Code of Practice for Re-railing Kirow Cranes using Outriggers

M&EE Networking Group
Background

A sub-group of the M&E Networking Group have looked at the process for re-railing Kirow cranes using the outriggers. The M&E 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
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Purpose
This Code of Practice provides good practice in the re-railing of Kirow cranes utilising the crane’s outriggers.

Scope
This Code of Practice concerns the re-railing of Kirow cranes utilising the crane’s outriggers and covers the following Kirow crane types:

KRC 250, KRC 250-S, KRC 810, KRC 910 & KRC 1200.
1 Roles and responsibilities

1.1 **Recovery Lead** – In the event of a derailment a Recovery Lead will be appointed to lead the re-railing operation. The Recovery Lead is responsible for ensuring the appropriate procedures and instructions are complied with. The Recovery Lead needs to have appropriate supervisory and operating experience and competency (as determined by the crane Operator) to lead the recovery process. It is permissible for the Recovery Lead to act as the Crane Controller if the appropriate competency is held.

1.2 **Crane Operator** – A Kirow crane operator will be appointed to facilitate the re-railing process. The Crane Operator is responsible for securing the crane, performing in-cab operations and making the crane safe for the re-railing process to commence. In the event the crane is successfully re-railed the Crane Operator is responsible for undertaking a function check. The Crane Operator will not be in the cab when the re-railing process is undertaken.

1.3 **Crane Controller** – The Crane Controller is responsible for ensuring that the staff involved have been briefed and understand the specific re-railing actions to be undertaken. The Crane Controller will ensure the crane is operated correctly in accordance with this COP. The Crane Controller has general responsibility throughout the duration of the re-railing process for ensuring the crane is operated in a safe manner. It is permissible for the Crane Controller to also act as the Recovery Lead and COSS.

1.4 **Kirow Ground Crew** – Will hold competency in the activities they are involved in to facilitate the re-railing process. Ground Crew could be requested to undertake operation of Kirow outrigger controls from the side of the crane, prepare bases for outriggers, remove lifting attachments and facilitate positioning, slinging and unslinging of loads.

1.5 **Controller of Site Safety** – COSS - Will ensure that a safe system of work is in place during the recovery process.
2 Initial activities

2.1 Once a crane has been derailed the operating company on-call engineer or crane manager will appoint a ‘recovery lead’.

2.2 Notwithstanding actions to be undertaken following an incident of this nature (for cause screening etc.), the requirements of 2.3 to 2.8 must be undertaken prior to re-railing the crane using the outriggers. If any of the conditions cannot be met or there are concerns relating to safety or potential damage to infrastructure, then re-railing using outriggers should not be carried out and a suitably equipped (Bruff) re-railing team should be called.

2.3 Set up an exclusion zone around the crane, only crane staff and those involved in the re-railing and track inspection are to enter under permission of the crane supervisor.

2.4 Assess the crane for damage that would prevent the crane from being re-railed or moved once it has been re-railed.

2.5 Assess damage to the crane jib and outriggers that would prevent them from being retracted or deployed.

2.6 Inspect for track damage that would prevent the crane from being re-railed.

2.7 Inspect for track geometry issues that would either prevent the crane from being re-railed and/or moved once it has been re-railed.

2.8 Undertrack structure and services may prevent the recovery operation. Also thrusting being applied to retaining walls and parapets should be considered. These may not be immediately visible so a check should be made first with the infrastructure manager prior to lifting the crane on its outriggers.

2.9 Inspect for obstructions which may prevent the crane from being re-railed. Pay particular attention within S&C areas and ensure there is sufficient space for outrigger pads without contacting sleepers or other infrastructure.

2.10 Gather together materials and equipment to enable re-railing using the outriggers e.g. blocks/shims to prevent bogie movement when lifting.

2.11 Prior to re-railing, plan the number of slewing movements and outrigger positions required to re-rail the crane.
2.12 Maximum crane movement for any one outrigger position is 150mm. Should further movement be required, then the outrigger pads must be re-positioned to minimise stresses on the outriggers. This will also enable the outriggers to be positioned as close to the crane as possible which has the effect of reducing relative movement of outriggers on the ground and subsequent stress on the outriggers.

2.13 The final slewing movement must be able to be achieved in a single pad/outrigger position. For example: If the crane derails 200mm laterally, track centre to crane centre, then lift and slew the crane 50mm then lower the crane and re-position the outrigger pads before lifting and slewing the final 150mm to re-rail the bogie. The recommended slewing movements are shown in Table 1.

<table>
<thead>
<tr>
<th>Derailment Distance/mm</th>
<th>First Slew</th>
<th>Final Slew</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>n/a</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
<td>n/a</td>
</tr>
<tr>
<td>200</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>250</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>300</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>&gt;300</td>
<td>Add additional slews up to maximum 150 mm</td>
<td>150</td>
</tr>
</tbody>
</table>

Table 1 Recommended movements using outriggers

2.14 Where multiple bogies have derailed, move one bogie at a time, gradually stepping them back onto the track. For example, if both bogies have derailed by 200mm, raise and slew the first by 50mm and lower, then raise and slew the second by 50mm, re-position outrigger pads and repeat for the final 150mm movement. See 3.4.
3 Procedure for re-railing Kirow crane

3.1 On plain line track with no cant

3.1.1 Apply brakes to all bogies if not already done so.

3.1.2 Disconnect the load and fully retract crane jib and counterweight (if applicable).

3.1.3 Where possible, position the counterweight at opposite end to the derailed bogie this will ensure the outrigger loads are at their minimum. If rotation of the crane superstructure in derailed state is required, then ensure that there is sufficient clearance between the crane jib/counterweight and OLE or other trackside structures as clearances may be reduced due to the derailed state of the crane.

3.1.4 Measure the lateral distance of the derailment. Position the base pad to be as close to the crane as possible without being on the sleeper end or other part of the infrastructure that cannot take the outrigger load. Ensure that there is sufficient clearance between outrigger and crane structure for the required slew.

3.1.5 Arrange a stable and level platform of ballast for the outrigger pads. An assessment of the suitability of where the outriggers are to be positioned should be made. Outrigger packing should be arranged as per existing Kirow documentation.

3.1.6 The Re-railing Lead is positioned in front of the derailed bogie to monitor the amount of slew. A Crane Operator/Kirow Ground Staff are positioned on each of the manual outrigger controls either side of the crane, both must be visible to the Re-railing Lead. A clear and suitable method of communication (ideally Duplex comms) must be deployed to allow the instructions to be heard and executed.

3.1.7 Using the manual controls on either side of the machine, deploy both outrigger arms and lower onto the pads.

3.1.8 Ensure the derailed bogie is shimmed/blocked as per Figure 1. This is to prevent unnecessary bogie movement whilst lifting. The sub bogie set may require additional support to prevent excessive loads on the retaining bolts. This can be achieved by provision of strapping to the main bogie sub frame. See red arrows in Fig. 1.
3.1.9 Extend the outrigger cylinders until the derailed bogie is lifted clear of the rail head to ensure the crane can be slewed over and no higher. This should be done slowly and in small co-ordinated steps with both arms raising at the same rate under instruction from track staff positioned in front of the crane.

3.1.10 Under instruction from the Crane Controller/Recovery Lead at the front of the crane, extend and retract outrigger arms as required to achieve the necessary movement of the crane and align the bogies with the rail head. Note that extending the outrigger arm slews the crane away from the operator whilst retracting brings it towards them.

3.1.11 Under direction of the Crane Controller/Recovery Lead lower the crane until wheelsets are fully aligned and in contact with the track. The derailed bogie may need to be rotated/barred round whilst suspended to ensure correct alignment prior to lowering. Ensure lowering the bogie will not cause the wheels to contact anything except the rail heads and the wheels and rails are aligned.

3.1.12 Remove any blocking or shimming.

3.1.13 Continue to lower outrigger cylinders until all the wheelsets of the derailed bogie are in contact with the rails and ensure the crane can take its own weight.

3.1.14 Raise outrigger cylinders clear of the ground and return them to their stowed position.
Figure 2  Outrigger on pad positioned close to crane

Figure 3  Bogie requires rotating to achieve wheel alignment with rail head

The de-railed bogie of the crane should have sufficient height clearance to allow for manual slewing.

Figure 4 Cross section of lift before slewing

Figure 5 Cross section of lift after slewing

Rail head and wheelset fully aligned and ready to be lowered safely.
Figure 6 plan view of lift before slewing

Figure 7 plan view of lift after slewing

Front end of bogie misaligned with rail. Outrigger arms set as close to machine as possible without resting on any sleepers.

Right side outrigger arm extends. Left side outrigger arm retracts. This moves the crane to the left. Wheels become aligned with track and can now be lowered onto the track.
3.2 On canted plain line track

3.2.1 Use the same basic procedure as that detailed in 3.1 is to be adopted with the following further controls for re-railing on canted track. Re-railing can be carried out on track with a cant up to the maximum working cant for the derailed crane.

3.2.2 Clearances between crane superstructure/counterweight and track structures/OLE will be further reduced on canted track. Where rotation of the superstructure is required, ensure there is sufficient clearance to complete the rotation.

3.2.3 The crane self-levelling system must put the crane in the level position so that the lift is vertical.

3.2.4 Block and shim the bogie relative to the machine frame as shown in Figure 1.

3.2.5 Ensure sufficient lift of the derailed bogie to ensure the wheels on the high side of the cant clear the rail head when slewing into position.

3.2.6 A slight over slew may be required when positioning the bogie over the rail heads to accommodate any tendency for the bogie to move down the cant when being lowered back onto the rail head.

3.2.7 Create a stable and level platform of ballast for the outrigger pads to lie on. The platforms should be as close to horizontal as possible and should not differ by more than 200mm in elevation.

3.2.8 The outrigger cylinder on the downside of the cant will need to extend on its own initially until the crane is level.

3.2.9 When lowering the crane back onto the rails, the outrigger with the greatest extension will have to continue to lower to allow the wheelset to fully contact with the rail on the low side of the cant.
3.3 On switches and crossings

3.3.1 A derailment within S&C has the potential to cause difficulties when re-railing. Track damage may be more substantial and difficult to identify within S&C preventing the re-railing and/or the removal of a re-railed crane. Always ensure the track is inspected by a competent person prior to re-railing.

3.3.2 Suitable locations for positioning of the outrigger pads may be difficult and may require slews that are more than 150mm. Where the outriggers cannot be positioned to provide the lift and slew required then a re-railing team (Bruff) must be called in.

3.3.3 Set up an exclusion zone around the machine. Kirow Ground Staff and Operator will have to enter the exclusion zone to perform the procedure but all other staff need to remain clear of the crane including the Re-railing Lead who can monitor and direct the re-railing activity from outside the exclusion zone in front of the crane.
3.4 Additional requirements for both bogies derailed

3.4.1 In the unlikely event that both bogies have been derailed the same considerations for plain line, canted track and derailment over S&C as described above needs to be undertaken.

3.4.2 The derailed crane should be re-railed one end at a time. Due to the individual nature of each derailment event the Recovery Lead will make the decision as to which end will be re-railed first.

4 Post derailment inspection

4.1 Following a derailment, the crane must be returned to a maintenance facility for full inspection. If the crane derailed whilst carrying a load then this inspection should include MPI of the jib and download and analysis of load data at the point of derailment. Particular attention should be given to the retaining mechanism for the traveling sub bogie as these will have been exposed to force during the rerailing process not part of their normal cycle. Additional strapping of the travelling sub-bogie (see 3.1.8) will mitigate against such damage occurring however a full inspection should be carried out.