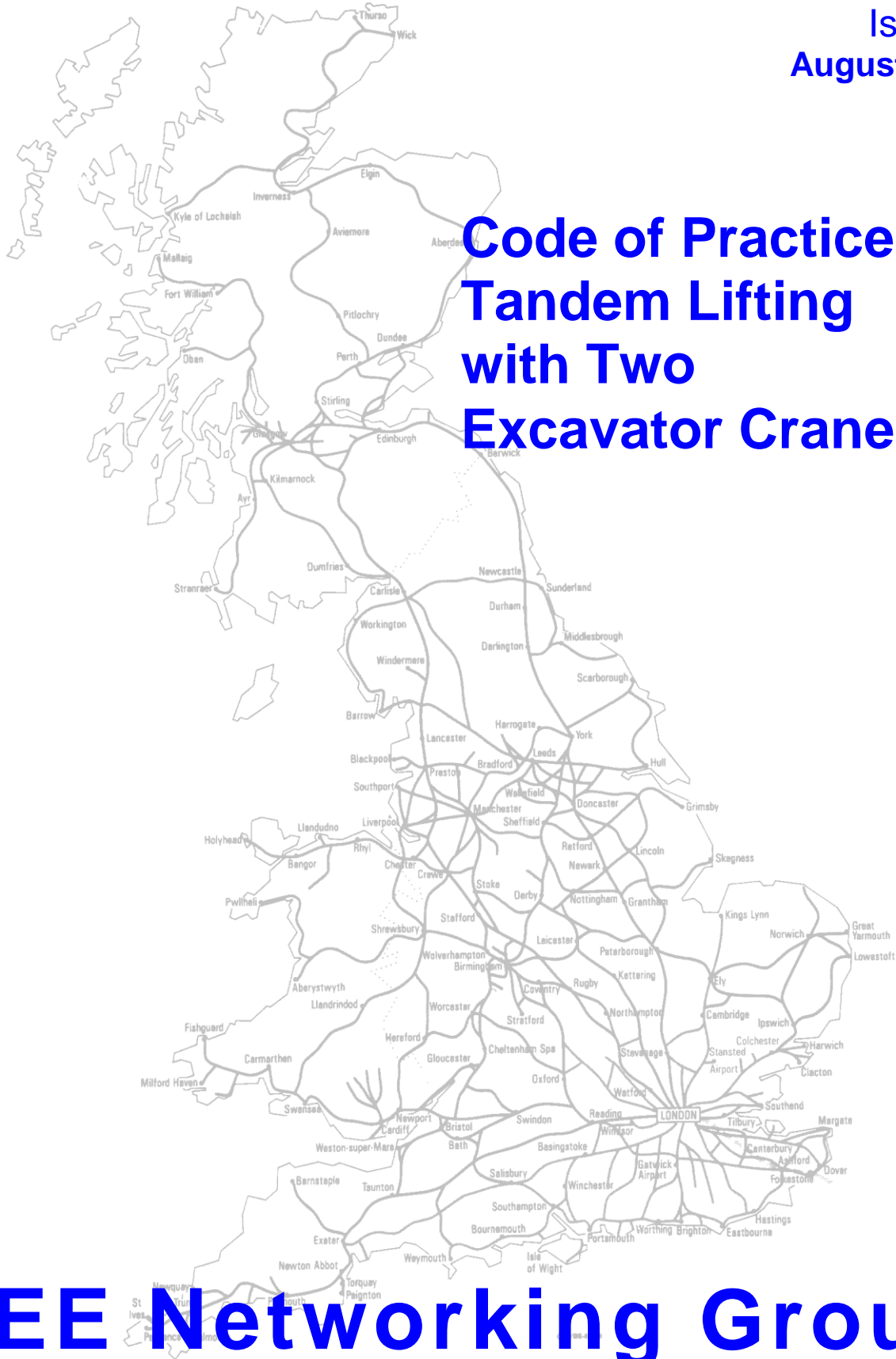


COP0008
Issue 6
August 2015



Code of Practice for Tandem Lifting with Two Excavator Cranes

M&EE Networking Group

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Document revision history

Issue	Date	Reason for change
1	Mar 01	First issue (now withdrawn)
2	Jul 07	Method of working with two excavator cranes researched by M&EE Technical Group and findings amalgamated in Issue 2 which has also been reviewed. (now withdrawn)
3	Apr 10	Amended to remove red / green label and include 'Tandem Lift' mode of RCI; document re-issued
4	Jan 11	Amended as a result of failures of panel grab bolts by the inclusion of new clause about use of panel grabs
5	May 12	The use of 'Tandem Lift' mode negates need for uprating of load
6	August 15	General review of the document and addition of parts from the Guidance on Good practice for Selection of RRV Excavator Cranes for Tandem Lifting of Track Panels document.

Background

A sub-group of the M&EE Networking Group have looked at the arrangements for tandem lifting with 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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Sign off

The M&EE Networking Group agreed and signed off this Code of Practice on 16 September 2015 and published on 5 December 2015.

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Purpose

This Code of Practice details the control measures to be applied when using two excavator cranes to lift a load simultaneously.

Scope

This Code of Practice applies to the use of two excavator cranes which normally lift loads independently but which are required to occasionally lift a load in conjunction with another similar excavator crane using a process known as tandem lifting. This Code of Practice applies to both construction based and rail converted excavator cranes tandem lifting operations.

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Definitions

Crane Controller	Rail industry equivalent to Crane Supervisor as defined in BS7121
Crawler machine	An excavator crane with tracks rather than wheels.
Tandem Lifting	The lifting of a single load using two lifting machines working together under the direction of a single Crane Controller (TL), trained and certificated to control tandem lifting operations under the Sentinel scheme.

Note: Where two excavator cranes are being used:

- physically connected, and
- controlled by a individual operator, and
- the RCI on either one stops the movements controlled by the RCI of both excavator cranes

then this is not tandem lifting and is not subject to the controls described in this COP. In this instance a Crane Controller with the appropriate competence

1 Principles

- 1.1 The use of more than one excavator crane to lift the same load simultaneously is a potentially hazardous operation and should only be resorted to where the site conditions, physical dimensions, characteristics or weight of the load prevent it being lifted by one excavator crane. Should it be necessary to resort to tandem lifting then this Code of Practice should be followed to assist in controlling the risks.
- Note: Where travel on rail is required consideration should be given to lowering the load onto trailers rather than using tandem lift and carry.
- 1.2 When using panel grabs, tandem lifting should be carried out with:
- the excavator cranes physically linked by rigid bar and / or trailer(s)
and / or
 - the two excavator cranes both have a minimum length of 500 mm flexible link (e.g. chain or cable) between the crane lifting point and panel grab.
- 1.3 Any lifting accessories including quick hitch necessary to achieve the lift should be included as part of the total load calculated in 1.5 and 1.6.
- 1.4 Where a machine is fitted with Tandem lift duty, the Tandem lift duty SWL is used by the planner in planning to lift the calculated load share.
- 1.5 When planning to tandem lift with both machines in single lift duty, the single lift safe working load of each excavator crane should not be less than the calculated share of the total load, plus 50%.
- eg 8 tonne load shared equally then 4 tonne per Crane + 50% means that each Crane needs a SWL of 6 tonne at the required radius.
- 1.6 When an unequal load is lifted both excavator cranes should have the capacity at the working radius used to lift the heavier end using the principle in 1.5.
- eg 8 tonne load shared unequally 5 tonne and 3 tonne, then BOTH cranes will need a SWL of 5 tonne plus 50% ie 7.5 tonne at the radius being used (see diagram 1).
- 1.7 On and Off Tracking should not take place whilst tandem lifting.

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2 Process

2.1 Planning

- 2.1.1 A documented lift plan should be produced in advance by a competent Lift Planner who is conversant with this Code of Practice and COP0011
- 2.1.2 Excavator cranes being used to carry out the tandem lifting should be operated by personnel competent in tandem lifting and be conversant with the contents of this Code of Practice.
- 2.1.3 A thorough assessment of the proposed operation should be made and the method adopted should be such that no excavator crane being used is at any time loaded beyond its Safe Working Load following re-rating as in section 1.3, 1.5 and 1.6
- 2.1.4 Lifting accessories and lifting points planned to be used during tandem lifting should be capable of lifting the load share plus 50%.
- 2.1.5 Both excavator cranes being used to execute a tandem lift should have similar characteristics eg:
- Load / radius capacity.
 - Boom configuration.
- 2.1.6 Any Road Rail excavator crane used for tandem lifting should be fitted with a rated capacity indicator (RCI) with a lift and carry duty.
- 2.1.7 Some excavator cranes have an RCI fitted with a 'Tandem Lift' mode. Whenever possible these excavator cranes should be planned to be used for tandem lifting.

Note: When this mode is being used the alarm and motion cut out will be activated by the RCI at the planned downrated figure (as calculated in section 1.5 above) and this will have the effect of preventing the machine from becoming overloaded.

2.1.8 When excavator cranes are used for moving along a ballast bed, consideration should be given to uneven surface where sleepers have been removed. Where practical, a crawler machine should be used which helps mitigate against uneven ground conditions.

2.1.9 For tandem lifting track panels, more information is shown in Appendix A

2.2 Site Working

2.2.1 Where any tandem lifts are to be undertaken using excavator cranes, there must be a valid lift plan, the lifts must be supervised by an appropriately competent Crane Controller/Crane Supervisor

2.2.2 One Crane Controller/Crane Supervisor should be in overall control of the two excavator cranes, The Crane Controller/Crane Supervisor and operators should be familiar with and agree with the lift plan before undertaking any tandem lifts. The CC should be in sight of the load throughout the duration of the lifting operation.

2.2.3 Duplex communication should be used between the Crane Controller/Crane Supervisor and the operators at all times.

2.2.4 The operators should work together at a speed applicable to the conditions and nature of work to ensure a safe controlled lifting operation.

2.2.5 The load should always be maintained vertically below the load lifting point of the excavator crane throughout the operation.

2.2.6 Where an excavator crane has an RCI fitted with a 'Tandem Lift' duty the RCI should always be switched into 'Tandem Lift' duty when undertaking tandem lifting operations.

2.2.7 In some circumstances there can be a motion cut (see Note 1 beneath 2.1.7) on one of the excavator cranes. Once the motion cut out has activated it may not be possible to manoeuvre the load to a position of safety. As soon as a motion cut out of one excavator crane occurs:

- a) the crane controller should halt all movements of both excavator cranes.
- b) it should be ascertained why the motion cut has occurred by reference to the lift plan and position of the RRV.

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- c) the crane controller should agree with both operators a process to enable a movement back to a more stable position.
- d) where necessary the lifting plan should be revised by a competent lift planner, the revised lifting plan should be briefed to both operators, who then carry out the rectifying movement.
- e) if it is not possible to carry out the planned lift with the lifting equipment available on site it could be necessary to reduce the weight of the load (e.g. by removing sleepers from a panel, or reducing panel length etc.) and a revised lift plan produced.

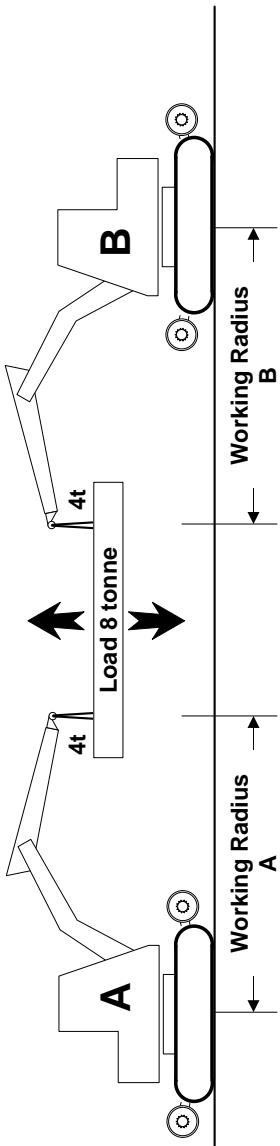
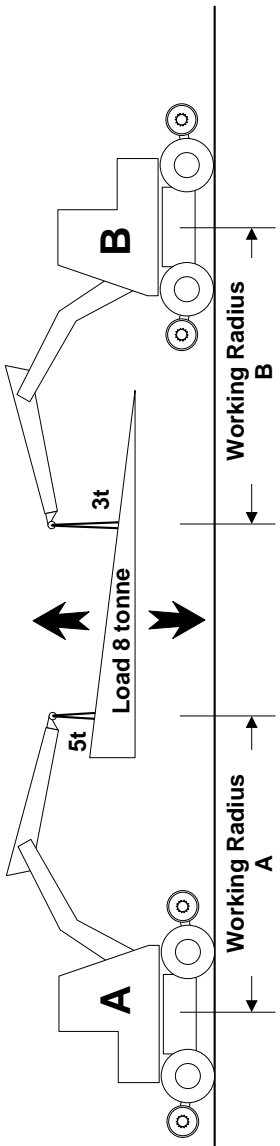
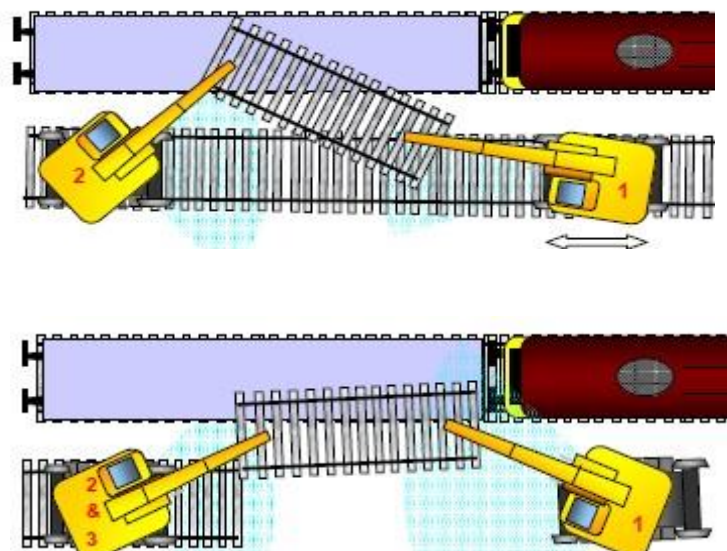
<p style="text-align: center;">LIFTING AN EQUAL LOAD</p> 	<p>LOAD SHARED EQUALLY 4 TONNE PER CRANE</p> <p>SWL REQUIRED BY EACH CRANE IS: 4 TONNE + 50% = 6 TONNE</p> <p>BOTH CRANES REQUIRE A MINIMUM SWL OF 6 TONNES AT THEIR WORKING RADIUS</p>
<p style="text-align: center;">LIFTING AN UNEQUAL LOAD</p> 	<p>LOAD SHARED UNEQUALLY 5 TONNE & 3 TONNE</p> <p>SWL REQUIRED BY EACH CRANE IS: 5 TONNE + 50% = 7.5 TONNE</p> <p>BOTH CRANES REQUIRE A MINIMUM SWL OF 7.5 TONNES AT THEIR WORKING RADIUS Note: CRANE B REQUIRES SWL OF 7.5 TONNE AT RADIUS B</p>
<p>Note: IN BOTH EQUAL AND UNEQUAL EXAMPLES 'A' AND 'B' RADII MAY NOT BE THE SAME.</p>	

Diagram 1

Appendix A Guidance on Tandem Lifting of Track Panels



This guidance applies to any lifting operation which involves the lifting of track-panels using a pair of RRV excavator-cranes working in tandem.

This guidance is aimed at staff directly involved in lift planning with RRV excavator cranes, staff involved in selection of RRV excavator-cranes for lifting operations, or staff involved in managing Track Renewals production activity.

This guidance assumes that sufficient and adequate information to properly plan a lifting operation has been obtained in sufficient time. Typically this is through a site assessment visit (ideally by the Lift Planner) at an early stage in the planning process.

This guidance represents good practice, but does not replace or remove the legal duty to properly plan all lifting operations.

This guidance is prepared in order to reflect the most commonly used scenario for the lifting operations in scope, and makes the following assumptions:

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- Any slewing movements are carried out with the oscillating axles set in the configuration (locked or unlocked) specified in the lift plan (typically this requires that the axles be locked on the rail-mode machines).
 - The maximum radius throughout the operation is based on the Duty that represents a 45° angle of rotation over the fixed (non-pivot) end, as this is typically where the optimum capacity is found. If other slew angles are used, the radius must be calculated for the chosen slew angle and the capacity of the RRV checked at the changed radius/slew angle.
 - Decision about the cant values to be used must be based on cant measurements taken on site or an accurate, up to date and detailed site survey.
 - There is no allowance made in the load weights used to prepare this Guidance for ground adhesion or frozen ground.
 - A change of Lifting Accessory will change the total load weight
 - The use of the Auxiliary Lifting Point (ALP) and the position of the ALP and RCI reading point on the actual machine to be used should be taken into account in evaluating the calculated radius. Note that the most recent RIS1530 RCIs allow selection of ALP, dipper nose pin or quick-hitch, so the CC should check the operator has selected the correct setting as per the lift plan.
 - When using the flexible link with the panel grab, allowance for the lifting accessories will need to be added to the “height” value. The CC should also check throughout the lifting operation that the flexible link is monitored for “plumb” as movement out of plumb indicates uneven load share/load transfer
 - A small change of slew angle can increase the Calculated Radius by a relatively large amount. The 45° slew angle this Guidance is based upon, represents the edge of a Duty Sector for many machines, so close control of the work will be required to remain in the optimum capacity position
 - The correct Duty for the slew angle must be chosen. The labeling of sectors in Duty Charts is different for different RCI types, however the pivot end is usually zero degrees, and the fixed end 180 degrees.

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- If using a machine with an articulated boom, it may not always be able to achieve the optimum boom configuration for maximum capacity, particularly if there are overhead restrictions
 - Consideration should be given to alternate static and unlocked duties to allow the 2 machines to move in relation to each other
 - The RCI will only “see” vertical loads, it does not react to sheer or lateral forces, or to swing.