
self-propelled machine that can move on railway track and ground

Note 1 to entry: It is normally a road vehicle adapted for moving on rail also but can also be a specially designed rail vehicle for moving on the ground.

Note 2 to entry: It does not imply that the machine is suitable for use on the public road.

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3.1.10
road-rail trailer
trailer that can be towed on railway track and ground

3.1.11
lightweight demountable machine
machine with rail wheels which is designed so that it can be manually placed on or off the track and is either self-propelled or towed along the railway track

3.1.12
trolley
equipment moved along track on wheels or runners by human force only, which is designed so that it can be manually placed on or off the track; uses include transport of materials, tools and/or various equipment

3.1.13
portable machine
machine designed or adapted for use on the track which is propelled by manual effort (i.e. no powered drive system), but has a lifting capability and/or incorporates a power system (e.g. internal combustion, electro-mechanical, hydraulic, pneumatic energy sources or from an external supply) for specific work applications

3.2 Operational modes

3.2.1
running mode
configuration of a machine when it allows movement along the track, all moveable parts stowed within the applicable gauge, with the machine interacting with the signalling and control systems

Note 1 to entry: A fuller explanation is given in 4.4.

3.2.2
travelling mode
configuration of a machine when it allows movement along the working track, all moveable parts stowed (but not secured) within the applicable gauge, and when the machine does not require to interact with the signalling and control systems (in this condition, there is no need to ensure operation of signalling systems or for cab-based signalling equipment)

Note 1 to entry: A fuller explanation is given in 4.3.

Note 2 to entry: A machine in travelling mode does not need to meet the operational requirements for the movement of trains on the railway network.

3.2.3
working mode
mode when the machine is used to perform any of its permitted designed working tasks

Note 1 to entry: A fuller explanation is given in 4.2.

3.3 General

3.3.1
infrastructure manager
body or undertaking responsible for establishing and maintaining railway infrastructure, as well as for operating the railway control and safety systems

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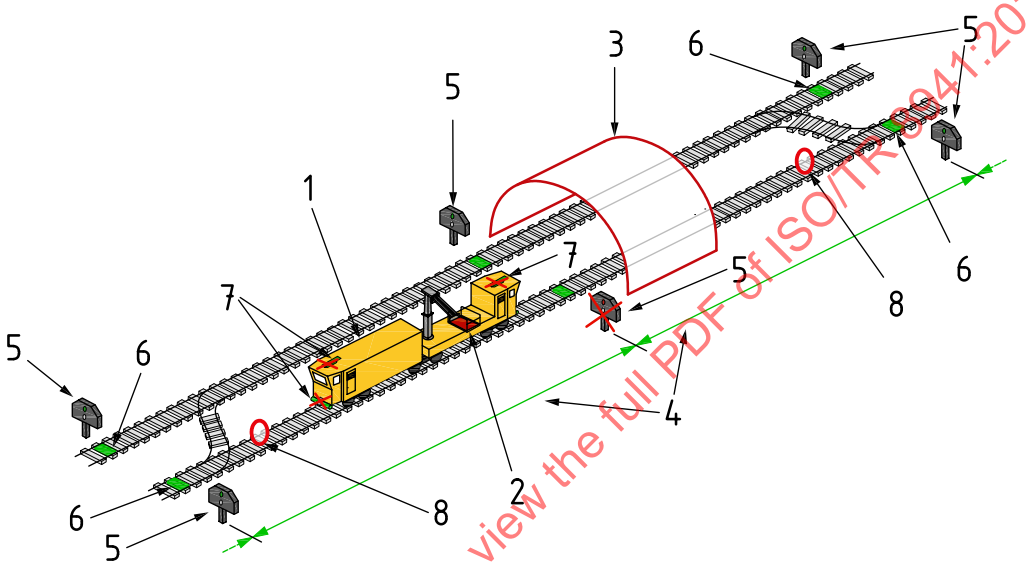
4 Modes of operation

4.1 General

Before explaining the various generic types of machines, it is useful to understand the three basic operating modes of a machine on the railway as described in this report, as they have a significant effect on the type of machine and its compliance process.

4.2 Working mode

When in working mode, the machine is protected from interference with passenger and freight trains by operational controls applied to the rules of the infrastructure manager. It is possible, but not always the case, that signalling systems will not be operational.



Key

1	machine	5	signal (with a cross means it can be isolated)
2	moveable component outside machine gauge	6	track mounted signalling equipment
3	limiting infrastructure gauge (tunnel, etc.)	7	vehicle mounted signalling equipment (off)
4	signalling block sections	8	train stop for passenger and freight trains

Figure 1 — Schematic representation of working mode

In working mode, as shown diagrammatically in Figure 1, a machine is permitted to exceed the vehicle gauge of the track it is on. Planning will be undertaken to avoid damage to the infrastructure by the machine which can need devices to limit its movement and/or other operational controls. Another area of planning is whether passenger and freight trains will be allowed to pass the work site on the adjacent track.

When self-propelled, a machine is operated by a driver/operator who fulfils the infrastructure manager's requirements for the line it is on.

4.3 Travelling mode

Where the machine needs to move from one site to another site, but only on the line that is protected from interference with passenger and freight trains by operational controls applied to the rules of the infrastructure manager, then the machine needs to be within gauge for the line but does not necessarily need to react with signals. This is called travelling mode, as shown diagrammatically in Figure 2. Where the machine is self-propelled, it is operated by a driver/operator who fulfils the infrastructure manager's requirements and the driver/operator needs to be able to see far enough ahead of the machine to enable the machine to stop within the sighting distance.

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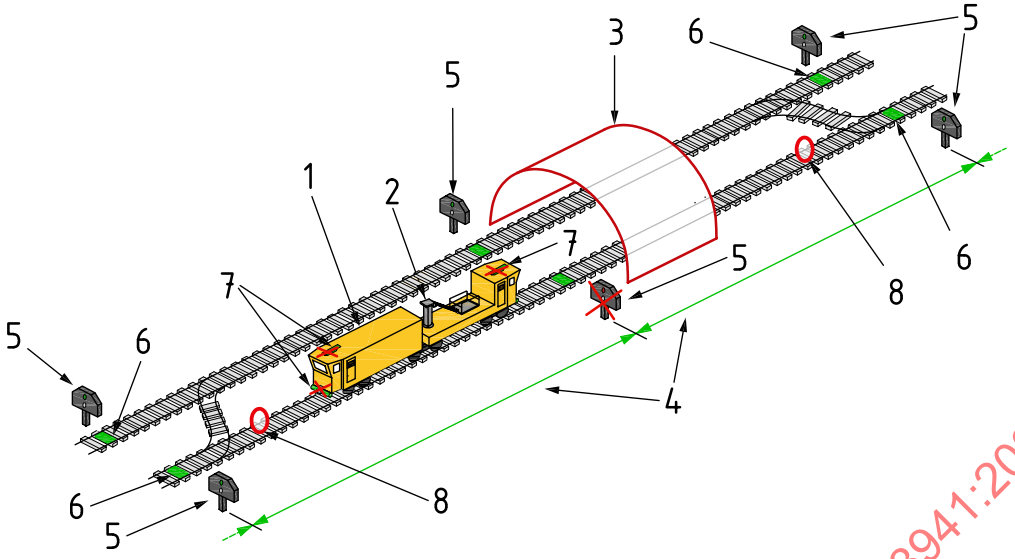

Key

1	machine	5	signal (with a cross means it can be isolated)
2	moveable component within machine gauge	6	track mounted signalling equipment
3	limiting infrastructure gauge (tunnel, etc.)	7	vehicle mounted signalling equipment (off)
4	signalling block sections	8	train stop for passenger and freight trains

Figure 2 — Schematic representation of travelling mode

4.4 Running mode

Running mode is shown diagrammatically in Figure 3. This is where the machine is operated under the same rules as a comparable standard railway vehicle.

Not every machine has a running mode. A machine in running mode will be expected to behave and react to the railway signalling and control systems on the track it is running on in the same way that a passenger or freight train would be scheduled for operational service.

In running mode, a machine can either be self-propelled or towed. When self-propelled, it will be driven by a train driver who complies with the signalling systems on the line it is running on, e.g. the driver has to be able to see signals, machine is fitted with in cab signalling etc. When a machine is not self-propelled in running mode, it will be towed and needs to behave with the signalling system in the same way that is expected for a railway wagon.

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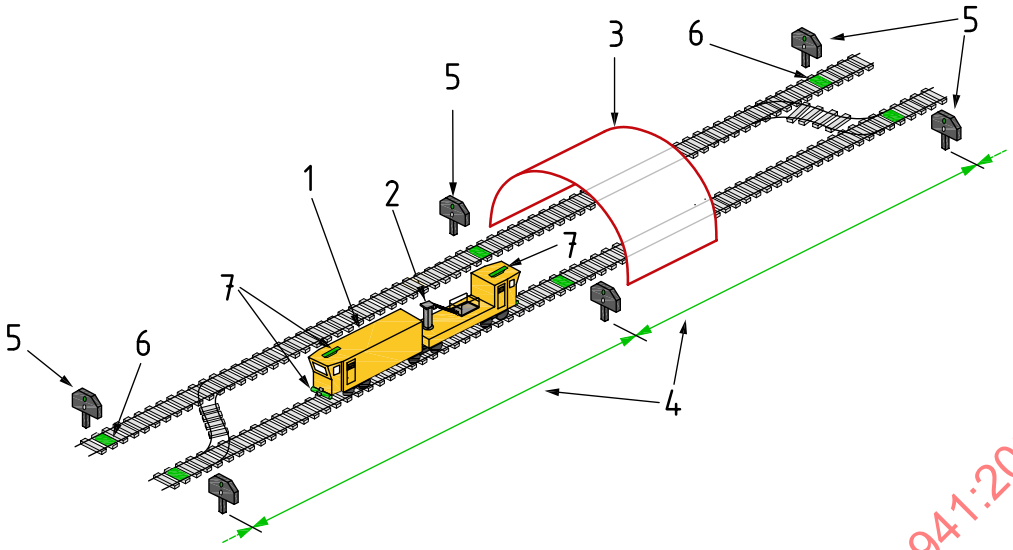

Key

1	machine	5	signal
2	moveable component locked in machine gauge	6	track mounted signalling equipment (includes detection of the machine)
3	limiting infrastructure gauge (tunnel, etc.)	7	vehicle mounted signalling equipment (working)
4	signalling block sections		

Figure 3 — Schematic representation of running mode

In addition to signalling, machines also need to comply with other infrastructure-based control and detection systems. The machine when in running mode has to be within, and remain within, the gauge of the line it is running on to avoid collision with infrastructure or trains/machines on adjacent tracks.

Machines that have a running mode will have similar features to conventional rolling stock (e.g. locomotives, wagons or multiple units). When a machine is in running mode, it will have to be compatible with the interfaces of the railway it is running on. There will always be differences between machines and railway vehicles, which are discussed in this document. The primary purpose of a machine are the working processes which are different to vehicles for the transportation of passengers and freight.

5 Generic types of machine

5.1 General

5.1.1 Classification

The range of machines that are used for railway infrastructure work is extremely varied. Some examples are shown in Annex A, but these are a small selection and new models are continuously created. However, there are a few basic principles that can be used to decide what generic type of machine any particular machine falls into. Principally there are five generic types of machines, and each machine will ultimately be one of these:

a) railbound machines with running mode;

b) railbound machines without running mode (including trailers);

c) road-rail machines (including road rail trailers);

d) lightweight demountable machines;

e) trolleys and portable machines.

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By a relatively simple series of decisions, it is possible to clarify which generic type the machine belongs to, see 5.2.5.

5.1.2 Railbound machines with running mode

5.1.2.1 General

Railbound machines with running mode tend to be the larger machines and, as the name suggests, remain on the railway line, i.e. they are delivered to their place of work by use of the railway line. Operationally, railbound machines with running mode are railway vehicles in running mode and machines in working and travelling modes.

5.1.2.2 On-track machine (OTM)

Railbound machines with running mode are built to be able to interact with the signalling and control system for the railway line they are being used on. If the railbound machine is self-propelled in running mode then it will need to be fitted with all the in-cab signalling systems that a passenger or freight train is fitted with on that line (e.g. Indusi, TVM300, AWS, ERTMS). If the machine is hauled in running mode, then it still needs to react with the signalling and control systems in the way that a freight wagon is expected to; for example, the axle weights and wheel spacing will need to be compatible with the signalling system, the axle bearings need to be in a position to be monitored by the hot box detection systems, etc.

Railbound machines with running mode can be self-propelled in running and travelling/working modes, or hauled in running mode and self-propelled in travelling/working modes, or hauled in both running and travelling/working modes. Railbound machines with running mode are usually capable of being incorporated into trains or hauled by locomotives, but some are only able to run under their own power or be towed by specially dedicated machines. The machines which are capable of integration with trains are normally characterised for example by having standardised railway wheelsets and couplings.

The various categories of railbound machines with running mode are shown in Table 1.

Table 1 — Railbound machines with running mode categories

	Self-propelled in running mode	Towed in running mode [b]
Can be incorporated into a train [a]	Category A	Category B
Cannot be incorporated into a train	Category C	Category D

[a] Some machines can have restrictions for their position within the train.

[b] These machines are permitted to have a self-propelling function in travelling or working mode.

5.1.2.3 Infrastructure inspection machines

The status of infrastructure inspection machines can be ambiguous, but for clarity:

— most infrastructure inspection machines, including those that are self-propelled infrastructure inspection machines are considered as railbound machines and comply with the standards written for railbound machines with running mode;

— infrastructure inspection machines that are designed to be incorporated into passenger trains are considered as railway vehicles rather than machines and comply with the standards applicable to passenger vehicle(s) concerned;

— infrastructure inspection machines that are designed to be incorporated into freight trains are considered as railway vehicles rather than machines and comply with the standards applicable to wagons.

Additionally, there is equipment that is attached to railway vehicles which is used to monitor the condition of the infrastructure, such as unattended measurement systems. This monitoring equipment is not considered within this document.

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5.1.2.4 Converted railway vehicles

Converted railway vehicles, where this involves components moving out of vehicle gauge or generating asymmetric/abnormal wheel loads, are now considered as machines and will need to be reassessed as machines. This is applicable to wagons and coaches that are modified with equipment or machines to carry out work on the railway infrastructure.

5.1.2.5 Environmental and emergency vehicles

These special vehicles are designed to move on railway tracks for a specific purpose, i.e. for clearance of the track from environmental conditions such as snow clearance machines or emergency use such as evacuation, firefighting, and recovery of trains (including breakdown cranes). These vehicles are normally very similar to machines shown above and will need to comply with the same rules and requirements.

5.1.3 Railbound machines without running mode

This generic type of machine is always used in an area separated from passenger or freight trains by operational means as specified for the railway line it is on and therefore does not have a running mode. They do not therefore need to interact with all the signalling and control systems.

Railbound machines without running mode have to be brought to near the intended railway worksite and then lifted onto the railway track, or stored in local sidings until needed. Once on the railway track, infrastructure maintenance machines are self-propelled, and trailers are hauled along the track.

Railbound machines without running mode which are designed and intended to be regularly lifted on and off track, or have the ability to lift themselves on and off track, are known as demountable machines.

Non self-propelled railbound machines without running mode, which are towed by other machines, are known as trailers.

5.1.4 Road-rail machines

A road-rail machine has the ability to move on its own power on railway track and on the ground. In general, they approach the railway track by land-based means and then are used on the track to fulfil their function. These machines move on the ground by means of either road wheels or crawler tracks. Machines which use only sliding rams to get onto the track are not considered road-rail (and would normally be a railbound machine without running mode). There are examples of machines with road wheels that get near to the track and then use sliding rams to position themselves onto the railway track, these are road-rail machines because of the fitment of road wheels (or crawler tracks).

The ability of the machines to move on the ground does not automatically mean the machines have the ability (or necessity) to be used on a public road. Therefore, in some respects, the name road-rail is slightly confusing because it does not confer rights or ability to use a “road”.

Some road-rail machines are designed, intended and permitted to be used on the railway line without special protection for them, i.e. they have a running mode; these will need to react with the signalling and control systems as explained in 5.1.2.

Road-rail machines have three basic means of propulsion along the railway track, known as Type A, B or C. Their drive and braking arrangements are described below and summarised in Table 2. Examples are shown in Annex A.

Type A machines are where the power is applied directly from the rail wheels, this is usually from an axle mounted hydraulic or electric motor, the braking on Type A machines is also directly on the rail wheels.

Type B machines have the road wheel squeezed against the rail wheel (or sometimes on a knurled extension of the rail wheels). The power to move along the track comes from the road wheels, which turn the rail wheels and move along the track. Braking is provided from the road wheel and can also have independent brakes acting directly onto the rail wheels.

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Type C machines have the rail wheels directly bearing on the rail head, with the rail wheels providing guidance only for the machine.

Table 2 — Road-rail machine drive types

	Type A	Type B	Type C
Power from rail wheel	✓		
Power from road wheel		✓	✓
Braking from rail wheel	✓	✓	
Braking from road wheel		✓	✓
Guidance from rail wheel	✓	✓	✓

NOTE Road-rail machines Type A, B and C have no relation to railbound machines category A, B, C and D.

Non self-propelled machines which have the ability to be moved on railway track and on the ground are road-rail trailers because of the fitment of road wheels (or crawler tracks). A road-rail trailer can be self-propelled on the ground but not on railway track.

5.1.5 Lightweight demountable machines

Lightweight demountable machines are self-propelled for movement along the track but are small enough to be lifted on and off the track manually.

5.1.6 Trolleys and portable machines

Manual propulsion is the only permitted form of movement along the railway track for trolleys and portable machines with rail wheels, which characterizes this specific generic type of machines. Any machine which is intended to be towed at any stage, belongs to one of the previous generic types. If there is any form of powered movement along the track, even if very slow, then it is not a trolley (and will probably be a lightweight demountable machine).

5.1.7 Demountable modules

Demountable modules are removable units which are capable of being attached with dedicated fastening system to a machine or wagon, to perform a specific function. A demountable module will need to be checked for conformity as part of the machine to all relevant clauses in all parts of the relevant machine standard when any of the following apply:

a) it has been manufactured or modified to suit the particular machine or type of machine;

b) it is used to carry personnel during travelling mode;

c) it is positioned on the machine by other than gravity or twist locks;

d) it has electrical, pneumatic or hydraulic connections to the machine;

e) it is connected to the machine by twist locks and is used for lifting any load whilst on the machine;

f) it is connected to the machine by twist locks and has moveable components which are able to exceed the gauge profile of the machine.

5.1.8 Attachments

Attachments can be fitted to machines that are described in this document. Any equipment that is mechanically fixed to and/or powered or controlled from the host machine is considered as an attachment (this can be a lifting accessory). Mechanically fixed is normally taken to indicate that the attaching point is semi-permanent (very often a quick hitch type device, twist lock or plug and play mechanism). Equipment which requires a workshop and skilled fitting staff to assemble/remove is considered to be a part of the host machine, and its addition is a modification to the machine.

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The use of attachments needs to be carefully described by the manufacturer of the attachment because they can have detrimental effects on the host machine. The effect on stability is more serious for railway use. For safe operation, the instruction handbook for the attachment will need to specify the minimum characteristics of the host machine.

5.1.9 Machines without rail wheels

There are many machines which do not have rail wheels, i.e. they have the ability to move on ground only, these are generally referred to as “civil engineering machines”, e.g. excavators, loaders, mobile elevating work platforms (MEWPs), mobile cranes. These machines are outside the scope of rail mounted machine standards. These machines will have their own specific regulations and can be subject to the infrastructure manager’s specific conditions when working on or adjacent to the railway.

There are machines that are specifically designed and intended for use on the railway infrastructure that are not guided by the railway track. These machines are not covered in this document, see A.9 for example.

5.1.10 Locomotives and wagons

There are railway vehicles (locomotives and wagons) that are specifically designed and intended for use with railbound machines, for example wagons for carrying ballast. Where the wagon carries a load only, and the loading and unloading activities are undertaken by other machines, then these vehicles are not covered in this document.

If during infrastructure maintenance activities these vehicles have any of the following characteristics:

— are capable of generating asymmetric and/or abnormal wheel loads,

— have parts of the ‘vehicle’ that can exceed the loading gauge,

— power operated mechanisms (i.e. not manually operated),

then, they are actually machines and considered to belong to machines in 5.1.2 to 5.1.4.

5.2 Classification of rail mounted machines

5.2.1 Classification method

There is an almost infinite variety of machines. However, with relatively few questions, it is possible to ascertain which family the machine belongs to, see Figure 4.

5.2.2 Machines with a running mode

Running mode means the ability to run on the railway track in a manner similar to passenger and freight trains, i.e. to interact with the signalling and control systems. Railbound machines and road-rail machines can have a running mode.

5.2.3 Machines with a road mode

Road-rail machines are able to move on the ground as well as on rail – all the machines have the ability to move along the railway line. Machines that have wheels or crawler tracks for use of movement on the ground are said to have a ‘road mode’. The use of the term road mode does not confer any ability of the machine to be used on a public road.

There are machines that in their working mode have the ability to move on ground; if these are railbound machines that only travel on the ground in working mode then they are not road-rail machines and are considered as OTMs that turn into civil engineering machines when on site, normally when the track is missing during the working process.

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5.2.4 Ways for the machine to move along the track

For movement along the track, a machine is either self-propelled, towed or manually moved along the track.

5.2.5 Combination of questions

By answering the three questions in 5.2.2 to 5.2.4, it is possible to ascertain which family the machine belongs to, as shown in the flowchart in Figure 4.

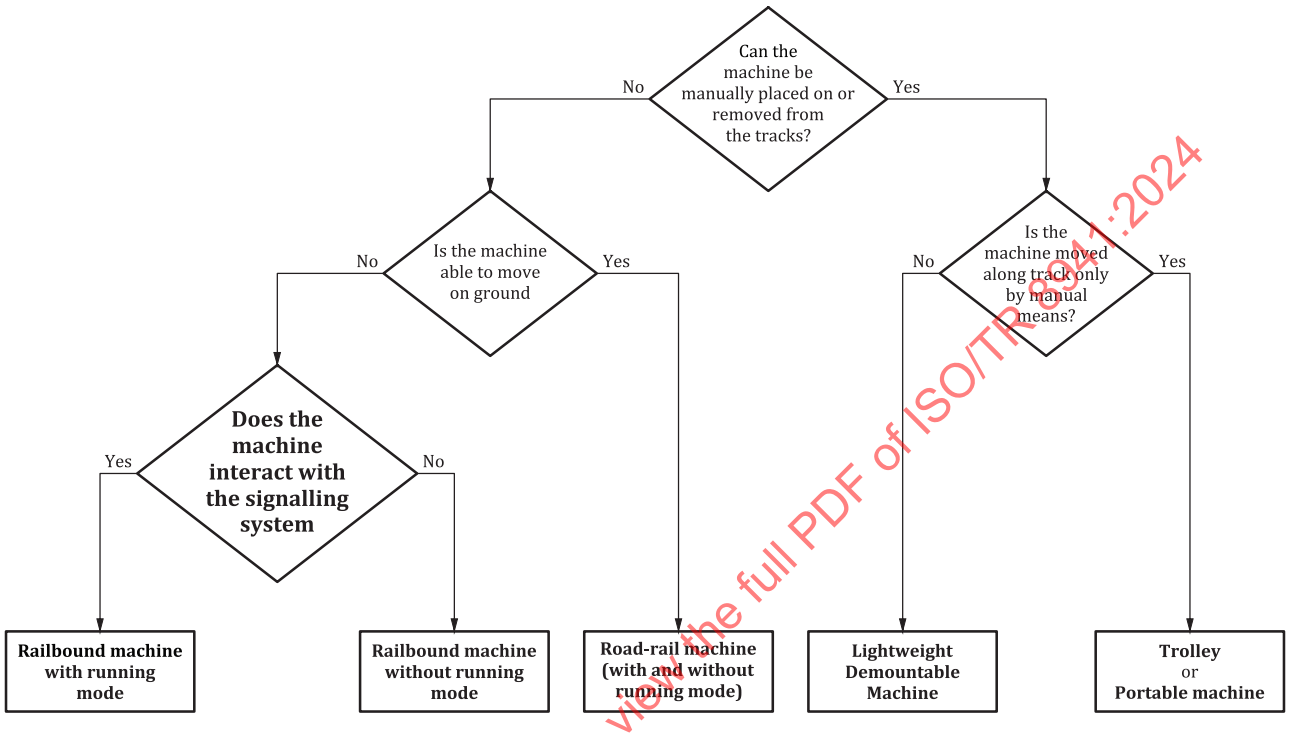

Figure 4 — Machine decision flow chart

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6 Acceptance of machines

6.1 General

The legal position of rail mounted railway maintenance and infrastructure inspection machines is complex because it is quite possible that some machines fall under two well-established processes. For all machines, relevant legislation and standards can apply in the country concerned. For any machine that is used on the mainline railway, interacting with signalling and control systems (i.e. has a running mode), relevant legislation and standards for railway vehicles can apply in the country concerned.

6.2 Machinery standards

For every machine, relevant legislation and standards for mobile machines can apply in the country concerned.

6.3 Railway standards

For any machine that is used on the mainline railway, interacting with signalling and control systems (i.e. has a running mode), mobile machine legislation as well as relevant legislation and standards for railway vehicles can apply in the country concerned.

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6.4 Acceptance to work on the railway

In addition to the legal requirements for mobile machinery and railway legislation, it is probable that entities that purchase machines and infrastructure managers who contract work on their railway will have their own specifications and quality requirements.

These will be overlaid on top of the legislative requirements of the country concerned.

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Annex A
(informative)

Examples of machine types

A.1 General

This annex is provided to give examples of the great variety of machines that exist, and to identify some common traits which help to establish which type and category they are. The explanations given to accompany each picture do not confer compliance to any/all standards nor permission to use the machine on specific railway infrastructure.

A.2 Railbound machine with running mode

A.2.1 Railbound machine with running mode - Category A

Figure A.1 — Railbound machine with running mode - On-track machine – Overhead line maintenance machine

The railbound machine with running mode in Figure A.1 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an on-track machine (OTM). It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. This particular machine is designed for maintenance of the overhead line system (the overhead line system is also formerly known as the catenary).

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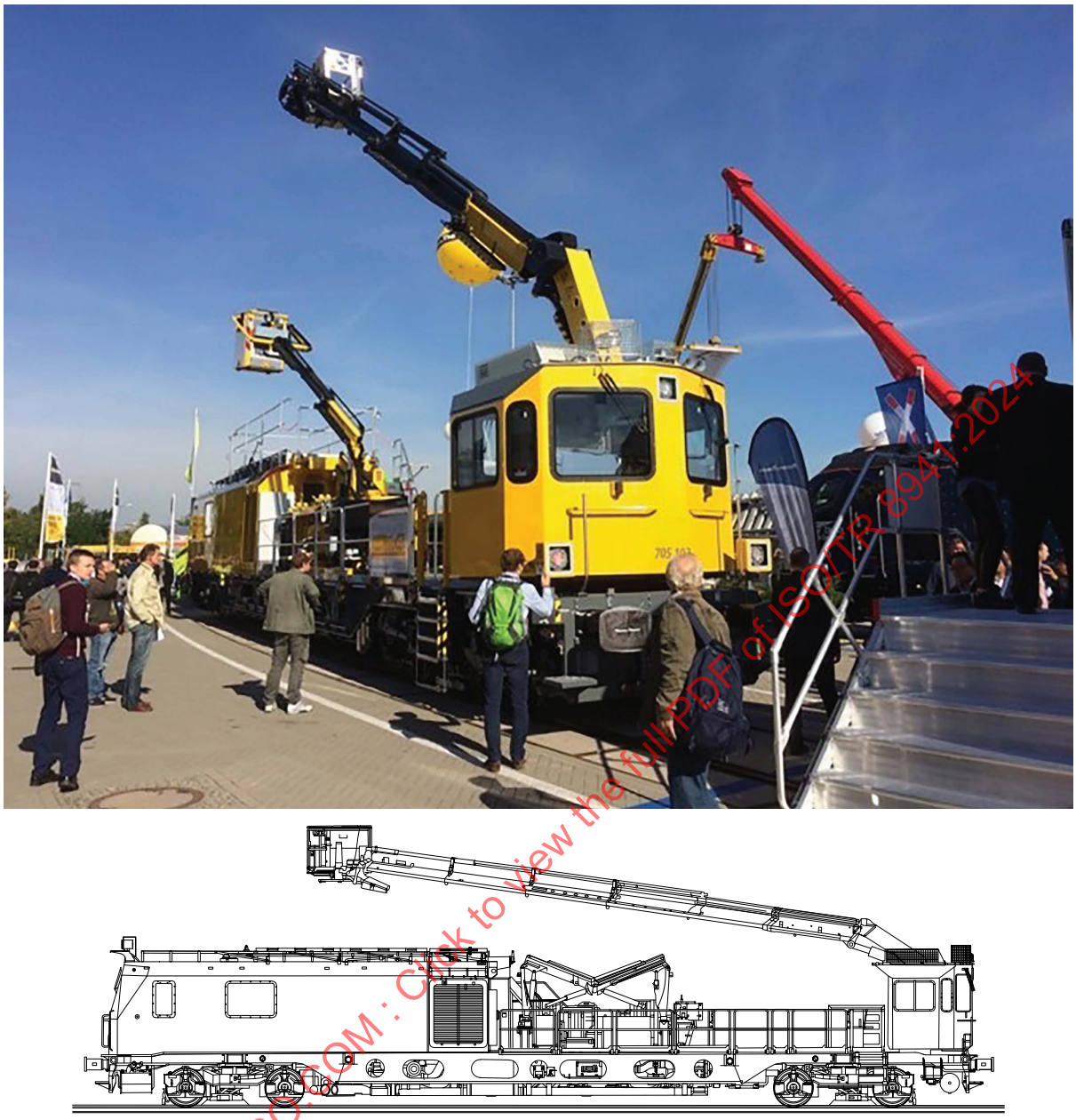

Figure A.2 — Railbound machine with running mode - On-track machine, overhead line maintenance machine

The railbound machine with running mode in Figure A.2 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. A novel feature of this general-purpose machine is that one of the cabs rotates through 360° - however this is only in working mode; in running mode the cab is secured and locked into the forward-facing position.

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Figure A.3 — Railbound machine with running mode - On-track machine - Tamping machine

The railbound machine with running mode in Figure A.3 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. The machine shown is a typical tamping machine. It has a different rail wheel configuration in working mode, so in running mode, the wheels and suspension system follow requirements of a railway vehicle which are different to the working mode.

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Figure A.4 — Railbound machine with running mode - On-track machine – Tamping machine

The electrically powered railbound machine with running mode in Figure A.4 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. Whether the machine is electrical or diesel powered does not effect the category.

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Figure A.5 — Railbound machine with running mode - On-track machine – Rail milling and grinding machine

The railbound machine with running mode in Figure A.5 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. The machine shown is a combined milling and grinding machine for reprofiling the rail head.

Figure A.6 — Railbound machine with running mode - On-track machine – Ballast plough

The railbound machine with running mode in Figure A.6 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It is self-propelled in running mode and can also be incorporated into a train, it is therefore a category A machine. The machine shown is a ballast plough, it does not have bogies, it is supported by two single conventional wheelsets.

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Figure A.7 — Railbound machine with running mode – Infrastructure inspection machine

The railbound machine with running mode in Figure A.7 is an infrastructure inspection machine. It is self-propelled in running mode and capable of interfacing with signalling control systems. It is classified as an infrastructure inspection machine because attachments and/or components do not move outside of the running gauge. It can also be incorporated into a train when necessary, so is considered a category A railbound machine.

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A.2.2 Railbound machine with running mode - Category B

Figure A.8 — Railbound machine with running mode - On-track machine – Ballast cleaning machine

The railbound machine with running mode in Figure A.8 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. This ballast cleaning machine comprises several on-track machines coupled together to form a train which is towed to the site of work and in running mode it is not self-propelled. Although the machine is capable of moving itself along the track in travelling or working modes this does not effect the category; i.e. the machine category is decided in its running mode and therefore this is category B railbound machine.

Figure A.9 — Railbound machine with running mode - On-track machine – Track renewal machine

The railbound machine with running mode in Figure A.9 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. This track renewal machine comprises several on-track machines coupled together to form a train which is towed to the site of work and in running mode it is not self-propelled. Although the machine is capable of moving itself along the track in travelling or working modes this does not effect the category; i.e. the machine category is decided in its running mode and is therefore a category B railbound machine. In working mode, this machine has crawlers which bear directly onto the ballast.

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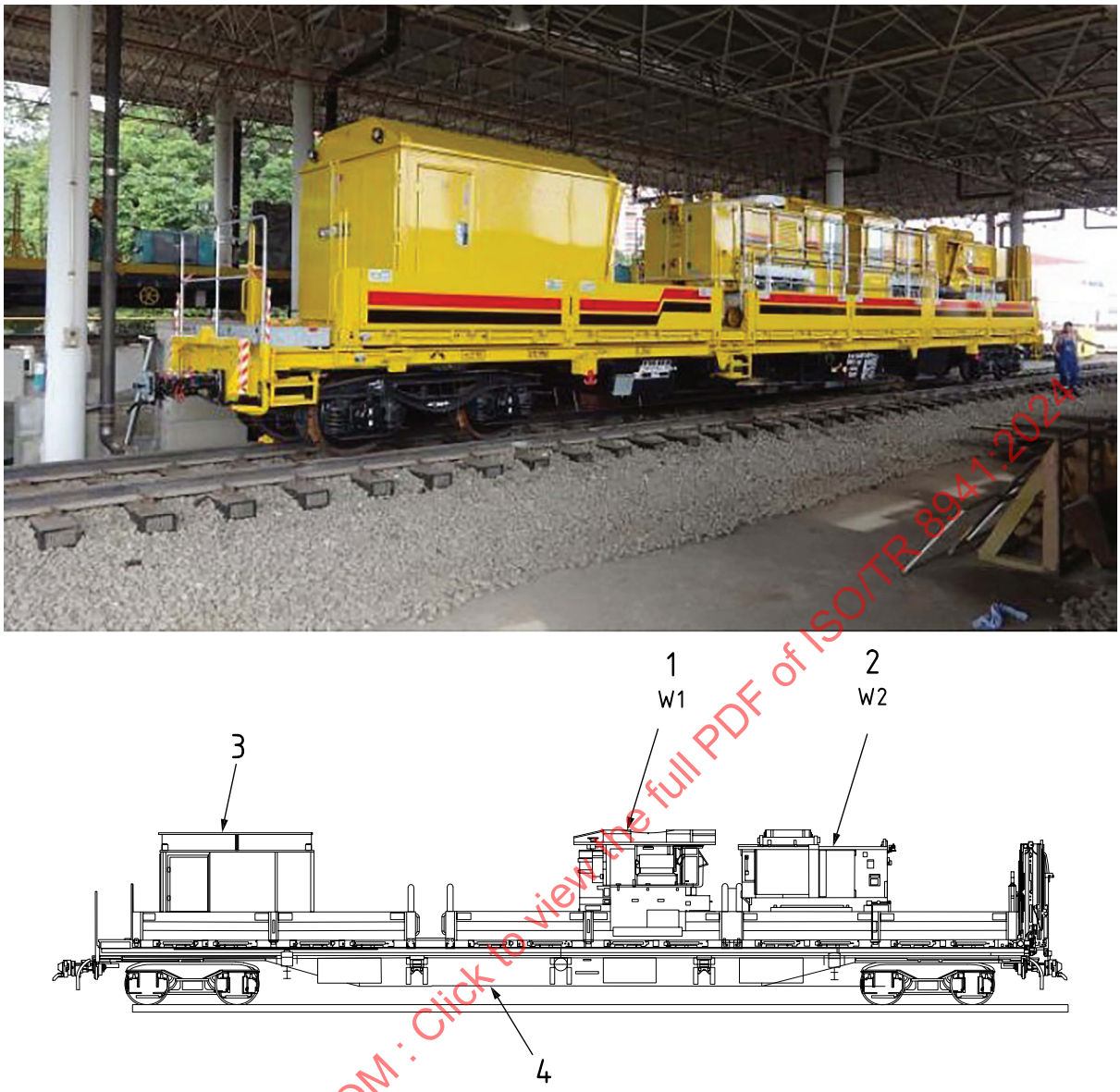

Figure A.10 — Railbound machine with running mode - On-track machine – Specialist wagon

The railbound machine with running mode in Figure A.10 is capable of interfacing with signalling control systems. It can be incorporated into a train but does not have a self-propelling capability and is therefore a category B railbound machine. The machine actually carries other machines, shown as 1 and 2 in Figure A.10, to the worksite. It is also capable of carrying a conventional load, shown as 3 in Figure A.10. Whilst the on-track machine, shown as 4 in Figure A.10, is transporting the other machines (in running mode) the other machines are simply treated as a load. It is only once the other machines are unloaded that they are considered as a machine, see Figure A.24.

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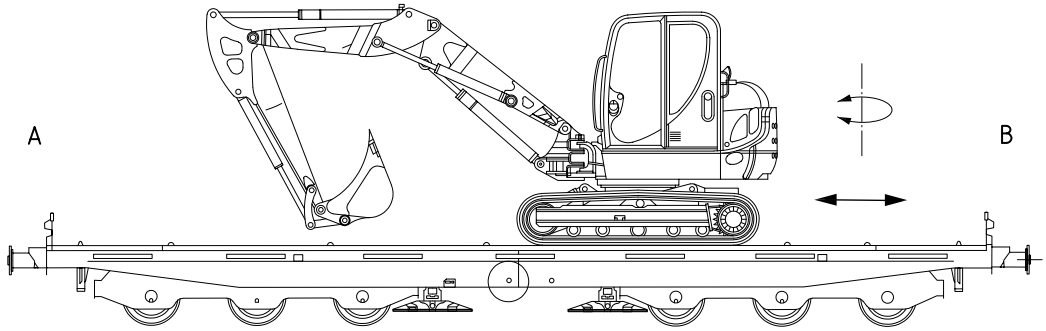

Key

A end

B end

Figure A.11 — Railbound machine with running mode - Converted railway vehicle – Machine carrier

The railbound machine with running mode in Figure A.11 is capable of interfacing with signalling control systems. It can be incorporated into a train but does not have a self-propelling capability and is therefore a category B machine. This actual example of a machine was converted from a wagon to carry other machines to the worksite. Whilst the on-track machine is transporting the other machines (in running mode) the other machines are simply treated as a load. However, at the worksite the mobile machine that has been carried works from the on-track machine and so the combined assembly will need to be assessed together for the working mode. The assembly will need to consider all the requirements for a railbound machine including stability, equipotential bonding, braking, control of movement out of gauge, rail and formation loading, etc.

Figure A.12 — Railbound machine with running mode - On-track machine - Crane

The railbound machine in Figure A.12 is capable of interfacing with signalling control systems and intended to work on the railway infrastructure therefore is classified as an OTM. It can be incorporated in a train with its support vehicles and in running mode it is not self-propelled. Although the crane is capable of moving itself along the track in travelling or working modes, this does not effect the category; i.e. the machine category is decided in its running mode and is a category B railbound machine.

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Figure A.13 — Railbound machine with running mode - On-track machine – Ballast carriage and transfer wagon

The machine in Figure A.13 has powered equipment and the ability for components to move out of gauge and is therefore a railbound machine with running mode; it is capable of interfacing with signalling control systems and so is specifically an OTM. It can be incorporated into a train but does not have a self-propelling capability and is therefore a category B railbound machine.

Figure A.14 — Railbound machine with running mode - On-track machine – Ballast transfer wagon with crawler tracks

The machine in Figure A.14 is capable of interfacing with signalling control systems and so is an OTM. It can be incorporated into a train but does not have an on-track self-propelling capability and is therefore a category B railbound machine. It is similar to the machine shown in Figure A.13 but additionally, there are crawler tracks which can be lowered and used to move the machine when off rails. When the crawler tracks are in use, i.e. in working mode, the machine is not on rail - this is not a road-rail machine - but is considered as a construction machine in working mode.

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Figure A.15 — Railbound machine with running mode - On-track machine – Turnout transporter wagon

The 'vehicle' in Figure A.15 has powered equipment and the ability for components to move out of gauge and is therefore a railbound machine with running mode; it is capable of interfacing with signalling control systems and so is specifically an OTM. It can be incorporated into a train but does not have a self-propelling capability and is therefore a category B railbound machine with running mode. It is designed to carry completed turnouts (which are also known as switches and crossings).

A.2.3 Railbound machine with running mode - Category C

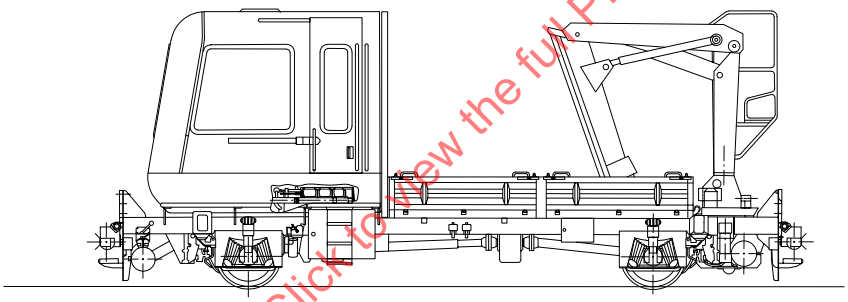

Figure A.16 — Railbound machine with running mode - On-track machine – General maintenance machine

The railbound machine with running mode in Figure A.16 is capable of interfacing with signalling control systems and so is an OTM. It cannot be incorporated into a train but does have a self-propelling capability. It is therefore a category C railbound machine with running mode. The couplings at each end of the machine are to connect to specific towed vehicles only. The machine does not have the frame strength or coupling capability for inclusion in a train.

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A.2.4 Railbound machine with running mode - Category D

Figure A.17 — Railbound machine with running mode - On-track machine – Towed wagon

The railbound machine with running mode in Figure A.17 is capable of interfacing with signalling control systems and so is an OTM. It cannot be incorporated into a train and is not self-propelled. It is therefore a category D railbound machine with running mode. The couplings at each end of the machine are to connect to specific towing vehicles only. The machine does not have the frame strength or coupling capability for inclusion in a train.

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A.2.5 Environmental and emergency machines

A.2.5.1 Environmental machines

Figure A.18 — Environmental machine – Snow blower

The machine in Figure A18 is capable of moving on railway track and is designed and intended to react with signalling control systems. It is specifically designed to remove snow from the railway track by the rotating blades at the front of the machine picking up the snow and depositing it beside the track.

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A.2.5.2 Emergency machines

Figure A.19 — Emergency machine – Derailed vehicle recovery

The emergency machine in Figure A.19 is capable of moving on railway track and is designed and intended to react with signalling control systems. It is specifically designed to rerail derailed railway vehicles.

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Figure A.20 — Emergency machine – Fire fighting train

The emergency machine in Figure A.20 is capable of moving on railway track and is designed and intended to react with signalling control systems. It is specifically designed to fight fires on the railway infrastructure.

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A.3 Railbound machine without running mode

A.3.1 Non-demountable machine

Figure A.21 — Railbound machine without running mode – Track motor vehicle

The rail mounted machine in Figure A.21 is not designed and intended to react with signalling control systems but is self-propelled on rail, so it is a railbound machine without running mode. This machine is only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. It is not designed for routine lifting from the track so is stabled in sidings until it can be used, in this case to pull the ballast renewal machine, similar to that shown in Figure A.8.

A.3.2 Demountable machine

Figure A.22 — Railbound machine without running mode – Demountable machine - Tamper

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The rail mounted machine in Figure A.22 is not designed and intended to react with signalling control systems but is self-propelled on rail, so it is a railbound machine without running mode. This machine is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. The machine has lifting eyes so that it can be lifted on and off the track and is therefore a demountable machine.

Figure A.23 — Railbound machine without running mode – Demountable machine - Tamper

The rail mounted machine in Figure A.23 is not designed and intended to react with signalling control systems but is self-propelled on rail, so it is a railbound machine without running mode. This machine is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. The machine has jacking legs so that it can be lifted on and off the track and transportation lorry trailer, it is therefore a demountable machine.

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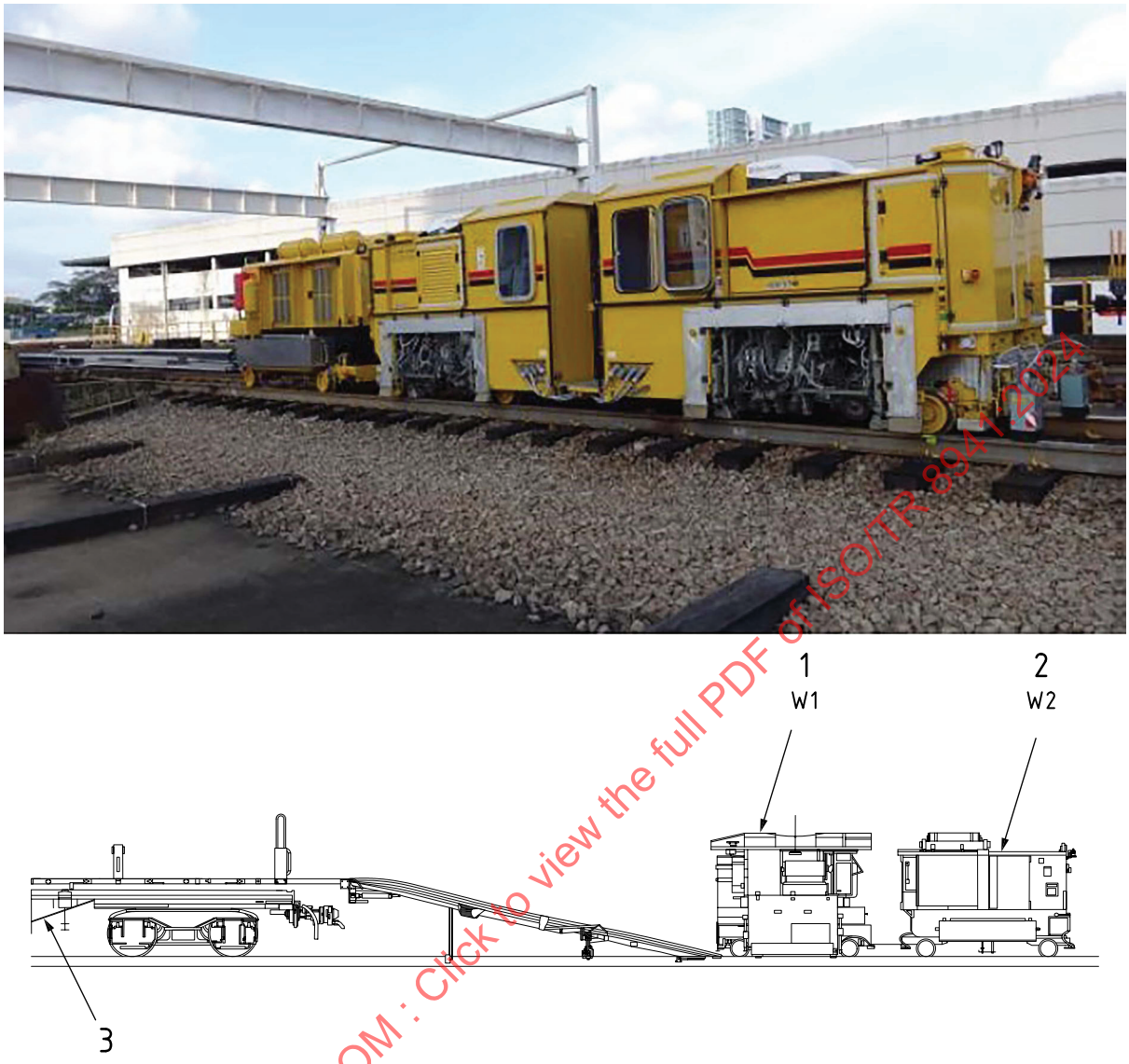

Figure A.24 — Railbound machine without running mode - Demountable machine – Rail grinder

The rail mounted machines W1 and W2 shown in Figure A.24 are not designed and intended to react with signalling control systems but W1 is self-propelled on rail, so it is a railbound machine without running mode (W2 is a trailer). These machines are brought to the worksite using the machine shown as 3 in Figure A.24 and also shown as 4 in Figure A.10. The machines W1 and W2 are only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. These machines can also be lifted onto the track and hence are demountable machines.

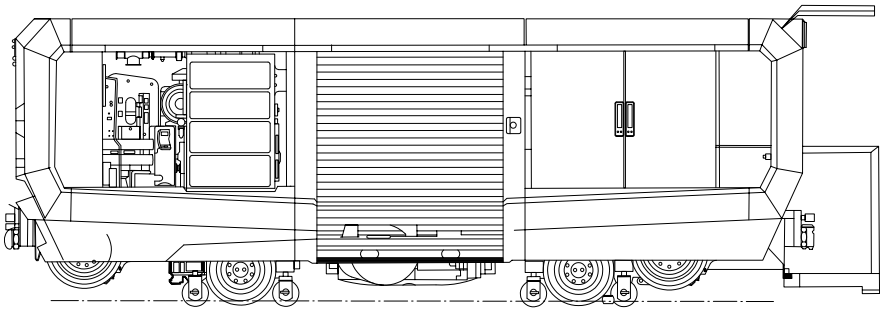

Figure A.25 — Railbound machine without running mode - Demountable machine – Rail grinder

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The rail mounted machine in Figure A.25 is not designed and intended to react with signalling control systems but is self-propelled on rail up to a maximum speed of 5 km/h, so it is a railbound machine without running mode. The machine can be hauled at a maximum speed of 60 km/h. It is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. It is designed to be lifted on and off the track and so is a demountable machine.

Figure A.26 — Railbound machine without running mode - Demountable machine – Track handler

The rail mounted machine in Figure A.26 is not designed and intended to react with signalling control systems but is self-propelled on rail so it is a railbound machine without running mode. It is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. When in working mode, the machine is capable of supporting itself on the ballast shoulders and lifting the track.

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Figure A.27 — Railbound machine without running mode - Demountable machine – Turnout handler

The rail mounted machine in Figure A.27 is not designed and intended to react with signalling control systems but is self-propelled on rail and so is a railbound machine without running mode. It is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. The turnouts are carried on the flat top of the machine for positioning in the worksite, the machine itself is remote controlled to move along the track.

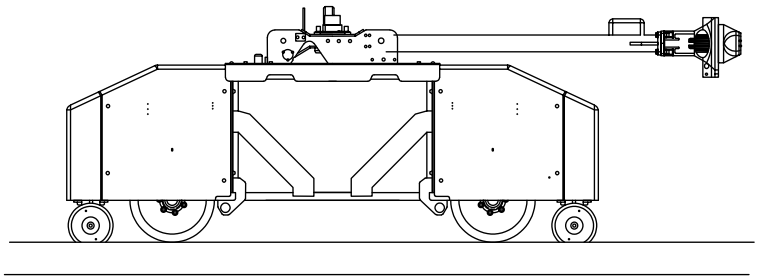

Figure A.28 — Railbound machine without running mode - Tug

The rail mounted machine in Figure A.28 is not designed and intended to react with signalling control systems but is self-propelled on rail and so is a railbound machine without running mode. It is electrically powered and remote controlled, commonly used in depots for shunting, but is only used where there it is protected against inadvertent movement of trains.

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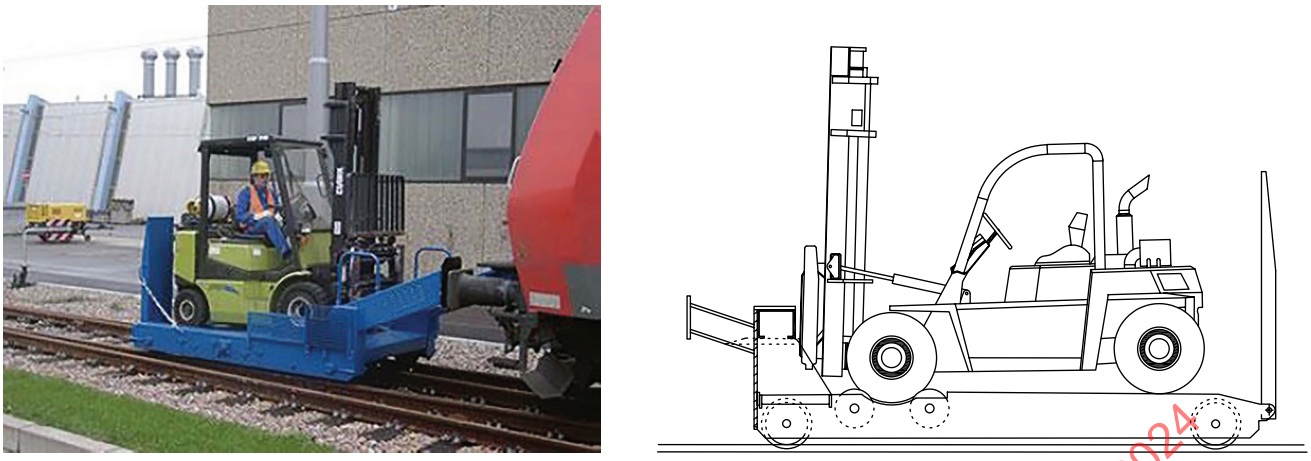

Figure A.29 — Railbound machine without running mode - Demountable machine - Shunter

The rail mounted machine in Figure A.29 is not designed and intended to react with signalling control systems but is self-propelled on rail when used with a forklift truck and so it is a demountable machine. It is commonly used in depots for shunting but is only used where there it is protected against inadvertent movement of trains. Although this machine looks like a trailer when the forklift is not present, the manufacturer intends the machine to be used with a forklift truck to power the rail wheels and therefore this is a railbound machine without running mode and will need to meet the requirements for the demountable machine. If this type of machine is also intended to be used as a trailer, i.e. if it will be towed by a powered machine, then it is both a trailer and a demountable machine and needs to meet the requirements of both.

A.3.3 Trailer

Figure A.30 — Railbound machine without running mode - Trailer

The rail mounted machine in Figure A.30 is not designed and intended to react with signalling control systems and is towed on rail so is a trailer. This machine is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

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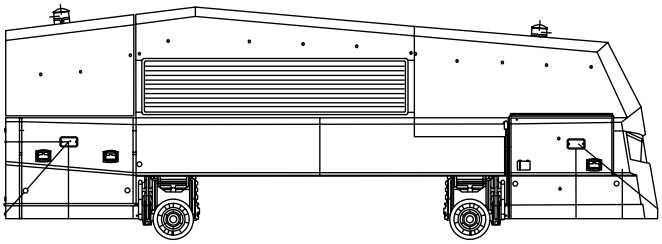

Figure A.31 — Railbound machine without running mode - Trailer

The rail mounted machine in Figure A.31 is not designed and intended to react with signalling control systems and is towed on rail, so it is a trailer. This machine is brought to the worksite and only used on tracks that the infrastructure manager has protected against inadvertent movement of trains. Whilst on rail, this trailer has grinding units that amend the profile of the rail head and has a maximum towed speed of 60 km/h.

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A.4 Road-rail machine

A.4.1 Road-rail machine with running mode

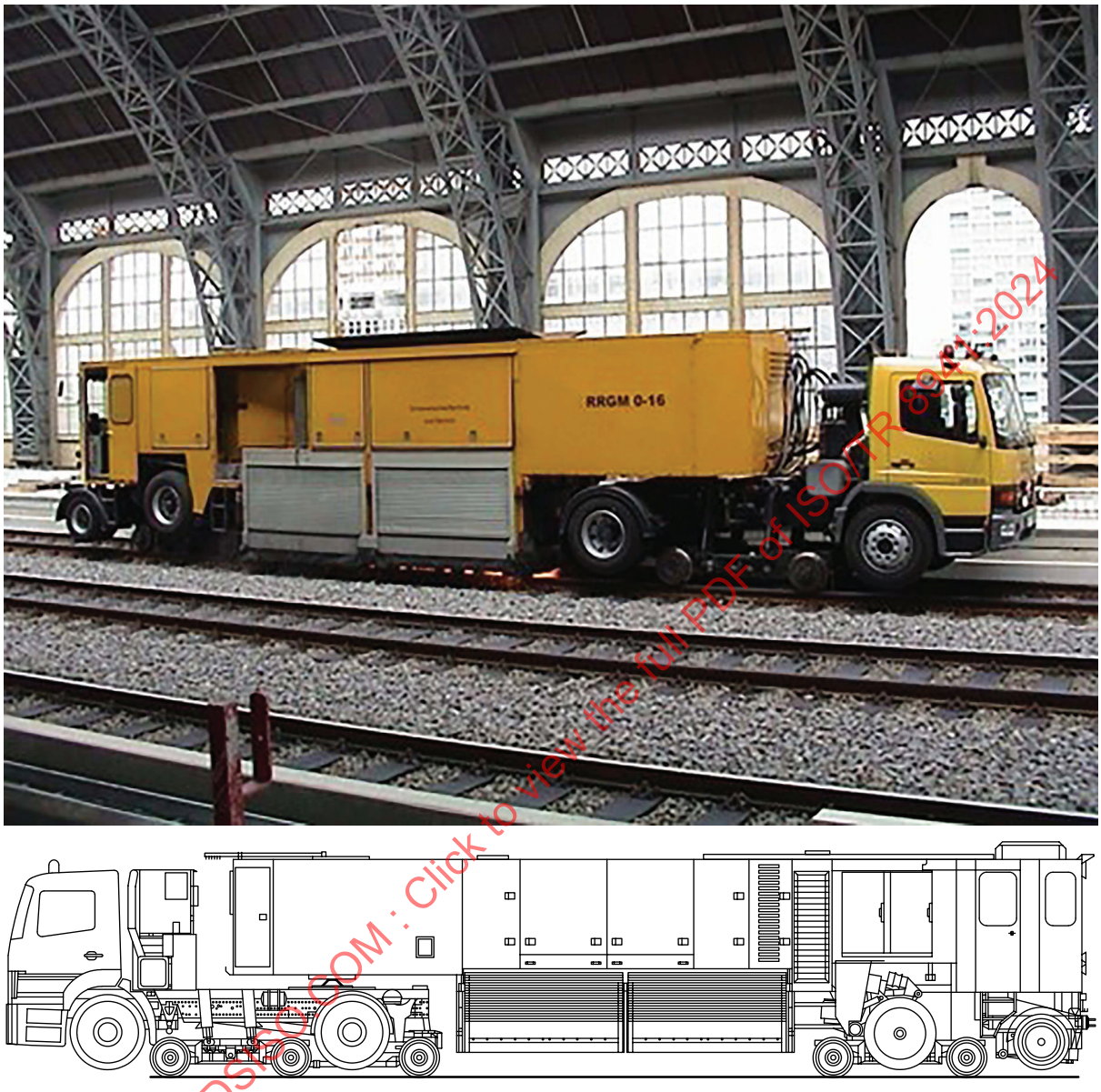

Figure A.32 — Road-rail machine with running mode, type A – Rail grinder

The machine in Figure A.32 is capable of moving on railway track and on the ground and so it is road-rail machine. This machine is designed and intended to react with signalling control systems but is not capable of inclusion in a train. The machine therefore is accepted as a railway vehicle in its running mode.

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Figure A.33 — Road-rail machine with running mode, type C – Railway shunter

The machine in Figure A.33 is capable of moving on railway track and on the ground and so is road-rail machine. This machine is designed and intended to react with signalling control systems and is also capable of inclusion in a train.

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A.4.2 Road-rail machine without running mode

A.4.2.1 Road-rail machine without running mode – Type A

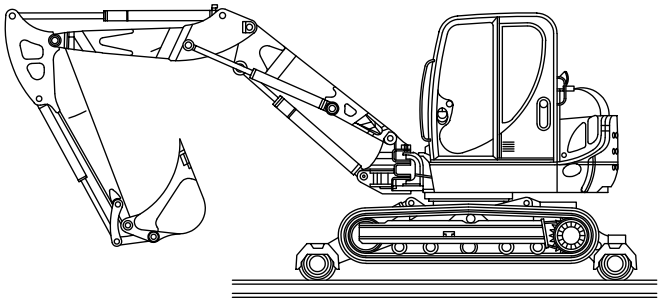

Figure A.34 — Road-rail machine without running mode, type A – Excavator

The machine in Figure A.34 is capable of moving on railway track and on the ground and so is a road-rail machine. This machine has rail wheels that are powered and braked and is therefore a type A road-rail machine. It is not designed and intended to react with signalling control systems and therefore is used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

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Figure A.35 — Road-rail machine without running mode, type A - MEWP

The machine in Figure A.35 is capable of moving on railway track and on the ground and so is a road-rail machine. Although the capability for moving on the ground is very limited, it does exist and therefore comes under the scope of road-rail machine (noting that the term road-rail does not mean the machine has the capability, or permission, for movement on the road). This machine has rail wheels that are powered and braked and is therefore a type A road-rail machine. It is not designed and intended to react with signalling control systems and therefore is used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

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A.4.2.2 Road-rail machine without running mode – Type B

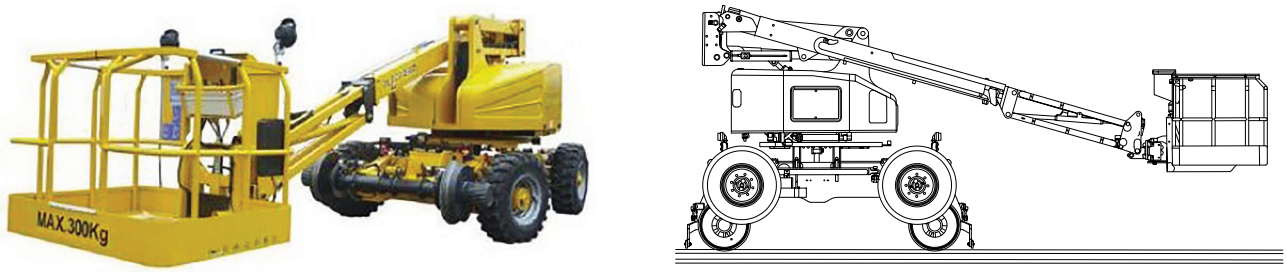

Figure A.36 — Road-rail machine without running mode, type B - MEWP

The machine in Figure A.36 is capable of moving on railway track and on the ground and so is a road-rail machine. The power for this machine is from the road wheels which sit on a knurled extension of the rail wheel axle, and is therefore a type B road-rail machine. This machine is not designed and intended to react with signalling control systems and therefore is used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

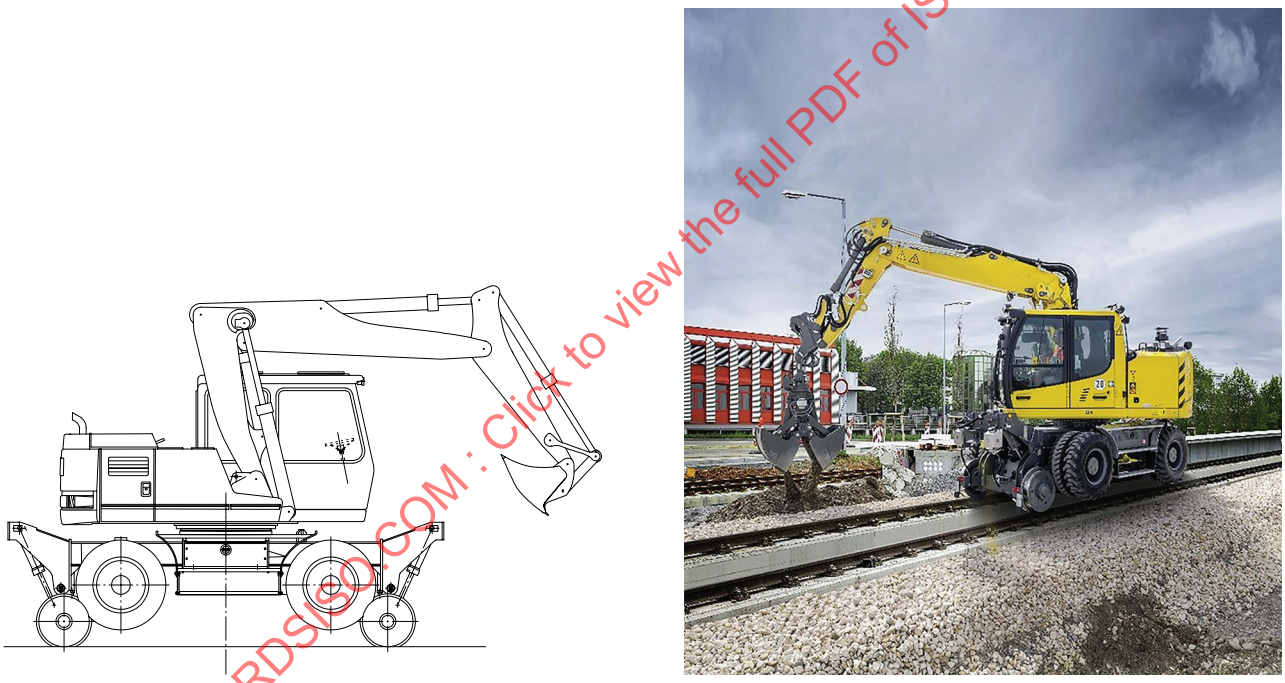

Figure A.37 — Road-rail machine without running mode, type B - Excavator

The machine in Figure A.37 is capable of moving on railway track and on the ground and so is a road-rail machine. The power for this machine is from the road wheels which sit on the tread of the rail wheel, and is therefore a type B road-rail machine. The example in the line drawing has rail wheel braking, whereas the photograph shows a machine that the brakes are on the road wheels. This machine is not designed and intended to react with signalling control systems and therefore is used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

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A.4.2.3 Road-rail machine without running mode – Type C

Figure A.38 — Road-rail machine without running mode, type C - Excavator

The machine in Figure A.38 is capable of moving on railway track and on the ground and so is a road-rail machine. The power and braking for this machine are from the road wheels which sit on the railway track therefore a type C road-rail machine. This machine is not designed and intended to react with signalling control systems and therefore is used on tracks that the infrastructure manager has protected against inadvertent movement of trains.

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