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Code of Practice for Loading of OTP

M&EE Networking Group
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Background

A sub-group of the M&EE Networking Group have looked at the arrangements for Loading of OTP. The M&EE Networking Group recommend this COP as good practice for the industry.

M&EE COPs are produced for the benefit of any industry partner who wishes to follow the good practice on any railway infrastructure. Where an infrastructure manager has mandated their own comparable requirements, the more onerous requirements should be followed as a minimum for work on their managed infrastructure.

The M&EE Networking Group makes no warranties, express or implied, that compliance with this document is sufficient on its own to ensure safe systems of work or operation. Users are reminded of their own duties under health and safety legislation.

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Purpose
This Code of Practice gives guidance on the arrangements for loading and securing of typical loads associated with on-track plant (OTP).

Scope
This Code of Practice concerns the loading and securing of equipment and materials onto all OTP whilst on rail.

Definitions
Dunnage Off-cut or spare pieces of scrap wood packing used to support loads to prevent damage to cargo or vehicle.

On Track Plant (OTP) Also known as ‘in possession only rail vehicles’ and includes road-rail vehicles (RRV), demountable machines and their trailers and attachments with guidance wheels.
1. **General Principles**

1.1 When undertaking loading of vehicles or trailers the responsible person should ensure that the load is stable, will not shift or fall and that it does not present a risk of collision with persons, other vehicles, or any part of the infrastructure whilst travelling.

1.2 The general principles when loading, unloading and operating a vehicle / trailer are listed below, and detailed in the corresponding section in this document.

   a) Loads should be within the designed capability of the vehicle. They should be loaded in accordance with the manufacturers’ instructions. Any restrictions on the Infrastructure Manager’s Certificate of engineering acceptance certificate should be applied.

   b) For maximum stability the load should be kept as low as possible and uniformly distributed about the centre of the loading area both laterally and longitudinally.

   c) Consideration should be given to the loading / unloading sequences.

   d) If the load exceeds the applicable Infrastructure Manager’s gauge then a site specific clearance assessment should be undertaken.

   e) Special consideration should be given to loads carried over multiple vehicles and loads that overhang vehicle(s).

   f) Uncontrolled movement of loads should be prevented.

   g) Methods of restraint for the load should be appropriate for the nature of the load and the operational circumstances, this may include: through bolts, twist locks, chains, straps, shackles or similar. Horizontal restraint only is not sufficient.

   h) The effect of forces applied externally to the load (e.g. uncoiling from cable drum carriers) should be taken into account.

   i) The speed of travel should be considered in particular when travelling over S&C.

   j) Special consideration should be given to hazardous loads.

   k) Consideration shall be given to task specific requirements for PPE when undertaking loading operations e.g. Respiratory Protective Equipment (RPE)

   l) There are specific requirements for transporting personnel.
2. **Guidance**

2.1 **Manufacturer’s Instructions**

2.1.1 Users of OTP can find requirements for safe use of the equipment and any other limitations from the following sources:

- Operator manuals and training instructions.
- Markings on the vehicle (e.g. speed, carrying capacity).
- Infrastructure Manager’s Certificate of engineering acceptance.

2.1.2 There are two main trailer types which affect loading:

a) A three point suspension arrangement (with one oscillating axle) where the load should be distributed as shown by the shaded area in Fig 1.

![Fig 1 Three point suspension]

b) A four point suspension arrangement where the load should be distributed evenly as shown by the shaded area in Fig 2.
2.2 Stability

2.2.1 Lack of stability can lead to three different hazards:
   a) The load topples or collapses.
   b) The load and carrying vehicle tip over.
   c) The vehicle derails during movement.

2.2.2 Lack of stability can be caused by:
   a) Load with a high centre of gravity (e.g. lighting towers).
   b) Uneven weight distribution.
   c) Unevenly shaped loads (e.g. with an offset centre of gravity).
   d) Load with a moving centre of gravity (e.g. liquids).

2.2.3 These hazards can be reduced by:
   a) Securing the load.
   b) Heaviest / largest items on the bottom and lightest / smallest items on the top.
   c) Ensure the centre of gravity of the load is as near to the centre of the carrying vehicle as possible.
   d) Reduce transit speed.
   e) Adequate dunnage is used between layers.
   f) Packing is used to support irregular loads.
g) Moving components of loads should be secured.

h) Loads should be re-positioned during the unloading sequence to maintain stability.

i) Using liquid tanks fitted with baffle plates.

2.2.4 Figs 3, 4 and 5 show examples of good, stable loading practice

![Image](image_url)

**Fig 3** Example good practice – stacked load using dunnage

Note: Other examples of good practice include:

- Leaving a gap between trailer end and the sleeper stack
- Evenly distributed load
- Securing of the load
- Load within rated capacity of the trailer
Fig 4  Example good practice – restraint of loose materials

Note: The volume of the load contained within the box should not be greater than the volume of the box and should not protrude higher than the sides

Fig 5  Example good practice showing pyramid stacked load

2.3  Loading / Unloading Sequences

2.3.1. Failure to follow an appropriate loading / unloading sequence may result
in the following occurrences:

- The load topples or collapses.
- The load and carrying vehicle tip over.
- The vehicle derails during movement.

![Image: Example of result of poor unloading sequence](Historic photograph)

**Fig 6** Example of result of poor unloading sequence

2.3.2 The following guidelines will reduce the risks identified in 2.3.1

a) During loading and unloading the carrying vehicle should remain as evenly loaded as possible so as to remain stable.

b) Loading sequence for full capacity for all types of trailer is shown in Figs 7 to 11 (lowest number first).

c) The unloading sequence should be the reverse of the loading sequence.

**NOTE:** Movement limiting devices may restrict the ability to load using the host machine; in these circumstances an alternative means of loading should be considered.
Note: If the reach limit of the RRV does not allow full use of the loading area, then the load is to be balanced.

**Fig 10** Where reach or capacity of the RRV is limited the load should be stacked symmetrically around the centre of the trailer:
Fig 11 Loading sequence for a second layer should be a pyramid formation

Note: Loading in this configuration may not be possible when working where there are overhead obstructions

2.3.3 Good practice method of lifting FIBCs is the spreader lifting beam identified in Fig 12

Fig 12 Flexible Intermediate Bulk Container (FIBC) Spreader Lifting Beam

2.3.4 Whilst loading and unloading driven mobile plant onto OTP the following control measures should be considered:

- The Gross Vehicle Weight (GVW) of the mobile driven plant and any ancillary equipment should not exceed the maximum load capacity shown on the trailer data panel.
- Consideration should be given to the individual axle loads of the OTP when loading/unloading to ensure load on the axle is not exceeded.
- Mobile driven plant should not be worked whilst loaded on rail trailers.
- Measures should also be put in place to prevent damage to the
infrastructure (e.g. damage to sleeper ends; rail heads etc. further guidance is available in COP0002).

- When unloading driven mobile plant off the end of the trailer onto the track a flat landing area should be created at the bottom of the ramp to provide a stable, smooth transition and to prevent damage to the rail head.

- Ramps should always be used and the capacity of ramps should be adequate for the load. Ramps should be marked with the Safe Working Load (SWL) e.g. for a 5 tonne item of plant each individual ramp should have a SWL of 5 tonne.

- OTP being loaded should have adequate support to prevent tipping (i.e. jack legs). Over side loading / unloading should be avoided wherever possible. Consideration should be given to permissible axle loads

- Where over side loading / unloading is unavoidable the machine track length should not exceed the width of the trailer to mitigate against the machine tipping off the trailer during any rotating manoeuvre.

- The landing area should be of sufficient size to enable the required manoeuvres to be undertaken safely and without damage to the plant and the infrastructure.

- The trailer should remain connected to the RRV during loading/unloading to assist stability and braking.

- When selecting location for loading/unloading driven mobile plant from trailer consideration should be given to any part of the machine going out of gauge or fouling open lines during this process.

- Operator is to be trained and assessed as competent in loading/unloading driven mobile plant onto OTP trailer.

- The need for a suitable exclusion zone when loading / unloading.

- Attachments which are fitted to the machine may have an adverse effect on the machine on the following during loading / unloading e.g. stability, gauge, weight, tractive effort etc.

- Rigidly attached loads should be kept to a minimum when loading/unloading

- There should be no freely suspended loads.

2.4 Loads exceeding Infrastructure Manager’s gauge

2.4.1 Infrastructure Manager’s gauges exist to prevent rail vehicles and their loads from coming into contact with railway infrastructure and other rail vehicles.
2.4.2 Before exceeding the Infrastructure Manager’s gauge, consideration should first be given to reducing the load size or splitting the load.

2.4.3 Where loads are outside the Infrastructure Manager’s gauge the loading arrangements should be planned in advance, including a site walkthrough to identify any physical restrictions / constraints. The following should be taken into account and control measures implemented:

a) **Staff Safety**

b) The loading should be planned and a safe system of work documented and implemented taking into consideration any requirements for ‘Any Line Open’ working and overhead obstructions.

c) Minimum clearances to any part of the infrastructure should be identified.

d) The maximum permitted speed of travel should be identified (reduce to walking pace if necessary).

e) Other Engineering Train / OTM / OTP movements on any line that could be fouled should be stopped whilst the load passes and it should be ensured that adequate clearance is maintained.
f) Load interfaces should be taken into account when planning e.g. when over sailing third party property

g) The need to reposition any load to pass restricted clearances.

2.5 Loads carried over multiple trailers and overhanging loads

2.5.1 The overhang of rails at the end of a trailer should not exceed three metres. There should be at least 500mm left clear at the side of the trailer. Thirty foot rails can be arranged as shown in Fig 14 below:

Figures 14 and 15 show typically how ‘30ft’ and ‘60ft’ lengths of rail can be carried using trailers and the above principles.

![Figure 14 Loading of rails on a single trailer](image)

Rails in excess of 30 foot can be arranged over multiple trailers as shown Fig 15 below and in accordance with the following criteria;

- should not interfere with the normal operation of the trailer
- rails should not be rigidly secured to the trailers as this may cause derailment.
- lead trailer should be coupled to the host machine with additional trailers coupled in series.
- through braking and lighting should be provided throughout the consist
2.5.2 Other Overhanging Loads

The above principles also apply to other types of overhanging load, consideration should be given to adjusting the amount of overhang to account for the rigidity of the load and any possible gauge infringement including ground clearance. The lowest point of the load should be at least 100mm above rail level.

2.6 Load Retention

2.6.1 When loading trailers the potential for the load to move, slip or fall should be considered, including the effects of cant, track geometry, braking and acceleration forces. The load carrying area should be free from debris prior to loading.

2.6.2 The most appropriate means of securing the load, if necessary, should be identified at the planning stage and necessary equipment made available at the loading point. Where the condition of the load makes the planned method of securing no longer valid, an alternative means of securing the load, appropriate to the current condition should be employed.

2.6.3 Means of load retention include:

- Straps
- Chains
- Twist Locks
- Ropes
- Stanchions
- Ballast boxes
- Removable Side boards
- Chocks

2.6.4 When using containment methods, the risk of damage to the load or vehicle should be considered. If the load is left loose within the sides / box, retention may still be required.

2.6.5 It is recommended that all wheeled plant and vehicles should be fully retained or secured and the parking brake applied where applicable. Where plant has the ability to slew it shall be secured in line with the centre of the trailer.

2.7 External Forces Applied to Load

2.7.1 Cable drum carriers

The following points should be taken into consideration:

- Drum carrying cradle should be positioned on the trailer in accordance with the trailer manufacturer’s instructions.

- Preferred location of drum centre of gravity is on the centre line of the trailer. Offset loading may destabilise the trailer.

- Drum carrying cradles should be securely fixed to the trailer by through-bolts, twist-locks, chains, straps, shackles or similar. Horizontal restraint only is not sufficient.

- All calculations for stability should include the effect of loading, unloading and operation on maximum cant where appropriate.

- When large diameter drums are used, account should be taken of the forecast weather conditions and potential side wind loading which could destabilise the trailer.

- When calculating potential overturning and derailment forces, account should be taken of forces present as a result of cables snagging on the drum as it is being deployed. Wherever possible the cradle should be angled towards the deployment area to reduce the potential for wire snagging.

- Only trailers approved for the purpose, should carry personnel to assist in cable deployment whilst the trailer is in motion.

- Consideration to be given to prevent drum rotating on its spindle during transit.
2.8 **Personnel Carriers**

2.8.1 **Planning**

2.8.2 When planning for the use of personnel carriers the planner should

a) Identify the number of staff requiring to be transported

b) Identify available approved trailer and host machine for transportation of personnel

c) Consider environmental conditions

d) Take the risks to personnel in account for any additional loads that may require to be carried on the same trailer.

Personnel should only be transported on a compatible and approved host machine and trailer consist in accordance with the Infrastructure Manager’s Certificate of engineering acceptance, with both host machine and trailers set up in accordance with the OEM operations manual.

![Incorrectly Secured Cage](Fig 16 Incorrectly Secured Cage)
2.8.3 During Work

2.8.3.1 Machine Operator

The OTP operator is responsible for the correct installation and removal, all pre operational checks in accordance with the OEM instructions.

2.8.3.2 Machine Controller

The Machine Controller is responsible for

a) Briefing the personnel being transported including the contingency.

b) Pre use testing of the host machine and trailer consist and safety systems

c) Testing of Duplex communications

The machine controller should travel in the personnel carrier in a position with direct access to the emergency stop.

Prior to any movement over points, the Machine Controller should:

a) Stop the consist,

b) Exit the transporter and confirm that the route is set correctly for the direction of travel from a suitable position on the ground.

2.9 Wind Loading

2.9.1 Due consideration should be given to the securing of loads which have a large surface area which could be affected by wind or passing train...
draught.

2.10 Effect of Speed

2.10.1. Speed of travel is a major factor in assessing whether or not retention or containment is necessary. A load that is unlikely to move whilst travelling at walking pace may present a serious risk when travelling at a higher speed or if an emergency brake application is applied.

2.11 Hazardous Loads

2.11.1 Assessment should be given to the secondary risk associated with a hazardous load should it become displaced or fall off the vehicle or trailer. Issues to consider include:

- Environmental hazards of fuel spillage from powered plant.
- Risk of fire or explosion from ruptured fuel tanks.
- The transport of wheeled vehicles (browsers / generators etc.).
- The carriage of gas cylinders etc.
- Any other hazardous chemicals.

2.11.2 It is recommended that all powered plant or potentially hazardous equipment and plant should be fully retained or secured.

2.11.3 Carriage of gas cylinders should only be undertaken using a secure cage or rack appropriate to the type of cylinder, ensuring they are carried upright and in all cases gas cylinders should be fully secured to prevent any potential movement.

2.12 Transporting Personnel

2.12.1. Personnel should not be permitted to ride on OTP or any vehicle attached unless there is purpose made seating or other adequate provision and its use is authorised on the Infrastructure Manager’s Certificate of engineering acceptance.

2.13 Lighting

2.13.1 Where an overhanging load obscures a vehicle marker light, alternatives are to be provided to maintain compliance with the relevant Infrastructure Manager’s requirements.

3. Competence

3.1 Persons planning and executing loading of OTP should have the
necessary knowledge of:

a) Assessment of weight.
b) Determining centre of gravity.
c) Infrastructure hazards.
d) Loading gauge.
e) Capabilities of the vehicles.
f) Load behavior.
g) Principles of UDLs (Uniformly distributed loads).
h) Load restraining devices and principles.
i) Characteristics of different load materials (e.g. steel on steel).
j) Use of chocks and dunnage.
k) Manufacturers’ instructions.
l) Infrastructure Manager’s Certificate of engineering acceptance.

4. Risk Assessment

4.1 Personnel planning and executing loading of OTP should have received appropriate training on undertaking risk assessment. This should include the ability to undertake dynamic risk assessment where changes to planned activities may occur.