Code of Practice for Pulling Rail with Road-Rail Excavator Cranes
Document revision history

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Reason for change</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 2013</td>
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</tr>
<tr>
<td>2</td>
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<td>General review, competence aligned with infrastructure manager's requirements. Removal of table A.2. addition of 1.1.5 pulling around a curve</td>
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Background

A sub-group of the M&EE Networking Group have looked at the process for pulling lengths of rail with road-rail excavator cranes. 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 provides good practice in the safe pulling of continuous welded rail (CWR) and to minimise the risk of damage to the CWR or infrastructure.

Scope

This Code of Practice concerns the pulling of individual lengths of CWR by a rail mounted road-rail excavator crane.
1. Pulling rail

1.1 Planning

1.1.1 The pulling of rail should only be carried out where absolutely necessary and in accordance with this Code of Practice.

1.1.2 Under no circumstances should:

   a) coated rail be pulled.
   b) bullhead rail be pulled.

1.1.3 The site of the intended rail pulling should be walked at the planning stage by a person conversant with the recommendations in this Code of Practice. All potential obstructions should be recorded and clearly marked up on site. See COP0002 for further guidance on planning.

1.1.4 Where items likely to be damaged by pulling the rail are found during the site visit, arrangements should be made to have them removed or, if deemed acceptable by the owner, protected in an agreed way.

1.1.5 When towing rail around curves, consideration should be given to the need to restrain the rail from rubbing against the running rail or tipping the rollers where these are used.

1.1.6 The selection of the road-rail excavator crane should be made at the planning stage because not every RRV has sufficient tractive effort to pull the rail successfully. When planning, a calculation should be made to determine the pulling force required for the length of rail, see Appendix A.

1.1.7 Consideration should be given to the exclusion zone required in 1.4.2, including the possibility of train movements on adjacent lines.

See COP0032 for guidance on Any Line Open (ALO) Working.
1.2 Equipment

1.2.1 Drag clamp/shoe

1.2.1.1 Care should be taken to ensure that the rail is not damaged by the clamp that connects the rail to the RRV (even though the end of the rail could be cut off on completion of the pulling operation). Avoid using a clamp that bears on the top of the rail which can cause damage to the rail head - see Fig 1.

1.2.1.2 From the work undertaken, the best results have been obtained with a clamp/shoe that fixes to the foot of the rail and has a wedge shape front to avoid snagging - see Fig 2.
1.2.2 Chain

1.2.2.1 The safe working load (SWL) of the chain should be greater than the tractive effort of the road rail excavator crane(s). As guidance, a chain with a SWL of at least 10 tonne should be used.

1.2.2.2 The chain should be permanently attached to the drag clamp as shown in fig 2.

1.2.3 Examination of drag clamp and chain

1.2.3.1 The chain and drag clamp are not classified as lifting accessories although it is recommended they should be treated as a lifting accessory and subject to a 6 monthly LOLER statutory examination and labelled ‘Not to be used for lifting operations’. See also 1.3.2

1.2.3.2 Additionally, the chain and drag clamp should be visually inspected prior to use by the machine operator.

1.2.4 Wooden blocks

1.2.4.1 Wood blocks should have the cross section of a wooden sleeper and should span the majority of the four-foot.

1.2.5 Rollers

1.2.5.1 Rollers should have a large enough diameter to allow the free passage of rail allowing for weld protrusions and have a wide enough base or be designed to resist being displaced by the movement of the rail.

1.2.5.2 From the work undertaken to date, rollers with side restraint (as shown in Fig 3), a minimum diameter of 100 mm and a minimum width of 300 mm, have proved to be successful.

Fig 3 Example of suitable roller
1.2.6 **Thimble**

1.2.6.1 A thimble should be used to support and guide the end of the rail.

1.2.7 **Camlock**

1.2.7.1 A camlock should be used to support and guide the end of the rail.

1.3 **General requirements**

1.3.1 Where a RRV is limited the infrastructure managers approvals to being a high rail machine only (type 9b), it must not be used in low rail mode as a means of increasing traction.

1.3.2 Only designated chains are to be used for the pulling operation and not certified as lifting accessories.

1.3.3 Wire ropes are not to be used for the pulling operation.

1.3.4 All rail should be pulled on its flat bottom.

1.3.5 Checks for protrusions on the flat bottom, eg from thermit welds, should be undertaken before pulling. The rail should be marked with chalk or paint in any affected area, and specially monitored during movement.

1.3.6 Where planning to pull rail down a gradient a specific assessment should be carried out to identify any additional control measures required to be put in place.
1.4 Method

1.4.1 The method is to fix the rail clamp to the end of the rail and attach to RRV tow hitch with the chain. The rail being supported approx 1 m from end by either thimble or camlock on the RRV excavator crane dipper – see Fig 4.

![Diagram of attachment of rail to RRV][rail_diagram]

**Fig 4** Line diagram of attachment of rail to RRV

1.4.2 The rail should always be pulled in the four-foot to avoid damage to the ballast shoulder and potential for rail whipping and injuring personnel. If the rail is initially located in the cess or six-foot it should be thimbled into the four-foot before pulling operations commence.

1.4.3 An exclusion zone should be put in place to prohibited personnel (except the machine operator within the cab) from being within 3 m from the rail and 5 m from the ends of the rail during thimbling and pulling operations.

1.4.4 The movement should be made at a maximum of walking pace 3mph (5kmph).

1.4.5 The crane controller should be ahead of the RRV movement and in direct radio contact (duplex communications) with the machine operator(s).

1.4.6 An additional person(s) should be available to monitor obstructions on the rail and control the exclusion zone. This person (or, if more than one used, each person) should be in direct contact with the crane controller and the machine operator(s) at all times while the movement is taking place.

NOTE: Radio communication with remote people may require back-to-back radios because of the limited range of duplex communications.
1.4.7 Before movement commences the crane controller and additional person(s) should agree a call signal for an emergency stop, as a default “STOP, STOP, STOP” should be used.

1.5 Protection of track infrastructure components

1.5.1 The rail being pulled should always remain in the four-foot. There are often obstacles in the four-foot which cannot be removed (pointwork, AWS magnets, TPWS grids etc.), therefore the rail being towed should be guided over the top of these obstructions by arranging a roller before and after each obstruction.

1.5.2 The rail can be guided onto the roller by use of the dipper arm and thimble/camlock, the remaining length will then naturally follow onto the roller. Where rollers are not available wooden blocks should be used before and after the obstruction.

NOTE: Some infrastructure managers mandate the use of rollers to ensure the rail does not touch the infrastructure. Where the rail is completely supported on rollers the M&EE Group recommend that rail is never pulled on a gradient.

1.5.3 Where there is a cable run along the four-foot, the cable should be moved to one side against a rail and protected by wooden blocks so that the rail being pulled cannot come into contact with the cable.

1.6 Staff competence

1.6.1 Operators and crane controllers should be fully conversant in the safe implementation of this Code of Practice. Where the infrastructure manager has a recognised competence for rail pulling this should also be used.
Appendix A  
Guidance on the selection of appropriate road-rail excavator crane

A.1  
Traction effort required

Testing has indicated that the typical coefficient of friction (μ) between the length of rail being pulled and the sleepers/ballast is 0.5. This means on level track the pull required is equal to half the weight of the length of rail.

Using the typical μ, estimation for the tractive effort required for different lengths of rail on different gradients is shown in Table A.1

<table>
<thead>
<tr>
<th>Track gradient</th>
<th>Length of UIC 60 rail metres (Length in feet shown in brackets)</th>
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<tbody>
<tr>
<td></td>
<td>30 (100)</td>
</tr>
<tr>
<td>Level</td>
<td>0.9</td>
</tr>
<tr>
<td>1 in 300</td>
<td>0.9</td>
</tr>
<tr>
<td>1 in 150</td>
<td>0.9</td>
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<tr>
<td>1 in 100</td>
<td>0.9</td>
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<tr>
<td>1 in 75</td>
<td>0.9</td>
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<tr>
<td>1 in 50</td>
<td>1</td>
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Table A.1  
Showing estimated drawbar pull in tonnes required

A.2  
Traction effort available

Once the estimated traction effort required is known the RRV supplier should be consulted to select the appropriate excavator crane for the planned job.

The traction effort available will be reduced dramatically in wet weather (this could be by 50%).

It should be noted that there are not many individual RRVs that are able to tow the longer lengths of rail. Where an individual RRV capable of towing the rail is not available it is permissible to use two RRVs in tandem.
A.3 Pulling rail with two RRVs in tandem

Two similar RRVs should be used, facing away from each other, physically attached to each other by the emergency tow bar or any other suitable rigid tow bar, see example Fig A.1.

NOTE The actual tow bar to be used should be agreed by the machine owners or the Operator's engineering department.

The operators and crane controller must be in communication with each other by duplex communications at all times.

The estimated total drawbar pull of the two RRVs is 75% of the sum of the two machines, i.e.

Total drawbar pull = 0.75 x (pull for RRV 1 + pull for RRV 2)

Fig A.1 Example set up for rail pulling with two RRVs in tandem