GOOD PRACTICE GUIDE

Safety Publication

Requirements for Lifting Equipment Adjacent to Railways Controlled by Network Rail

CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA

Requirements for Tower Cranes, Mobile Cranes & Other Mobile Lifting Equipment Adjacent to Railways Controlled by Network Rail

CPA Good Practice Guide

Reference No: CIG/TCIG 2503 *(replaces CPA1801 and CPA1402)*
First Published: CPA 1801 for Mobile Cranes - December 2018 & CPA1402 for Tower Cranes - June 2014
Combined Revised: November 2025
Published by: Crane Interest Group (CIG) & Tower Crane Interest Group (TCIG)
Construction Plant-hire Association
27/28 Newbury St
London
EC1A 7HU
www.cpa.uk.net
0207 796 3366
Email: enquiries@cpa.uk.net

Contents

Foreword

Welcome to this latest edition of the Construction Plant-hire Association's (CPA) publication on the requirements for lifting equipment adjacent to railways controlled by Network Rail. This guidance has been jointly developed under the direction of the Crane Interest Group (CIG) and the Tower Crane Interest Group (TCIG) in collaboration with Network Rail. We'd like to further acknowledge the input and support from members of the rail sector's M&EE networking group and the NRIL Routes Senior Asset Protection Engineers Forum.

As cranes working alongside railways have regretfully collapsed onto railway structures, collaborative work with Network Rail was undertaken in the past by both CIG and TCIG members to produce clarification, based on Network Rail's own published documentation, on cranes and other equipment alongside the railway, where equipment collapse could transgress across their boundary and onto their infrastructure. Two publications from each interest group, although broadly similar, were first published respectively in 2014 (TCIG) and 2018 (CIG).

During 2023 onwards, Network Rail embarked on a programme of updating their CIV 0063 publication and sought and involved members from both CIG and TCIG. On completion of this work in 2024, both interest groups set about updating their respective publications and was agreed that a single publication be devised that covered all relevant crane types.

As the title indicates, this publication provides the foundational knowledge and all requirements in order to mitigate any potential effects on railway infrastructure when erecting, dismantling and carrying out of lifting operations where a crane is working next to a railway boundary.

Due to the subject matter, the publication needs to contain extensive detail, but the working group have endeavored to convey the key information in a clear-as possible, legible format.

Much time, energy and effort has gone into the devising of this publication to identify the considerations and actions, as well as notification requirements, in a bid to ensure the safety of travelling public using Network Rail infrastructure.

We thank those listed on page 56 who contributed to this publication and commend the content and practices to those specifying or carrying out lifting operations to ensure both safety and compliance when working alongside railways.

Peter Gibbs
Chairman
Crane Interest Group (CIG)
Construction Plant-hire Association

Dave Holder
Chairman
Tower Crane Interest Group (TCIG)
Construction Plant-hire Association

Introduction

Network Rail has for many years had requirements for mobile cranes and tower cranes, as well as other plant operating adjacent to the railway. This standard, known as NR/L3/CIV/0063, is mandatory when working on or beside the railway. This CPA document discusses the requirements of the Network Rail document with an explanation of those requirements and how they may be complied with. The guide does not introduce any additional requirements and is aimed at producing an easily accessible document which has been endorsed by Network Rail. This document is linked to NR/L3/CIV/0063 Issue 2 (01 June 2024).

The principles contained here-in may be used for other lifting equipment, provided there are no other prevailing Network Rail written requirements.

This guidance is relevant irrespective of whether an ASPRO BAPA agreement is in place. See link: *https://www.networkrail.co.uk/our-work/looking-after-the-railway/asset-protection-and-optimisation/*

This CPA guidance is focused on lifting operations outside the Network Rail boundary. Subject to agreement with Network Rail, it may be used for works within the boundary, but not for works 'on or near the line' (within 3m of an operational line). When working inside the boundary, NR ASPRO will advise on any additional standards or requirements to comply with, in addition to the CPA document. Where working within the boundary, other guidance will also apply, such as the 'Infrastructure Plant Manual' and Module P513 - which is beyond the scope of this document.

NOTE: *See Annex F for the legal basis under which compliance is required for projects working adjacent to railway infrastructure.*

NOTE: *Network Rail can carry out Variation Applications on amber clauses within its standards.*

NOTE: *Network Rail has in place a Standards Challenge process, where feedback on its standards is enabled.*

1.1 General

This document provides guidance on the use of mobile cranes, tower cranes and other mobile lifting equipment adjacent to Network Rail managed infrastructure. The guidance may also be used when working adjacent to non-Network Rail managed assets with the railway asset managers' consent.

Lifting operations by their very nature involve risk. The starting point for the reduction of risk should always begin with consideration of the need to carry out lifting operations, or whether other, less hazardous, techniques can be used.

It is essential that the person requiring lifting operation(s) to be undertaken ensures that these are effectively planned. This will be carried out by the Appointed Person, in consultation with the organisation requiring the lifting operation to be undertaken (crane user, often a Principal Contractor).

Mobile cranes, tower cranes and other mobile lifting equipment may present a risk to railways during rigging, use, maintenance and de-rigging. Both Network Rail and crane users have a duty to ensure the safety of the railway. If the crane or its load falls or slews onto the track or railway infrastructure, a catastrophic incident may well result that could include multiple fatalities. It is therefore essential that good practice is followed to eliminate or reduce this risk to as low as reasonably practicable.

By following this guidance, the crane user will be able to demonstrate to Network Rail that industry accepted measures have been put in place when cranes are rigged and used adjacent to Network Rail assets. Early consultation with Network Rail will help to ensure that any issues are identified and addressed well before any lifting operation starts.

NOTE: *Annex E of BS 7121-1:2016 gives recommendations for operation of cranes on or adjacent to sites of exceptional hazards which include railways. This CPA guidance document aligns with the content of the normative Annex E, albeit the NR/L3/CIV/0063 interpretation of the Annex E provides a risk-based approach to assessing various scenarios of lifting adjacent to the railway. NR/L3/CIV/0063 should be followed where there is any difference.*

This guidance covers temporarily installed lifting equipment, including:

- static and rail mounted tower cranes;
- mobile and static self-erecting tower cranes;
- wheeled mobile cranes;
- lorry loader cranes;
- crawler cranes;
- mini/compact cranes;
- chassis mounted mobile self- erecting tower cranes;
- telescopic handlers, both suspended loads and loads mounted on forks;
- excavators used for lifting.

In this document, the term ‘crane’ will include all these types of lifting equipment, although reference should be made to the relevant figures for illustrations.

Some equipment, like tower cranes, presents additional risks which are addressed here and include erection, testing, alteration and dismantle activities. Elements of these may also apply to other pieces of lifting equipment, such as mobile cranes or crawler cranes, therefore the principles associated with tower cranes should be applied.

Although this guidance does not cover the use of Mobile Elevated Work Platforms (MEWPs), gantry cranes, piling rigs or rail mounted cranes, nor road/rail units where they are on rails, the principles contained in this document should help the user assess the level of risk to the railway and introduce control measures that should be acceptable to Network Rail.

This document does not provide explicit guidance on any additional requirements for Any Line Open (ALO) working. However, the principles here-in will help to control the movement of loads beside the railway. Guidance on working near to open lines is provided by the Mechanical & Electrical Engineers Networking Group (M&EE NG) publication COP0032 - *Code of Practice for Plant Any Line Open (ALO) working* [1].

This document can be used when planning lifting operations that are undertaken on Network Rail property or projects where Network Rail is the client. Further requirements can be found in NR standard NR/L2/OHS/CP0070, *Principal Contractor Licensing Assurance* (formerly NR/L2/INI/CP0070).

This guidance does not cover the use of cranes on jack up barges, pontoons or cranes on waterways. In such cases consultation should be made with Network Rail.

1.2 Liaison With Network Rail Asset Protection & Optimisation (ASPRO) Team.

If the crane can be positioned so that the compound collapse radius is greater than 4-metres (m) at any 360-degree slew angle from the railway asset or property boundary, the Network Rail Asset Protection & Optimisation (ASPRO) team will not need to be consulted. Refer to Section 9, **Figure 1** and Section **3.0**.

The Network Rail ASPRO team should be consulted by the crane user in all circumstances where the compound collapse radius of the crane and its load is within 4m of a railway asset or property boundary (see **3.1, 3.2, 3.3** and **3.4**).

---

[1] *This document is an M&EE Group document hosted on the RSSB website.*

As part of the consultation, Network Rail asset protection staff will need to see the risk assessment and lift plan for the proposed lifting operation(s). Confirmation of acceptance is required before commencing work.

Where it is necessary to carry out lifting operations over or adjacent to a live railway or any Network Rail infrastructure or railway public areas, a line block or isolation may be required for which the Network Rail ASPRO team should be consulted at the earliest stage of planning.

There may be considerable lead time required for a line block and, if needed, electrical isolation. The oversailing of Network Rail infrastructure by tower cranes is not normally approved due to the inherent risks to Network Rail operations, personnel, the travelling public etc. It is recognised however, that occasionally at certain restricted/constrained sites, it may be unavoidable. Any proposed oversailing will be subject to a formal 'Crane Oversailing Agreement' and strict site control measures.

Entry into a *'Crane Oversailing Agreement'* is obligatory where the above elimination methods prove impossible and the crane jib is required to weathervane over the railway boundary when out of use, even though it does not oversail whilst in operational use. Whilst in use, prevention of the crane oversailing the Network Rail infrastructure will be required using a working range limitation system (see **4.5**).

NOTE: *See https://www.networkrail.co.uk/our-work/looking-after-the-railway/asset-protection-and-optimisation/*

When weathervaning, the tower crane must be left in accordance with the manufacturer's instructions and without any load on the hook. Where a crane's manufacturer requires a weight to be left fixed on the hook when out of service, this should be discussed with Network Rail. In such scenarios, the load is often fixed to the hook rather than being freely suspended from the hook block via a chain. As such, the weight should not become separated from the crane.

These requirements are discussed in more detail in Section **3.0.** and are summarised in **Table 1** for ease of reference.

The primary focus is to minimise the risk to the railway so ideally, the lifting equipment should be positioned such that if it were to fall over or come into difficulty, it would remain 4m away from the adjacent Network Rail infrastructure. This would place it in risk hierarchy at Level 1. Table 1 contains other risks: Level 2, Level 3a, Level 3b and Level 4. Ideally, the activity is planned to keep the lifting equipment in as low a category as possible as this protects the infrastructure and minimises the impact on the planned lifting operation.

NOTE: *The crane user may either be the person hiring in a crane from a supplier or a person using a crane which they own. In some scenarios, a crane hire company may take on the responsibility to manage the approval process for lifting adjacent to the railway.*

NOTE: *Network Rail asset protection contact details can be found at https://www.networkrail.co.uk/running-the-railway/looking-after-the-railway/asset-protection-and-optimisation/*

NOTE: *This document should be read with Network Rail standards such as, but not limited to, those standards listed in Annex C2.*

Table 1 for Levels of Control for Cranes adjacent to the Network Rail Managed Infrastructure

Network Rail requirement based on CIV/0063 and CIV/003.	Level 1 - no risk	Level 2 - collapse within 4m of railway boundary	Level 3a or 3b – collapse within 4m of railway, with partial possession and some lines blocked & other open			Level 4 - collapse within 4m of railway, no possession
KEY TO ASSESSMENT – Check the compound collapse radius of the lifting equipment, plus the load lifted, do not fall within 4m of either NR boundary (L1) or within 4m of the nearest running line or critical infrastructure (L2 - L4).	Collapse or oversail not within 4m of the railway boundary	Collapse with full possession and lines blocked	Collapse will not affect open lines [3], Level 3a. (Mobile crane)	Collapse might affect open lines[3], Level 3b. (Mobile crane)	Collapse might affect open lines[3], Level 3a & b. (Tower crane).	All lines open to railway traffic [3]. (All equipment)
Risk assessment of effect NR Infrastructure req'd.	Yes	Yes	Yes	Yes	Yes	Yes
Upper limit for the crane's rated capacity in that configuration [1].	N/A	90% [4]	90% [4]	75% [4]	75% [4]	75% [4]
Use of working range limitation to prevent lifting within 4m of live railway. See 4.5.	N/A	N/A	N/A	Yes	Yes	Yes
Uplift to be applied to worst load exerted on working platform [2]. See 4.7.	N/A	1.1	1.1	1.33	Greatest of either: 1.0 x In-service loads, or 1.33 x Out of service loads	Tower Crane greatest of either: 1.0 x In-service loads, or 1.33 x Out of service loads. Mobile cranes as 3b.
I&TP for creation & monitoring of working platform / foundation	N/A for NR, but good practice	Yes	Yes	Yes	Yes	Yes

NOTE 1: *Cranes can be configured by boom or jib length. In some cases, alternative counter-weight options are available too. Alternative base configurations or outrigger centres may also be available. The lifting operation shall be planned so that the down-rate value shown is applied to the rated capacity for the configuration selected.*

NOTE 2: *Some lifting equipment has identical in-service and out of service load cases, but it is dependent on type and configuration. The foundation should be designed for the worst case either the in-service or out-of-service load cases, with the relevant factors of safety applied. For mobile cranes, a factor of 1.33 is applied to the worst-case ground loading, although this can be applied to the loads derived whilst the crane is working at the reduced capacity. In the case of tower cranes, there are two possible worst-case loadings that can apply – in-service or out-of-service. The designer is to use the higher of the two load cases either a) a factor of 1.0 is applied to in-service loads, or b) a factor of 1.33 is applied to the worst case out-of-service load, which may include the effect of tying and climbing operations. The in-service case requires the OEM's calculation to use the 100% rated capacity.*

NOTE 3: *Open Lines includes critical infrastructure, such as OLE, signalling equipment etc. too that may affect operation railway, which may cause a L3a to be treated as a L3b or L4.*

NOTE 4: *A Network Rail Senior Engineer may accept lifts planned to greater than 90% and 75% of the rated capacity when the possible collapse is onto non-operational land free of operational equipment, or where compliance with the down rate introduces other additional risks because on increasing the size of the crane or foundation.*

2.0 Definitions

When considering the safety of the railway, it is important to note that other critical infrastructure should be considered and not just the open railway. Such critical infrastructure may include overhead line equipment or surface-mounted cables, bridges and signals which affect lines that are beyond a possession or line block.

Although a line may be blocked, such that the travelling public are protected, should these critical infrastructure items be damaged, then these items should be considered as essential to the safety of the operational railway, and this may require additional safety considerations and extra control measures. Hence, when the document refers to 'open lines', it also requires the user to consider other critical infrastructure too.

any line open (ALO)

Any railway lines open to traffic could, without controls, be foreseeably fouled by any plant, attachment or the loads associated with them

asset protection and optimisation (ASPRO) [1]

assist in mitigation of potential risks imported to the Network Rail infrastructure by third-party organisations when working on, near, over or under the infrastructure

compound collapse radius (CCR)

the crane collapse radius plus the load collapse radius *(see **Figures A to E & Figures 2 to 12**)*

crane collapse radius (CR)

the diagonal dimension from the base of the crane mast or crane tie location or centre of slew at ground level to the end of the jib, (see **Figures 2 to 12**). This definition includes the collapse radius of mobile plant such as telehandlers or static lorry loaders which can be mobile until lifting and applies throughout the document

***NOTE:** The terms 'collapse' or 'overturn' are taken to both mean a failure of the lifting equipment's structure, load or the ground or surface supporting the lifting equipment failing. These should both be avoided, for obvious reasons, but where either event affects Network Rail infrastructure, the implications for the travelling public could be catastrophic.*

crane user

person or organisation who requires a lifting operation to be carried out and is responsible for the safe use of the crane

foundation

load bearing structure designed and constructed to be in direct contact with the ground and transferring loads from the crane outriggers, stabilisers or tracks to the ground

isolation

planned and documented switch-off of railway traction electrical power supply for overhead power lines or third rail

lifting equipment

work equipment for lifting or lowering loads, including lifting accessories and attachments (used for anchoring, fixing or supporting lifting equipment)

***NOTE:** Lifting appliance is a machine that is able to raise, lower or suspend a load – e.g. crane, hoist, chain hoist or jack (non-exclusive list).*

***NOTE:** Also known as lifting equipment / rigging equipment / lifting gear / lifting tackle.*

[1] ASPRO define themselves as: 'Asset Protection and Optimisation teams (ASPRO) provide expert railway assistance and support to those who are planning activities on or near the railway'

lifting accessories

devices which attach the load to the lifting equipment or lifting appliance (for example slings, removable eyebolts, chains, chain blocks ropes, shackles, grabs, magnets, vacuum lifters, crane forks, lifting beams and spreaders)

lift plan

information provided to the person supervising the lifting operation to enable them to complete the operation safely

NOTE: *This normally consists of at least risk assessment, method statement and any relevant drawings.*

load collapse radius

the longest dimension of the load (see Section 9, **Figure 12**)

method statement

document produced by the Appointed Person to describe how the lifting operation is to be carried out

NOTE: *This is supplied as part of the lift plan and should eliminate, reduce or mitigate risks identified in a risk assessment.*

Network Rail asset or property boundary

the boundary of plant, signalling equipment, electrical control boxes, property, buildings, vehicles, and other assets owned or used by Network Rail

NOTE: *Rail assets are not always exclusively within physical boundary fences protecting the railway.*

OLE

Overhead line equipment and supporting structures

other mobile lifting equipment

other mobile lifting equipment within the scope of this document, but not limited to these, are telehandlers, lorry loaders, self-erecting tower cranes and excavators conducting lifting operations

possession

A defined period and location on the network where rail operation is ceased. It can contain one or more work sites belonging to one or more projects

NOTE: *Possession and line block are different – RSSB Rule book provide guidance on the difference and where these would apply. The CPA document assumes all work will be undertaken in an agreed zone of work, with the appropriate lines closed to rail traffic. Refer to the following documents for further useful information NR/L2/MTC/PL0175/05 (Planning and Managing Line Blocks) as well as NR/L2/OHS/019/02 Module 2 – Planning and Working in a Possession.*

vehicle exclusion zone

zone around the crane from which vehicles are excluded to minimise the risk of collision

working range limitation

a requirement where the boom, jib or hook of a piece of lifting equipment is restricted to only be in an agreed zone

NOTE: *This is often achieved through using a device fitted to a piece of lifting equipment that prevents the hook or boom of the lifting equipment passing over a defined and programmed boundary, usually giving warning as it approaches the boundary. Slew restrictors and virtual walls are both forms of working range limitation.*

3.0 Hierarchy of Risk Elimination and Reduction

The CDM Regulations place responsibilities on designers to consider the impact of the proposed scheme on the local environment, along with a method and sequence. These fundamentals should be communicated in the Design Risk Assessment, which should also refer to the presence of the railway and associated infrastructure. The risk assessment should clearly establish why lifting operations that pose a risk to the railway could not be eliminated through the design of the works.

When planning the positioning of a crane adjacent to a Network Rail boundary, the hierarchy of risk control described Network Rail's document, NR/L3/CIV/0063, in sections **5.1** & **10.3** should be followed.

This document requires a *'project specific risk assessment to be undertaken, to determine the risks to the operational railway and that they are eliminated or reduced so far as is reasonably practicable, accounting for the requirements of this standard.'*

Completion of a suitable and sufficient risk assessment by the crane user, usually a principal contractor, should lead to the most appropriate solution which will, where reasonably practicable, eliminate risks posed to the railway. This should be evidenced.

The solution should ideally eliminate the risk of collapse by positioning the crane(s), such that they cannot collapse within 4m of the Network Rail boundary as per Section 9, **Figure 1**. For example, a mobile crane or a tower crane - along with any mobile crane(s) that are required to erect and dismantle the tower crane - should ideally be positioned as such that they cannot collapse onto the railway. This is rarely achievable for projects adjacent to railways. If this is not possible, such as where a load or crane jib is within 4m of the boundary, then several mitigations are possible.

The hazard presented to the travelling public can be eliminated by either line blocks or a full possession. However, this cannot eliminate risks to the infrastructure if a collapse occurs. It may be possible that the risk of collapse could be reduced sufficiently by de-rating lifting capacity, using working zone limitation and preparing a suitable foundation or supporting platform.

An important provision is made which Network Rail states in 6.2e) of their publication NR/L3/CIV/0063: '*Wherever reasonably practicable, the risk to the railway of hierarchy levels 2, 3 and 4 should be reduced by positioning cranes and planning works such that crane jibs are pointing away from the railway. Where this is not practicable, crane jibs may work parallel to the railway or, where justified by risk assessment [1], towards the railway'.*

Advice should be sought from suitable industry specialists in order that the most appropriate solution can be identified at the earliest opportunity and prior to finalising the design concept.

In places where no physical barrier exists between the working area and the railway, a safe system of work should include creating a physical barrier to prevent personnel and mobile plant from straying onto the tracks. A barrier may be required to shield machinery lights from train drivers, to prevent dazzling them, if this is considered a likely risk.

The planning process should consider the movement of the load through the full lift cycle. Attention must be given to long loads that could slew within 4m of the boundary or over it, even when the crane hook itself is prevented from doing so.

Loads must be always kept under control and cannot be permitted to slew into the 4m zone. A risk assessed method of control is required, considering the practicalities of controlling a load at height. Tag lines or equivalent could be used to control loads where these are properly deployed and used.

[1] It is for those making the application to Network Rail to justify the adequacy of the controls being proposed to reduce the risks sufficiently and thus provide adequate justification. This should also explore what other lifting options are available and demonstrate that this proposed lifting operation presents the least risk.

Other load handling/control devices which are located below the hook could be considered. These should require risk assessment and be shown in a lift plan, as each brings their own particular risks.

3.1 Level 1 – No risk of collapse or oversail within 4m on plan of the railway boundary

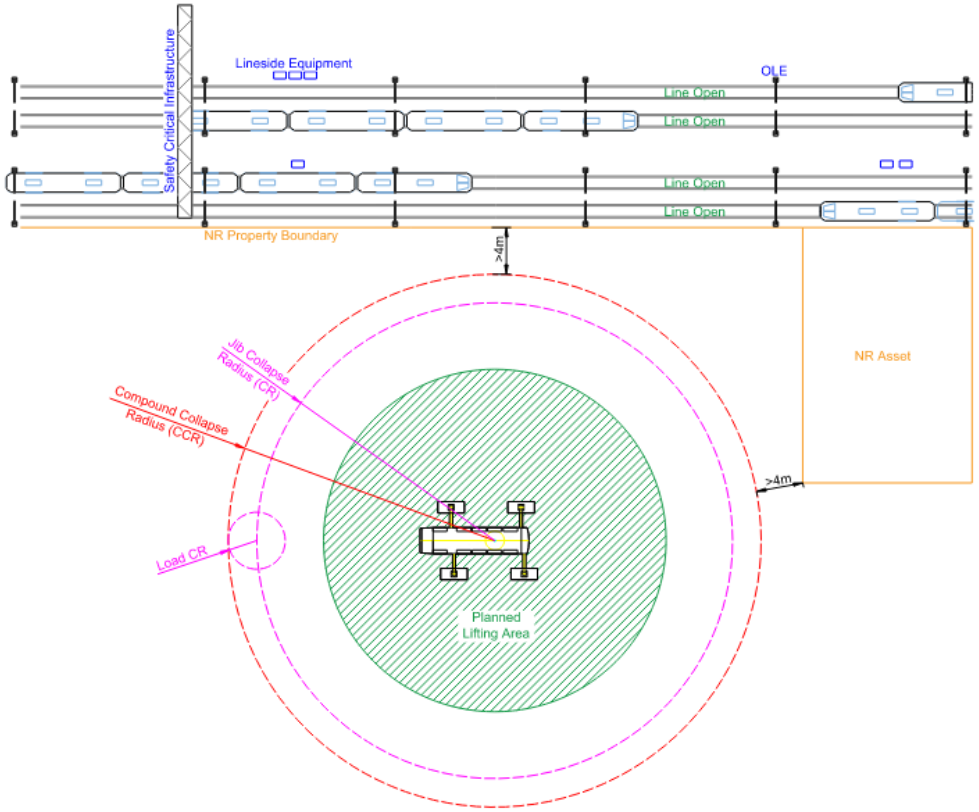


Figure A: Level 1 - The crane is positioned away from the railway boundary such that the load or crane cannot fall within 4m of the railway boundary

Wherever practicable, the crane should be positioned so that if it does overturn, the compound collapse radius in any direction is at least 4m from a Network Rail boundary – Section 9, **Figure 1** & **Figure A.**

NOTE: *Level 1 critical dimension is 4m to the Network Rail boundary. If this can be achieved, then no further requirements apply regarding the assessment of the boundary. Where Level 2, Level 3a, Level 3b or Level 4 apply, the distance to the live railway or safety critical infrastructure applies, hence Figures C to E inclusive show the 4m to critical infrastructure and not the Network Rail boundary.*

Collapse could be due to causes such as mishandling, structural failure, tipping through excessive overturning moment or tipping due to ground collapse.

The Compound Collapse Radius 'CCR' (see **Figures A** to **E** and Section 9, **Figure 12**) is defined as the maximum extent of a collapse as follows CCR = (CR+L) as per the following:

- The Crane Collapse Radius 'CR':
  - For tower cranes [1], it is the diagonal dimension from the foot of the tower to the end of the jib (see Section 9, **Figure 2**). In the case of a tower crane with a luffing jib, this dimension should be the height of the jib foot pin (pivoting or hinge point), plus the length of the jib to its tip (see Section 9, **Figure 3**);
  - For tower cranes with a mechanical tie to the structure (See Section 9, **Figure 4**), it is the diagonal dimension from the tie on the tower to the end of the jib;

[1] *A static self- erecting tower crane (not fitted on a mobile crane or lorry chassis) should be treated as a tower crane on a static base as it is covered by the EN14439 design standard for tower cranes.*

- For non-tower cranes it is the diagonal dimension from the centre-of-slew to the end of the jib (see Section 9, **Figures 5 to 11**).

Plus: The Load Collapse Radius "L" - The longest dimension of the load (see Section 9, **Figure 12**).

***NOTE:** If the load is slung horizontally about the mid-point, "L" may be halved subject to risk assessment and consideration as to how the load may fall in relation to the crane.*

If the crane can be positioned so that the compound collapse radius is greater than 4 metres (m) at any 360-degree slew angle from the railway asset or property boundary, Network Rail do not need to be consulted. Also in this case, no under utilisation is required, no increase to foundation capacity is required and no additional thorough examination requirements. A risk assessment should however be undertaken to ensure that no load will slew into the 4m boundary zone.

In a Level 1 scenario, where there is a railway in proximity to the lifting operation, a written risk assessment should be prepared which records the assessment of the hazards and demonstrates that the risk to the operational railway and any critical infrastructure has been eliminated. The risk assessment does not need to be submitted to Network Rail.

3.2 Level 2 – Risk of overturn or collapse within 4m on plan from the railway boundary with full possession and lines blocked.

Network Rail may be prepared to consider a possession to prevent trains running during times when there is a risk of the crane and or load falling on Network Rail assets. See **Figure B**.

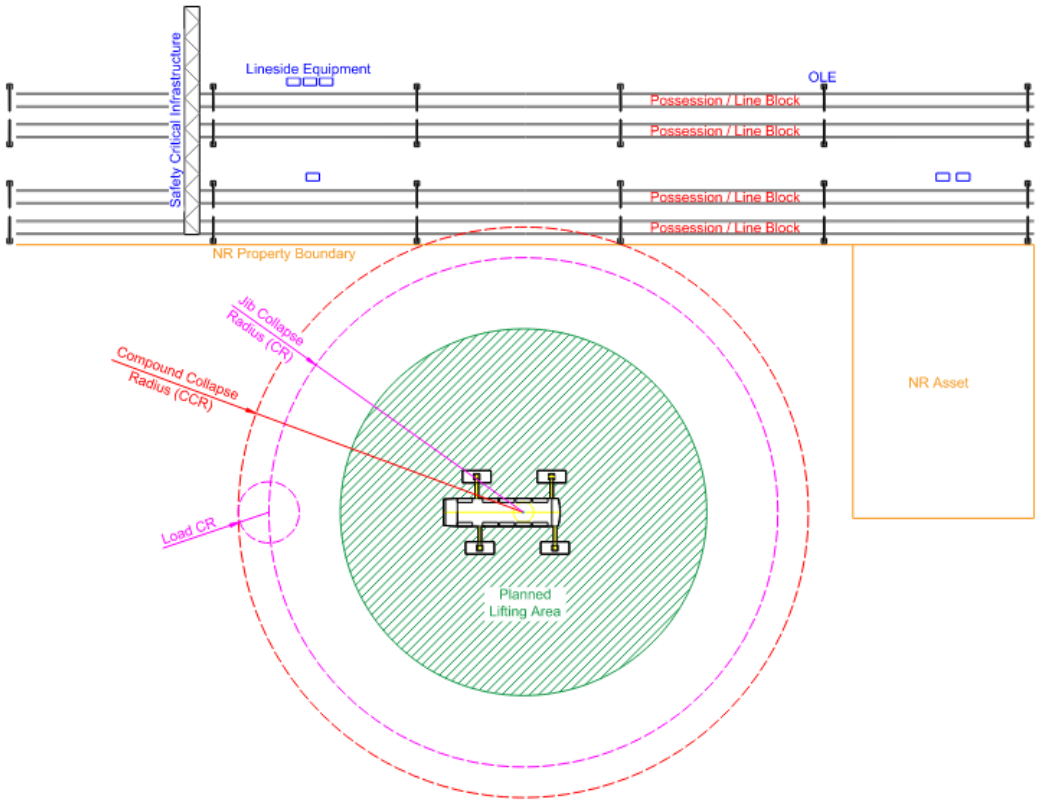


Figure B: Level 2 - The crane is positioned such that the crane or load could potentially collapse or overturn, crossing into the boundary and or lines and the risk is addressed with full possession and all affected lines blocked.

***NOTE**: In this scenario, where there is lineside equipment, control box or overhead line equipment in the possession zone, whilst any damage to them will not immediately affect the operational railway (as the railway is already non-operational), the potential for damage must be considered as it could prevent the reopening of the railway (at considerable cost).*

The crane is not shown with working range limitation placed on it as the railway is closed to rail movements.

Unless approved by the Network Rail Senior Engineer:

- Lifting operations should not be planned to exceed 90% of the rated capacity of the crane;
- Foundation capacity should be uplifted by a factor of 1.1, when considering the load imposed on the ground for the down rated crane capacity; and
- Loads must be controlled such that no part of it passes beyond the 4m exclusion zone.

***NOTE**: In some cases, selecting a crane to achieve the 90% rated capacity limit may introduce additional risk due to the geometric size of the crane and the effect on the ground.*

3.3 Level 3. Risk of collapse within 4m on plan from the railway boundary with partial possession and some lines open to railway traffic; or no possession and all lines open to railway traffic

If the crane cannot be positioned as specified in **3.1** or all lines blocked to remove the risk as in **3.2**, Network Rail Asset Protection may accept the crane to be positioned and rigged with the compound collapse radius encroaching within the 4m of the Network Rail boundary, over operational lines, or equipment which can affect the operational railway. Examples are shown in **Figures C, D** and **E**.

Network Rail's NR/L3/CIV/0063 states in 7.2d) that jib-cranes should work with their jib either parallel to or pointing away from the railway wherever reasonably practicable. However, noting clause 6.2e), where this is not reasonably practicable, a risk assessment should be provided to accompany the proposal which examines each of the risks and demonstrates how these are minimised or mitigated as below. These mitigate against overloading the crane, overloading the working platform, the ground being overloaded or deteriorating through use and management of change.

The process of rigging or erecting / assembling the crane should be such that it does not oversail the 4m boundary zone, although once-erected parts of the crane may oversail the zone. However, the process of assembling/erecting and/or testing the crane should be subject to review and acceptance by Network Rail. Once completed and the crane is in service, oversailing of parts of the crane may be accepted, although no load should be permitted to pass into the boundary zone. Hence the hook of the crane should be prevented from entering the zone during service, although the jib may oversail the 4m boundary zone and/or railway during in-service and/or out-of-service conditions.

There are many possible scenarios that cannot be adequately covered in this document, although the following factors should all be considered in the lift planning and risk assessment preparation:

- Crane location;
- Crane type;
- Crane capacity and restricted capacity (down-rating) – see **4.3**;
- Line block / possession for erection or not;
- Direction of lifting operation;
- Availability of shielding by another structure;
- Ground conditions & loading – see **4.6** & **4.7**;

- Permitted oversailing – see **4.4**;
- Crane working range limitation and/or anti-collision system – see **4.5**.

Level 3 considers two options as shown in Table 2 below. Level 3a and Level 3b are shown, but tower cranes are treated differently to mobile cranes, due to the difference between in and out of service conditions.

Level 3 – Overturn within 4m of railway, with partial possession and some lines blocked & others open			
Network Rail requirement.	Collapse will not affect open lines, Level 3a [3]. (Mobile crane)	Collapse might affect open lines, Level 3b [3]. (Mobile crane)	Collapse might affect open lines, Level 3a & b [3]. (Tower crane)
Risk assessment of effect NR Infrastructure req'd.	Yes	Yes	Yes
Upper limit for the crane's rated capacity in that configuration[1]	90%	75%	75%
Use of working range limitation to prevent lifting over live railway. See **4.5**.	N/A	Yes	Yes
Load factor to be applied to worst load exerted on working platform / foundation in the above configuration in either in-service or out of service conditions [2] .See **4.7**.	1.1	1.33	Greatest of either: 1.0 x In-service loads or, 1.33 x Out of service loads
I&TP for creation & monitoring of working platform / foundation	Yes	Yes	Yes

Table 2 – Level 3 category risk of overturn within 4m of the railway boundary

The lift plan should include a statement that any deviation from the lift plan should lead to the suspension of all lifting operations until a management of change process has been completed, and Network Rail have accepted the proposed changes.

NOTE 1: *Network Rail may accept lifts planned to greater utilisation than 90% and 75% of the rated capacity when the possible collapse is onto non-operational land free of operational equipment, or compliance with the down-rate introduces other additional risks due to the effect of increasing the size of the crane or foundation.*

NOTE 2: *Cranes can be configured by boom or jib length. In some cases, alternative counter-weight options are available too. Alternative base configurations or outrigger centres may also be available. The lifting operation should be planned so that downrate value shown is applied to the rated capacity for the configuration selected.*

NOTE 3: *Some lifting equipment has identical in-service and out-of-service load cases, but it is dependent on type and configuration. The foundation should be designed for the worst case either the in-service or out-of-service load cases, with the relevant factors of safety applied. For mobile cranes, a factor of 1.33 is applied to the worst-case ground loading, although this can be applied to the loads derived whilst the crane is working at the reduced capacity. For tower cranes, there are two possible worst-case loadings that can apply, in-service or out-of-service. The designer is to use the higher of the two load cases either a) a factor of 1.0 is applied to in-service loads, or b) a factor of 1.33 is applied to the worst case out-of-service load, which may include the effect of tying and climbing operations. The in-service case requires the OEM's calculation to use the 100% rated capacity.*

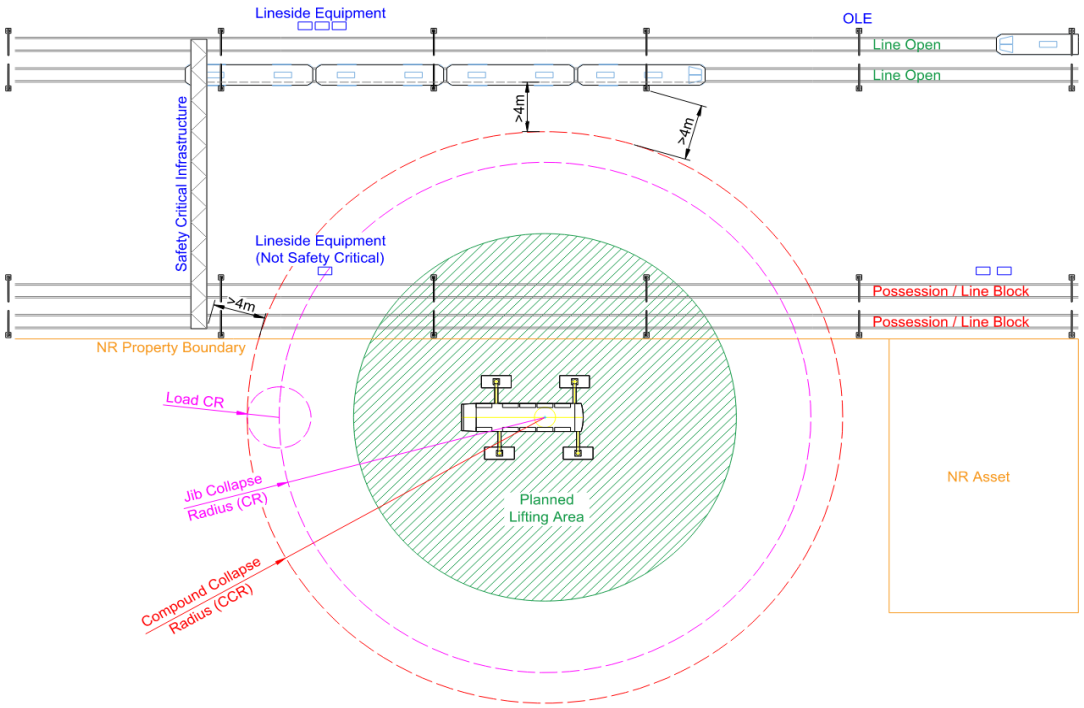


Figure C: Level 3a - The crane is positioned such that the crane or load could potentially collapse or overturn, crossing the boundary and or lines and the risk is addressed by a partial line block.

***NOTE**: In this scenario, if there is lineside equipment, control box or overhead line equipment in the possession zone, that could affect the operational railway, the Level would be increased from Level 3a to Level 3b or Level 4* and 4 has all lines open (ALO).

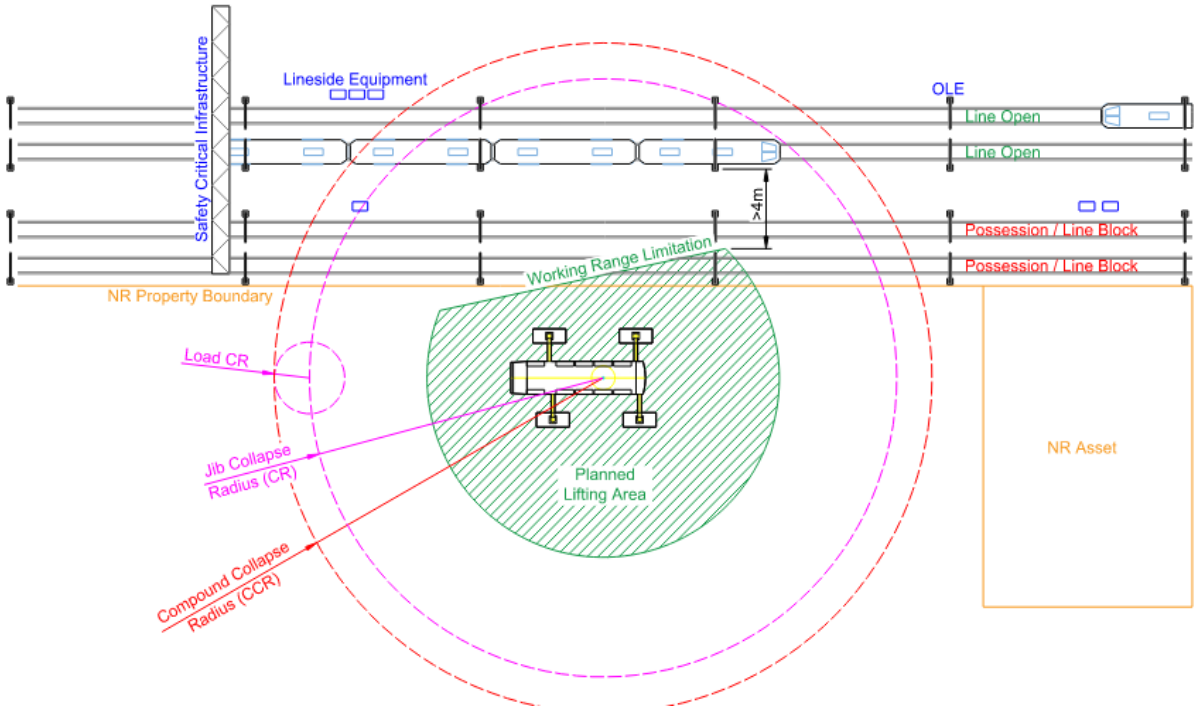


Figure D: Level 3b – The crane is positioned such that the crane or the load could potentially collapse the boundary onto open lines. Oversailing and movement of the load is prevented from encroaching within 4m of open lines by restrictors.

It should be noted that cases Level 3A and Level 3B are only as a last resort when it is not reasonably practicable to position the crane elsewhere, and only after a risk assessment has been completed, which demonstrates that sufficient control measures are in place to reduce the risks to an acceptable level. The use of working range limitation should be a last resort when compared to correct crane positioning. However, this may be an operational requirement given other constraints on site. The crane is shown with working range limitation placed on it. These are programmed and verified by testing. Slew restrictors operate in a similar way but with the slewing arc being limited, preventing the hook of the crane entering the exclude zone.

Tower cranes can be configured in many ways, as demonstrated by the various load curves for a crane which vary by jib length as well as the lifting radius. Tower crane suppliers should provide the foundation, or mast loads to the hirer, that show the imposed loads, based on the crane working at 100% of the stated capacity for the crane and jib length combination. They should also be the loads that are for the correct height of crane. Adjustments may need to be required where a shorter crane is located on top of a building to give the correct foundation loads. These loads should be for the correct wind zone (usually C or D) and for the agreed recurrence period. This is usually for 1:25 year period.

A tower crane is required to have an acceptance test prior to being put into service. This is required by the normative Annex C of EN14439:2025 and 4.2.4.3 of EN13001-2:2021. This is a static load test of 125% of the load curve when the crane is brand new and prior to its first use. The test load is not lifted at windspeeds > 8m/sec (Table 1). This is not repeated at any other erection activity, limiting the risk of degrading the crane through unnecessary overloads which affect the fatigue life of the crane and mast.

Subsequently, the crane is subjected to a load of 110% on erection, for the purpose of setting the crane's limits and indicating devices. The risk of fatigue in the crane structure would be increased and safety factors in the foundation/base design would also be reduced.

The design in-service limiting wind speed of 20 m/s can exceed the loads imposed by the 125% static load test for certain crane configurations. It is for this reason that the crane will be downrated to either 90% or 75% of the normal 100% rated capacity load chart, depending on it being in Level 3a or Level 3b or Level 4.

3.4 Level 4. Risk of collapse within 4m on plan from the railway boundary with no possession and all lines open to railway traffic

If the crane cannot be positioned without the compound collapse radius passing within 4m of the railway boundary, then the following rules are to be followed. Typically, this will apply to a long-term project, such as the use of a tower crane beside the railway or where long-term mobile crane use would otherwise mean extended periods of rail network closure.

This crane is depicted out of service *(left)* and then operational *(right)*, located on top of the train station at Ilford. The Level 4 requirements were applied to all lifting operations.

Level 4 has identical requirements to Level 3b, as both cases permit the cranes to work even though the crane's compound collapse radius passes over operational rail tracks/ infrastructure.

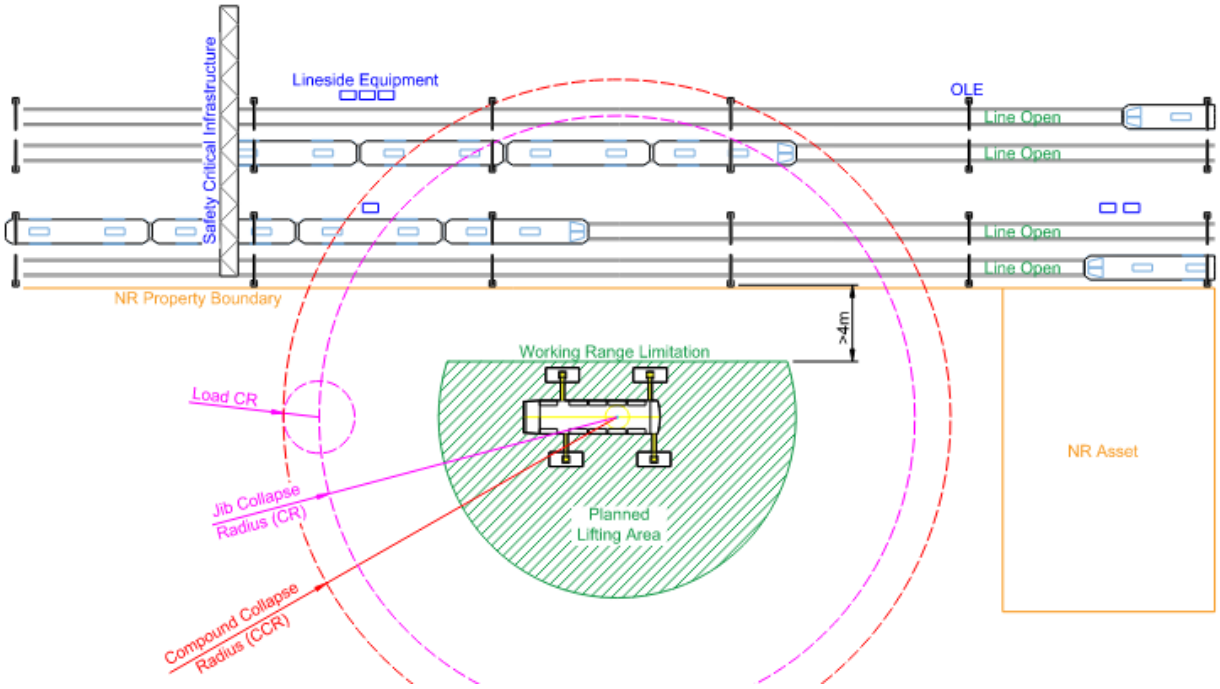


Figure E: Level 4 - The crane is positioned such that the crane or the load could potentially collapse over the boundary and onto open lines. Oversailing and movement of the load is prevented from encroaching within 4m of the Network Rail boundary by restrictors.

It may be necessary to oversail within 4m of the railway boundary when a tower crane is out of service. Where this is proposed, then Network Rail should be consulted and formal oversailing agreement should be required. Tower cranes that are to be supported by manufacturer's proprietary static or travel bases and held down by kentledge, should use the weight of kentledge as specified by the manufacturer. Uprating of kentledge weight may lead to the base being overloaded, so should be avoided.

Table 3 differentiates between mobile and tower cranes. Some lifting equipment, like mobile cranes, only have a single load case whereas others, such as tower cranes, have both in and out of service load cases. This table shows how to differentiate the load cases where these are available.

The lift plan should include a statement that any deviation from the lift plan should lead to the suspension of all lifting operations until a management-of-change process has been completed, and Network Rail have accepted the proposed changes.

Level 4 - collapse within 4m of railway, no possession		
Network Rail requirement.	All lines open to railway traffic. (Mobile crane & similar) [3]	All lines open to railway traffic. (Tower crane) [3]
Risk assessment of effect NR Infrastructure required	Yes	Yes
Upper limit for the crane's rated capacity in that configuration [1].	75%	75%
Use of working range limitation to prevent lifting over live railway. See 4.5.	Yes	Yes
Uplift to be applied to worst load exerted on working platform / foundation in the above configuration [2]. See 4.7.	1.33 x Outrigger load (or similar ground loading)	Greatest of either: 1.0 x In-service loads, or 1.33 x Out of service loads
I&TP for creation & monitoring of working platform / foundation	Yes	Yes

Table 3 - Level 4 category risk of overturn within 4m of the railway boundary.

NOTE 1: *Network Rail may accept lifts planned to greater utilisation than 75% of rated capacity when the possible collapse is onto non-operational land free of operational equipment, or compliance with the down rate introduces other additional risks due to the effect on increasing the size of the crane or foundation.*

NOTE 2: *Cranes can be configured by boom or jib length. In some cases, alternative counter-weight options are available too. Alternative base configuration or outrigger centres may also be available. The lifting operation should be planned so that the downrate value shown is applied to the rated capacity for the configuration selected.*

NOTE 3: *Some lifting equipment has identical in-service and out-of-service load cases, but it is dependent on type and configuration. The foundation should be designed for the worst case, either the in-service or out-of-service load cases, with the relevant factors of safety applied.*

NOTE. *For mobile cranes, a factor of 1.33 is applied to the worst-case ground loading, although this can be applied to the loads derived whilst the crane is working at the reduced capacity. In the case of tower cranes, there are two possible worst-case loadings that can apply, in-service or out-of-service. The designer is to use the higher of the two load cases either a) a factor of 1.0 is applied to in-service loads, or b) a factor of 1.33 is applied to the worst case out-of-service load, which may include the effect of tying and climbing operations. The in-service case requires the OEM's calculation to use the 100% rated capacity.*

4.0 Detailed Requirements - General

Ideally, crane operations, positioning etc. should be configured to eliminate any risk to Network Rail infrastructure operations etc. (see Section **3.0**).

Where it has not been possible to eliminate risks by positioning a crane or other lifting equipment, such that they cannot collapse onto the railway, then the following points should be considered when creating the safe system of work.

4.1 Competency of those planning & managing operations which affect Network Rail Managed Infrastructure

Those individuals planning and managing activities should do so according to the Network Rail requirements. Attention is therefore drawn to the following Network Rail documents requiring individuals to be appointed to assurance roles:

- NR/L2/RSE/02009 Module 1 (issue 3) – Assessment for Project Engineering Roles;
- NR/L2/CIV/1000/06 - Competency requirements for Engineering Assurance roles for Design Engineers (DE) and all Project Engineers (PE). Reference should also be made to NR/L2/RSE/02009 for these roles.

The principal contractor should also advise, via the lift plan, the competency and training required of those undertaking the lifting operations on site and who should be monitoring the preparation of the site along with following the lift plan.

4.2 Project Specific Risk Assessment and Lift Plan

For all Levels, a project specific risk assessment should be undertaken to ensure that risks are eliminated or reduced so far as is reasonably practicable. A lift plan should be prepared that details the safe system of work to be followed.

NOTE 1: *refer to NR/L2/OHS/0047 and NR/L2/RSE/100/02 for details on undertaking project risk assessments where working, as ASPRO dictates.*

NOTE 2: *Within NR/L3/CIV/0063, the Project Risk Assessment and Lift Plan is referred to as a Risk/Hazard Identification and Management Document.*

NOTE 3: *The Project Specific Risk Assessment should include, but not be limited to, clarification of risk level, justification for the risk level, confirmation that all options for line blocks/possessions have been investigated and evidence from the designer that construction risks were mitigated in the design.*

4.3 Restricting Lifting Capacity

For Level 2 and Level 3a all lifts should be planned to ensure that the crane lifts no more than 90% of the manufacturer's rated capacity for the crane configuration chosen.

NOTE: *For Level 2 and Level 3a, Network Rail may accept lifts planned to greater than 90% of capacity where this justified by risk assessment.*

For Level 3b and Level 4, all lifts should be planned to ensure that the crane lifts to a maximum of 75% of the manufacturer's rated capacity for the crane configuration chosen.

NOTE: *For Level 3 and Level 4, Network Rail may accept lifts planned to greater than 75% of capacity when the possible collapse is onto non-operational land, or the addition of the larger crane or foundation introduces additional risks to Network Rail.*

Lifting accessories should be subject to a thorough examination period of 3-months where they are being used in a lifting operation where the crane is downrated as per **3.2, 3.3** or **3.4**. This is in accordance with Annex E.5.3 of BS7121-1:2016 and avoids the need to downrate the lifting accessories with the associated complications of assessment of mode factors for lifting accessory angles and hole sizes in prepared lifting points. The lifting equipment should remain on a 6-monthly thorough examination cycle unless in exceptional circumstances, such as due to a shock load, overload or jib clash.

4.4 Oversailing

The crane planning process should ideally have eliminated the risk of oversailing the 4m boundary zone.

The oversailing of Network Rail infrastructure by cranes and their loads should not be undertaken unless it is unavoidable due to the inherent risks to Network Rail operations, personnel, the travelling public etc.

Any proposed oversailing will be subject to strict site control measures which should be accepted by Network Rail prior to being undertaken. This will always require a possession as per the requirements of the hierarchy of risk 'Level 2' (*Level 2 activities are covered in 3.2).*

In addition, an isolation will be required on electrified sections of the railway. Such possessions will be arranged through Network Rail and require considerable advance notice (frequently more than 12 months).

Oversailing may be permitted in exceptional circumstances, such as for a tower crane jib in out of service conditions. In such cases, a formal oversailing agreement might be considered by Network Rail.

4.5 Operating Area Restriction / Working Range Limitation / Anti-collision

For Level 3 and Level 4, where an operating area restriction is required, the lift plan should identify the required areas of restriction and the method to be used. These should be followed by the crane operator, under the instruction of the Crane Supervisor and supplemented by an appropriate restriction system, whether using slew restrictors or working range limitation systems.

Once the crane has been positioned on site, the restriction should be set and tested to prevent any part of the crane and/or the load being lifted encroaching within 4m of the Network Rail boundary and/or over operational lines as agreed with Network Rail (see **7.2** and **Figures D or E**). Restriction should be achieved with a limiter and linked to the crane's control system, which should be set at the minimum arc required to enable the lift to be carried out safely to maximise the distance from the 4m position.

NOTE: *Restrictors may be electronic, hydraulic or mechanical.*

NOTE: *A limited number of cranes are available that provide both slew arc and radius restriction.*

Special care should be taken when using crawler cranes as any movement of the crane undercarriage, such as turning or travelling, will invalidate the settings of the restrictor. In such cases, physical movement limiting devices may be appropriate, such as stop-blocks or concrete barriers.

The correct operation of the restrictor should be checked and the result recorded in writing before the start of each shift, or after any movement of the crane undercarriage.

To prevent the tower crane oversailing the operational boundaries during use, it must be fitted with a zoning system to limit the slewing, luffing or trolley motions. Zoning systems will also assist in the avoidance of obstructions, such as tall chimneys.

Where more than one tower crane is erected on a site, an anti-collision system must be fitted if there is a risk of a clash between the hoist rope and load of one crane, and the jib or counter jib of another crane.

The lift plan should include a drawing of the site with the Network Rail boundary, showing the crane position(s), with the extent and position of the operating restriction area. Further details can be found in CPA TCIG TIN 010 (www.cpa.uk.net)

When considering excavators that are working where they have a risk of collapse onto the Network Rail infrastructure as per Figure 11 in Section 9, then slew restriction should be provided as per the Network Rail requirements. This may be achieved by either high performance or low performance movement limiting devices.

High performance devices are more robust, including additional reliability. They are useful to control operating speed. High performance limiters are generally only available on excavators and are not fitted to tower and mobile cranes as their systems are entirely different.

Reference should be made to the Rail Safety and Standards Board Code of Practice for Plant Any Line Open (ALO) Working (current version issue 5), available at https://www.rssb.co.uk/standards-catalogue/CatalogueItem/cop0032-iss-5

For details relating to movement limiting devices, refer to **Table 5** and Sections **3.4** to **3.6** in particular.

4.6 Outrigger/track loads

The maximum outrigger/track loads for a crane in the configuration in which it is rigged for the lifting operation, or during rigging/de-rigging, should either be obtained from the crane supplier/manufacturer or by using calculation software or calculation tools approved by the crane manufacturer.

Note: *Examples include manufacturer-specific software such as LICCON (Liebherr) and Lift Planner (Terex, Demag, Tadano), generic software and online tools such as those made available by ALLMI, Kobelco and Hitachi-Sumitomo.*

All the loading conditions for the given configuration should be considered – for example, laden with the maximum load to be lifted; unladen with actual required counterweight; during rigging, all over the full 360°arc of slew).

NOTE*: When slew arc restriction is in place, load outrigger/track loads for the relevant reduced arc of slew may be used.*

For Level 3b & Level 4, these loads should be multiplied by a factor of 1.33 to increase the level of safety of the foundation absorbing these loads.

NOTE: *Maximum outrigger loads may occur when the crane is unladen at minimum radius or during rigging.*

4.7 Elements requiring temporary works design

All elements of temporary works related to cranes beside railways should be controlled by a competent person, usually the Temporary Works Coordinator (TWC). It is the responsibility of the Temporary Works Coordinator that they appoint competent persons to design the temporary works, or check that any permanent works are strong enough for the loads that are to be applied to them. They are also required to ensure that the designer(s) have the correct loads and design information, along with any updates when information is revised.

The TWC should also advise which of Network Rail's Levels of Control will apply to the design, so that the correct factors of safety are applied as per **3.2, 3.3,** & **3.4**.

The design should then be subject to an independent design check, in accordance with Category 3 of Table 2 of BS 5975-1:2024, to ensure that the concept, overall design and details of the foundation proposed are adequate and that the foundation designer's intentions (including the requirements of this guidance note) have been properly reflected in the drawings to be supplied to site. The check is not intended to take the place of any checking carried out by the foundation designer, who will retain full responsibility for the adequacy of the foundation design.

The crane(s) working platform, base, foundation or ties should be subject to design submission in accordance with the requirements of Network Rail Civil Engineering Assurance standard NR/L2/CIV/003 (issue 8), clause 13 - including the presentation of a Form C, along with the correct Design Check Certificate to Clause 15 and Appendix A, well in advance of the proposed installation date.

4.7.1 Outrigger foundation design / Working Platform design

The principal contractor should prepare a scope of ground investigation that should gather sufficient information via ground investigation, probing and testing, including to a sufficient depth, so that a suitable working platform can be designed.

A temporary works engineer / ground engineer should assess the adequacy of the ground or bearing surface for the proposed loads as well as the type of working platform that is to be formed.

If such information is not available, then it may be acceptable to increase the factor of safety against overturning by improving the ground as well as considering the down-rating of the equipment.

The Principal Contractor should ensure that the scope of the lifting operation is identified, such that the lift plan requires assessment of all load cases, including rigging activities and loads associated rigging cranes, as well as the lifting operation. Those planning the outrigger mat spacing and size should also advise the temporary works engineer / ground engineer, as this may have an effect on the type and depth of the ground investigation.

The Appointed Person should, in consultation with the Temporary Works Coordinator for the site, verify that the ground has sufficient bearing capacity and settlement characteristics to take the factored loads from **Table 1** and **4.7** and agree on the spreader pads or other measures to be taken to transfer the loads into the ground.

For Level 2, Level 3 and Level 4, unless otherwise agreed by Network Rail, foundations should be subject to design submission in accordance with the requirements of Network Rail Civil Engineering Assurance standard NR/L2/CIV/003 - including the presentation of Form C Certificate of Design and Check for Temporary Works by the site Temporary Works Coordinator well in advance of the proposed installation date.

For Level 2, Level 3 and Level 4, the temporary works designer should consider ground conditions for access and egress of the crane to the lifting position. This should consider poor ground or other features such as potentially unstable cuttings / embankments and identify any temporary works required to avoid instability of the crane or ground.

Once the working area for any mobile plant has been defined, then a further 1m working platform is to be designed and created all round, to minimise the risk of failure of the platform, where the crane is close to the edge during any positioning activities. This may need to be increased where a deep platform is being created.

Inspection and Test Plans (ITP) should be produced by the contractor and accepted by the designer to meet all the designer's requirements. These should also include any required maintenance or check activities that will maintain the strength and resilience of the foundation/ working platform during its construction and use. This may include the system of work to be adopted when installing drainage requirements, along with reinstating or repairing geotextile membranes that are damaged or cut, and including a safe system of work to deal with hard spots that may need to be removed from below the working platform.

An assessment should be made for the ability of the platform to drain surface water and run-off, along with any water produced as a by-product of construction activities.

NOTE: *Guidance on the temporary works engineering assurance process for works adjacent to Network Rail is provided in Network Rail Standard NR/L2/CIV/003. This includes discussion of the content for inspection and test plans.*

NOTE*: Each outrigger foundation should be designed using the largest outrigger load for that given outrigger. For Level 3 and Level 4, this load should be increased by the factor specified in 4.7.*

NOTE: *Details of ground assessment, together with methods or ground improvement and imposed load reduction, are given in the Plant Safety Group's Good Practice Guide on Ground Conditions for Construction Plant (www.cpa.uk.net)*

4.7.2 Tower crane height

The freestanding height of the tower is limited to the manufacturer's specified maximum freestanding height for the crane configuration chosen, calculated to the requirements of EN14439. The effect of out of service wind must be calculated using the appropriate wind region for the crane's location with a minimum of Region C, a minimum 25-year recurrence interval and the roughness factors for *"flat open country".*

This may be varied where Network Rail accept a site-specific wind study

Further details can be found in CPA TCIG TIN 027 – *Tower Crane Out-of-Service Wind Speeds*. This explains where zone D requirements apply also

***NOTE:** "Freestanding height" is the maximum height specified by the manufacturer for a specific configuration of tower crane which is not tied to an adjacent structure. If a taller crane is required, then mast of enhanced strength may be added or ties used to provide mast restraint.*

4.7.3 Tower crane base design

The base design must be completed in accordance with guidance provided in CIRIA RP999 (C761) *Tower Crane Foundation and Tie Design*. The base loads may need to be increased by a factor as required in **3.2, 3.3, & 3.4.**

Pre erection checks of the base/foundation are to be carried out in accordance with **4.8.** Copies of the foundation drawings must be retained on site with the crane. Photographs of foundations under construction must be taken and retained on site. Cube tests must be taken of each batch of concrete used. Results of the tests must be retained on site. The crane must not be erected until a competent engineer has verified that the foundation has been constructed correctly and the concrete has achieved the necessary strength.

4.7.4 Tower crane tie design

Where a tower crane is to be tied, this reduces the collapse radius. However, this approach requires the tie and the adjacent structure to have adequate strength to provide the benefit shown in **Figure 4**.

The tie design must be completed in accordance with guidance provided in CIRIA RP999 (C761) *Tower Crane Foundation and Tie Design*. The design must then be subject to an independent design check in accordance with Category 3 of Table 2 of BS 5975-1:2024 to ensure that the concept, overall design and details of the tie proposed are adequate and that the tie designer's intentions have been properly reflected in the fabrication and installation drawings. The check is not intended to take the place of any checking carried out by the tie designer, who will retain full responsibility for the adequacy of the tie design.

Pre erection checks of the tie are to be carried out in accordance with **4.8.** Copies of the tie drawings must be retained on site with the crane. The crane must not be erected until a competent engineer, or engineers, has/have verified that the tie and tie attachment points on the structure have been constructed correctly.

4.7.5 Shielding

If the crane is sited behind a building of sufficiently robust construction to resist the collapse of the crane, this would have the same effect as being tied at the top of the building. Checks should be undertaken to ensure that the shielding remains in-situ to provide the planned shielding.

4.8 Site Checks for Foundations & other temporary works

For all Levels 2 to 4, before the crane is rigged, checks should be completed on foundations to confirm that they have been installed or constructed as designed. The recognised industry form; *Mobile Crane Base/Foundation Pre-rigging Inspection Report* (see **Annex B)** should be completed. For Level 2, Level 3 and Level 4, a copy of the form should be given to Network Rail along with a Form E (*refer to clause 18.2 and Appendix A of NR/L2/CIV/003).* Reference should also be made to the completed Inspection and Test Plan, along with associated evidence that what was designed was provided.

A check should be made by the Principal Contractor after the initial loading of the work platform to ensure that the work platform is performing as intended, such as the expected settlement / rutting values are not being exceeded. The cross-slope / fall should be verified and monitoring of standing water. Checks should include where vehicles are turning. Records should be kept of any assessment.

Soft spots may be formed in the work platform due to other construction activities, such as piling. Reinstatement of the working platform should be completed before allowing cranes and other plant into such areas. These should be cordoned off to prevent access for the cranes.

For tower crane bases: before the tower crane is erected, the necessary checks must be completed on both ties (where applicable) and bases/foundations and a *Tower Crane Tie Approval/Completion Certificate* (See Annex C) completed, together with a *Tower Crane Foundation Approval/Completion Certificate.* Copies of both certificates must be given to the Network Rail Asset Protection Engineer, together with the tie and foundation designs.

Further details can be found in CPA TCIG TIN 031 (www.cpa.uk.net)

NOTE 1: *TIN 031 requires a Category 2 design check. This must be increased to Category 3 for tower cranes alongside Network Rail infrastructure.*

NOTE 2: *A Network Rail Form E (Certificate of Fitness to be Taken into Use) may also be used instead of the form in Annex B.*

4.9 Periodic Check of Foundations & Management of Change

For Levels 2 to 4 where the crane is to be in one location for a long period, foundations should be checked at least weekly (in accordance with the Inspection and Test Plan), after foundation modifications and in periods of bad weather. The check should be recorded.

No alteration should be made to the working platform without approval from Network Rail. This includes where excavating to remove ground obstructions during piling works (associated with the use of cranes on site), or the excavation of trenches for services / drainage.

4.10 Lifting Accessories and Load Attachment Points

For Level 2, Level 3 and Level 4, lifting accessories and/or detachable load attachment points should have been subject to CE/UKCA conformity assessment. They should be supplied with conformity declarations and be appropriately marked.

For all Level 2, Level 3 and Level 4, where a load has been specifically designed for the project and is to be lifted from non-detachable load lifting points, the structural integrity of the load/arrangement should be considered by the temporary works process. For Levels 2 to 4, the design check should be to NR/L2/CIV/003 Design Check Category III (DCC III). This is not considered necessary for items or products that have been purchased on the open market and already covered by CE marking, such a concrete skip, compressor or pump.

In accordance with **7.2(i)** of NR/L3/CIV0063, pile cages / diaphragm wall cages that could fall within 4m of the boundary (with no possession in place) should be provided with secondary restraint. It may however be prudent to design the lifting arrangement, such that the failure of a single attachment point on the load or single part of any lifting accessory, does not result in the load falling within 4m of the boundary, by providing redundancy in the lifting arrangement (such that remaining lifting points / accessories are able to support the load and prevent loss of the load). This alternative however, would be subject to approval of NR through a Variation Application to NR/L2/CSG/STP001/04.

NOTE: *This applies to Level 3B or Level 4.*

4.11 Planning for De-rigging / Dismantling

For Levels 2 to 4 as part of the lift planning process, the de-rigging or crane dismantling operation should be evaluated, at least in outline, to ensure that changes to the site between rigging and de-rigging do not impede the de-rigging operation; for example, building on the area required to stand an assisting mobile crane for de-rigging.

If a line block and/or isolation is needed for the de-rigging operation, the lead time for these should be considered and factored in the planning.

4.12 Crane Collision Prevention and protective measures

For Levels 2 to 4 where there is a risk of impact from vehicles and mobile equipment travelling on site, the Traffic Management Plan should provide a vehicle exclusion zone ensuring that traffic is routed away from the crane. If this is not achievable, an adequate vehicle containment barrier should be provided.

4.13 Wind Speed Monitoring

For all Levels, the lift plan should consider the maximum wind speed for each load to be lifted. The plan should also include the maximum permissible wind speeds by which lifting operations should be terminated and the crane jib placed in the out of service condition. Arrangements should be in place to obtain weather forecasts and monitor wind speeds.

NOTE 1: *Where the crane is not fitted with an anemometer, a hand-held anemometer should be used.*

NOTE 2: *Guidance on the effect of wind is provided in Annex D of BS7121-1:2016.*

4.14 Assisting Crane Requirements

Smaller mobile cranes are commonly used to assist with the rigging of large mobile cranes or erection of tower cranes. The requirements of this document apply equally to them.

NOTE: *Details of the assisting crane should be included in the submission to Network Rail.*

4.15 Submission to Network Rail

For Level 2, Level 3 and Level 4 in advance of the lift taking place, the Project Specific Risk Assessment, the ALO Plan, and Lift Plan (see **4.2**) and the foundation design (see **4.7**) should be submitted to Network Rail for review and acceptance.

NOTE: *Network Rail may wish to be in attendance during the lift.*

5.0 Positioning, Rigging, Alteration and De-rigging

5.1 Correct Crane Configuration and Position

It is essential that the crane supervisor ensures that the crane specified in the lift plan is both delivered to site and positioned and configured correctly. Any deviation from the specified crane, position or configuration may well invalidate the planning and increase the risk to the railway assets. Any changes to the lift plan should be approved by the Appointed Person.

Network Rail should be consulted if any changes are made to the lift plan that are detrimental to the safety of railway assets.

NOTE: *It is beneficial for the planning process to include alternative cranes to allow for non- availability of a given crane.*

5.2 Rigging, Alteration and De-rigging

Network Rail should be notified in advance of the date and time of any rigging, alteration, or de-rigging operations.

A ready-for-work check should be completed by the crane operator and the lifting supervisor who is responsible for the lifting operation. This is to ensure that the crane has been rigged as per the lift plan prior to being put into service. This should be machine and rig-specific and include a check on the reeving of any hoist and luffing ropes This will apply to other slave / attendant cranes that are being used as part of the rigging of a larger crane.

The Principal Contractor should issue a permit to load structures or crane platforms / foundations, or similar temporary works permit prior to any rigging or lifting operations commencing.

Further information on the rigging and de-rigging of mobile cranes is given in:

- BS 7121-3:2017 + A1:2019, *Code of practice for safe use of cranes – Part 3: Mobile cranes*
- BS 7121-5:2019, *Code of practice for safe use of cranes – Part 5: Tower cranes.*

5.3 Tower Crane Preparation

Before a tower crane is delivered to site and prior to each erection or alteration, it is essential that it is inspected thoroughly to identify any worn or faulty components and that these are replaced. It may be easier and less costly to replace components and carry out lubrication and adjustments in a depot, than when the crane has been erected on site. Work on an erected tower crane always involves work at height and presents difficulty in handling heavy components.

Pre-delivery maintenance provides a good opportunity for the completion of supplementary tests before the crane is erected. It is also strongly recommended that the tower crane's drive and control systems are powered up and checked for correct functioning during pre-delivery maintenance.

The direct transfer of cranes between sites should be approached with extreme caution, as it often leads to both delays in erection and time lost through the correction of faults. Direct transfers should not to be undertaken for cranes which are to be erected alongside the railway.

Records of the pre-delivery inspection must be retained in a file for the crane held on site.

Further details are given in CPA TCIG 0801: *Maintenance, Inspection and Thorough Examination of Tower Cranes (www.cpa.uk.net)*

5.4 Tower crane climbing

Climbing is the process by which the height of a tower crane may be increased or reduced without the aid of another crane and requires a significant degree of forethought and skill if it is to be accomplished successfully.

It is essential that all climbing operations are carried out by competent and authorised personnel who are familiar with the make and model of tower crane to be climbed and have adequate information to undertake their tasks effectively.

The limiting windspeed for climbing operations must be set at 75% of the manufacturer's maximum for climbing, to allow time for the crane to be safely secured in a rising wind.

It is essential that Network Rail are notified in advance of any climbing operations.

Detailed guidance on the climbing of tower cranes is given in:

- CPA TCIG 1101 - *Climbing of Tower Cranes; . (www.cpa.uk.net)*
- BS 7121-5:2019, *Code of practice for safe use of cranes – Part 5: Tower cranes.*

6.0 Lift Plans

6.1 General

The use of cranes alongside railways requires particular care to ensure that neither the crane, nor the load it is lifting or moving, will overturn, fall or collapse. This is best accomplished by strict adherence to the planning, supervision and use requirements of the BS7121 series of standards. In particular, the assessment needs to encompass the complexity of the load, lifting operation and the environment in which it is being carried out.

The lift plan for Level 3b and Level 4 should include the following items:

NOTE: *Lines are blocked in Level 2 and Level 3a and so the following requirements do not apply from a Network Rail perspective, although some elements may still be considered good practice.*

- All lifts should be supervised by a dedicated Crane Supervisor and measures put in place for adequate briefing of that person;

NOTE: *BS 7121-1:2016 requires a crane supervisor for all lifts. It is, however, possible to combine roles with the appointed person where they are present.*

- Training and competence level required for the lifting team, including the crane operator, crane supervisor, slinger-signallers and crane coordinator (where specifically required);
- Necessity to verify that the lifting equipment and any lifting accessories have an in-date report of thorough examination:
  - *6-months for lifting equipment / appliance*
  - *3-months for below-the-hook lifting accessories*
- In accordance with the LOLER Approved Code of Practice (L113), a Declaration or Certificate of Conformity (DoC / CoC) may be accepted in lieu of a report of thorough examination after lifting equipment (including accessories) is first put into service and during the initial examination period as defined by LOLER.
- Equipment or accessories that are assembled before use from parts, require a thorough examination before use, where thorough examination is required by LOLER. However, as a DoC or CoC records the date of conformity assessment and not the date of first service, the following questions should be addressed before putting the accessory into service:
  - *Has the lifting equipment /accessory been used before?*
  - *If yes, is the lifting equipment /accessory still within its first examination period (as defined by the Level of working)?*
  - *If no, record the date when the lifting equipment /accessory is first put in service and the date when the thorough examination will be required (e.g. use a lifting equipment /accessory register or record the date on the relevant DoC / CoC);*
  - *Some companies require lifting equipment /accessory to be thoroughly examined before first use if the date of manufacture is more than 1yr before the first use date. This is due to concerns regarding potential deterioration during storage / internal company procedures. Refer to Reg 9 (1)(b) of LOLER;*
  - *If the DoC or CoC are outside of these or other agreed date criteria, then undertake a thorough examination before use, noting that the CoC or DoC is still a valid record of conformity to the Machinery Directive and should be retained as evidence of authenticity for the equipment / accessory.*
- Where the lift plan requires the use of working range limitation, working zone limitation or anti-collision systems, then the lift plan should include when and how this should be tested and recorded, along with what to do if the system is not operational;

- The need for hold points in the lift plan to ensure that certain actions are confirmed before the lift proceeds e.g. confirmation that a line block and/or isolation is in place. This should also include a relevant check list for ready-for-work checks;
- Location, date, starting time and expected duration of rigging, lifting and de-rigging operations;
- Any nighttime working should consider lighting and the effects of shadows, cut-off, dazzle and duration of the lifting operations to ensure they can be terminated when loads are no longer supported by the crane when either light, wind or end-of-possession times are being approached;
- Communications during nighttime working should always be using radios;
- Assessment of the loads to be lifted, including weight, dimensions, position of centre-of-gravity, lifting accessory attachment points, lifting accessories (type and configuration);
- A dimensioned drawing showing the crane load pick up and set down points, the direction of slew and any operating area restriction;
- Crane foundation arrangements, including any spreader pads or crane mats (size and type), demonstrating that the minimum edge distance for the working platform is not breached;
- The requirement to obtain site-specific weather forecasts and monitoring of wind speeds;
- Specification of the limiting wind speeds for rigging and operation of the crane;
- Ensuring that the forecast wind speed for long duration lifting operations is taken into account before starting the lift;
- Taking account of additional wind loads on loads with a large wind area;

NOTE: Additional information is given in Technical Information Note TIN 101 *The Effect of Wind on Mobile Cranes In-service,* Construction Plant Hire Association (CPA) and *Influence of wind on crane operation*, Liebherr-Werk Ehingen GmbH (free download from http://www.liebherr.com/AT/en-GB/default_at.wfw/measure-metric/tab-94354).

- Consideration of the possibility of lightning strikes.

NOTE: *Guidance on protection against lightning is given in BS EN 62305-1:2011, Protection against lightning, General principles.*

- Any crane or load that is at risk of touching or coming within 2.75m of live o/h power equipment should be bonded to a ‘suitable earth’ (earth requirement not to be unnecessarily restricted to railway network earth). Earthing and bonding arrangements should be agreed by the Network Rail ASPRO E&P Engineer.

NOTE: *This earthing point may, with the agreement of Network Rail, be used to provide lightening protection.*

- Any requirement for the lifting of persons by the crane in exceptional circumstances;
- Ensuring the crane is fitted with a sufficient length of hoist rope where lifting below ground level e.g. shaft work;
- A schedule of lifts showing the percentage utilisation of manufacturer’s original rated capacity required for each lift;
- A requirement that no loads or lifting accessories are left suspended on the hook block when the crane is out-of-service;

- Requirements for leaving the crane out-of-service, including the limiting wind speed before which the crane superstructure should be lowered, along with ensuring there is sufficient room to lay any boom / fly jib down;
- The route for the crane to and from the set-up position on site;
- Arrangements for establishing and maintaining any restricted access and/or exclusion zone around the crane;
- The need for aircraft warning lights (if required);
- Additional restriction in available capacity for tandem or multiple lifts in accordance with BS 7121-1 and BS 7121-3;
- Where there is a risk of overrun of the work, Network Rail may require a line block overrun contingency plan showing break points in the work to be submitted in advance for Network Rail agreement;
- Rescue / recovery plan should the crane breakdown, especially where a working zone limitation or anti-collision system has been installed. This should include contact numbers for the Principal Contractor and relevant Network Rail staff;
- Rigging and de-rigging method statement and risk assessment is to be supplied;
- Any requirement by Network Rail for their personnel to be in attendance during the lift.

6.2 Lift plan retention on site

A copy of the lift plan prepared by the appointed person should be retained on site. Detailed guidance is given in:

- BS 7121-1:2016, *Code of practice for safe use of cranes – Part 1: General.*
- BS 7121-3:2017+A1:2019 *Code of practice for safe use of cranes – Part 3: Mobile Cranes.*
- *BS7121-4:2010, Code of practice for safe use of cranes – Part 4: Lorry Loaders.*

7.0 Maintenance, Inspection and Thorough Examination

7.1 General

The effective maintenance of cranes is vital in ensuring that cranes remain safe and free from defects whilst on site. Maintenance activities include inspection, preventive maintenance, and repair of breakdowns. Cranes should be maintained, inspected, and thoroughly examined in accordance with manufacturer's instructions and BS7121-2 series of standards.

***NOTE**: Guidance on inspection, maintenance and thorough examination of mobile cranes is provided in CPA CIG 1001 - Maintenance, Inspection and Thorough Examination of Mobile Cranes.*

For cranes scheduled to be on site for extended periods, adequate time should be allowed in the construction programme to ensure that these activities can be carried out as and when required.

Thorough examination is a separate activity from maintenance, but again sufficient time should be allowed for thorough examination to be carried out.

It is essential that both maintenance and thorough examination are carried out by competent and authorised personnel who are familiar with the make and model of crane and have adequate information to undertake their tasks effectively. It is essential that thorough examination is undertaken by a competent person who is sufficiently independent from the rigging and maintenance activities.

Arrangements should be in place for pre-use inspection and periodic thorough examination of lifting accessories.

7.2 Thorough examination of tower cranes

It is essential that thorough examination is undertaken by a competent person who is sufficiently independent from the erection and maintenance activities. Some cranes require the lifting of a load in excess of the crane's rated capacity to set their hoisting capacity limits.

The competent person may require overload testing to be carried out to supplement thorough examination after each erection and after every reconfiguration (alteration of jib length, alteration of tower height, addition or removal of ties etc. The magnitude of the test load should be as specified by the tower crane manufacturer based on the full rated capacity [1].

The following supplementary tests are compulsory:

- Independent verification of zoning and anti-collision systems by the competent person;
- Independent witnessing of hoist brake tests by the competent person (See **Table 2**);
- Independent witnessing of luffing brakes tests on a luffing jib tower crane by the competent person (See **Table 2**);
- Independent witnessing of trolley brakes tests on a saddle jib tower crane by the competent person (See **Table 2**);
- Earth continuity test for lightning protection.

***NOTE 1:** Test loads should be kept as near to the ground as possible to minimise the effect of failure.*

***NOTE 2:** Tests should be carried out with the jib parallel to or away from the railway.*

***NOTE 3:** Details on Minimising the Effects of Winch Failure During Load Testing can be found in CPA TCIG TIN 037.*

[1] Some lifting equipment, such as tower cranes, require loads more than the rated capacity of the machine to set their limits. This is often up to 110%. In some cases, this is 125% of the rated capacity if this is a brand-new crane. This is a requirement of EN14439. The foundation loads supplied by the manufacturer consider this when they are provided to the user for use in the temporary works design.

Table 4 – Requirements for Dynamic Supplementary Brake Testing

Brake	Test Load	Procedure	Performance Requirement
Hoist Brake	100% of rated SWL	Lower test load and actuate emergency stop	Brake should arrest load
Luffing Brake	75% of derated SWL at 50% of max radius	Lower jib and actuate emergency stop	Brake should arrest load
Trolley Brake	100% of derated SWL at 75% of max radius	Trolley out and actuate emergency stop	Brake should arrest load

7.3 Records

Records of thorough examination, supplementary testing and maintenance should be held on site.

Detailed guidance on both maintenance and through examination is given in:

- CPA CIG 1001 - *Maintenance, Inspection and Thorough Examination of Mobile Cranes*;
- BS 7121-2-1:2012, *Code of practice for the safe use of cranes, Part 2-1: Inspection, maintenance and thorough examination – General;*
- BS 7121-2-3:2012, *Code of practice for the safe use of cranes, Part 2-3: Inspection, maintenance and thorough examination – Mobile cranes;*
- *BS 7121-2-4:2025, Code of practice for the safe use of cranes, Part 2-4: Inspection, maintenance, and thorough examination – Loader cranes;*
- BS 7121-2-5:2012, Code of practice for the safe use of cranes, Part 2-5: Inspection, maintenance and thorough examination – Tower cranes.

8.0 Records

It is essential that the records listed in **Annex B** & **C** are available on site for inspection by Network Rail.

The site must also complete and retain on site a *Management of Tower Cranes Leading Indicator Audit* (See **Annex D**) at intervals not exceeding 3 months during the period that the tower crane is erected on site.

Refer also to Section 20 - ‘Records’ within NR/L2/CIV/003.

9.0 Figures

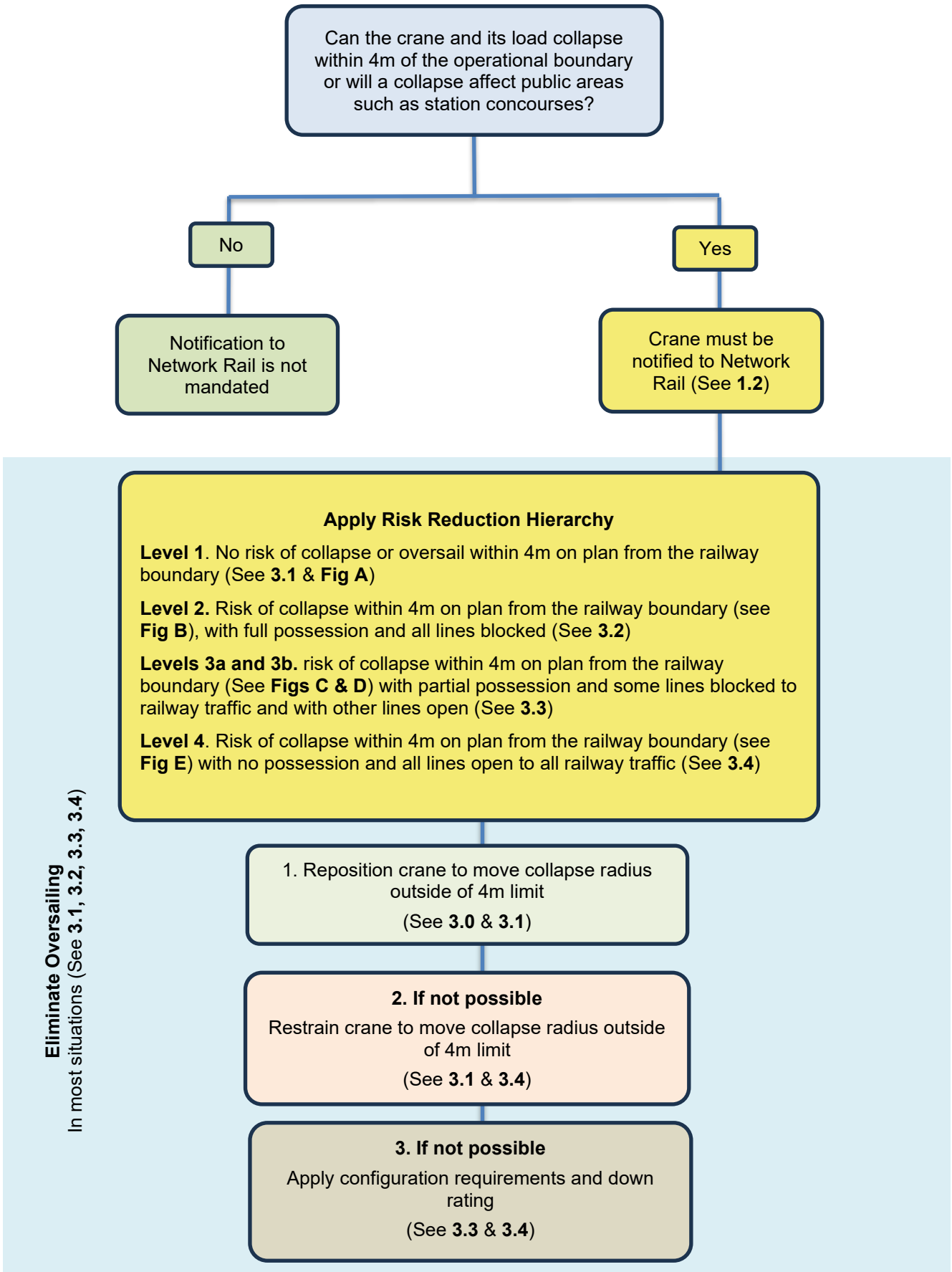


Figure 1 - Initial Hierarchy of Risk Elimination and Reduction

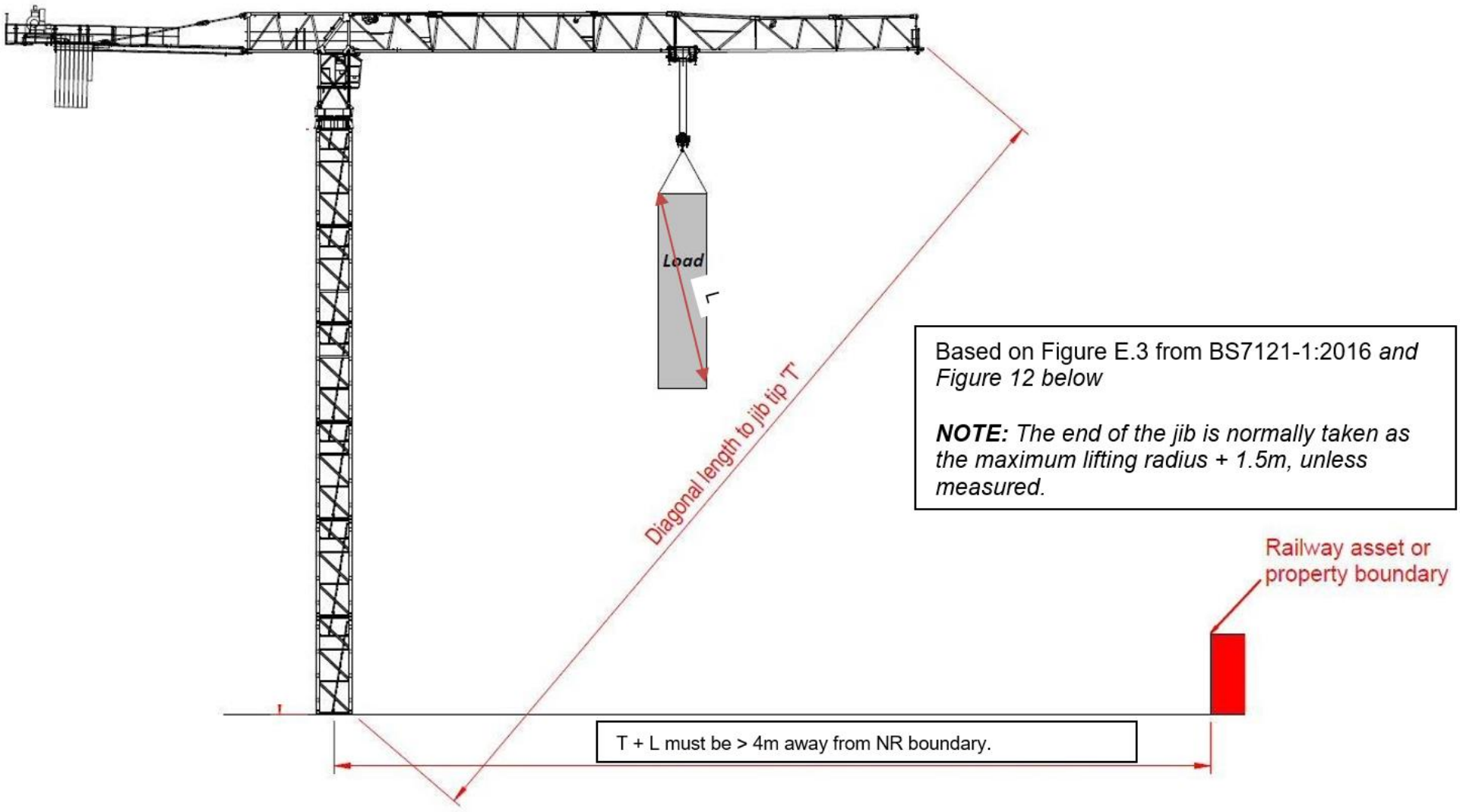
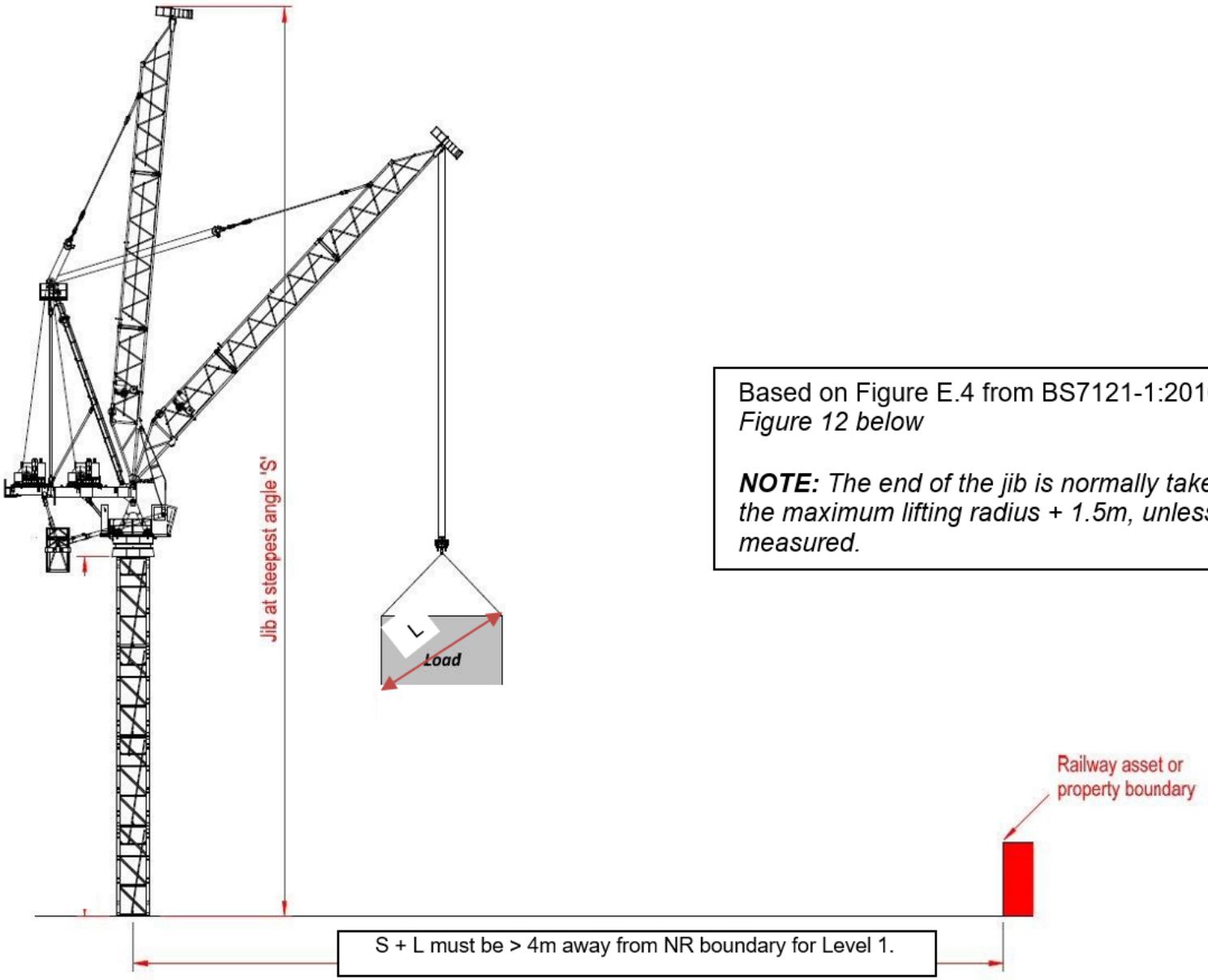


Figure 2 – Collapse Distance - Saddle Jib (vertically slung load)



Based on Figure E.4 from BS7121-1:2016 *and Figure 12 below*

NOTE: *The end of the jib is normally taken as the maximum lifting radius + 1.5m, unless measured.*

Figure 3 Minimum Collapse Distance – Luffing Jib (horizontal slung load)

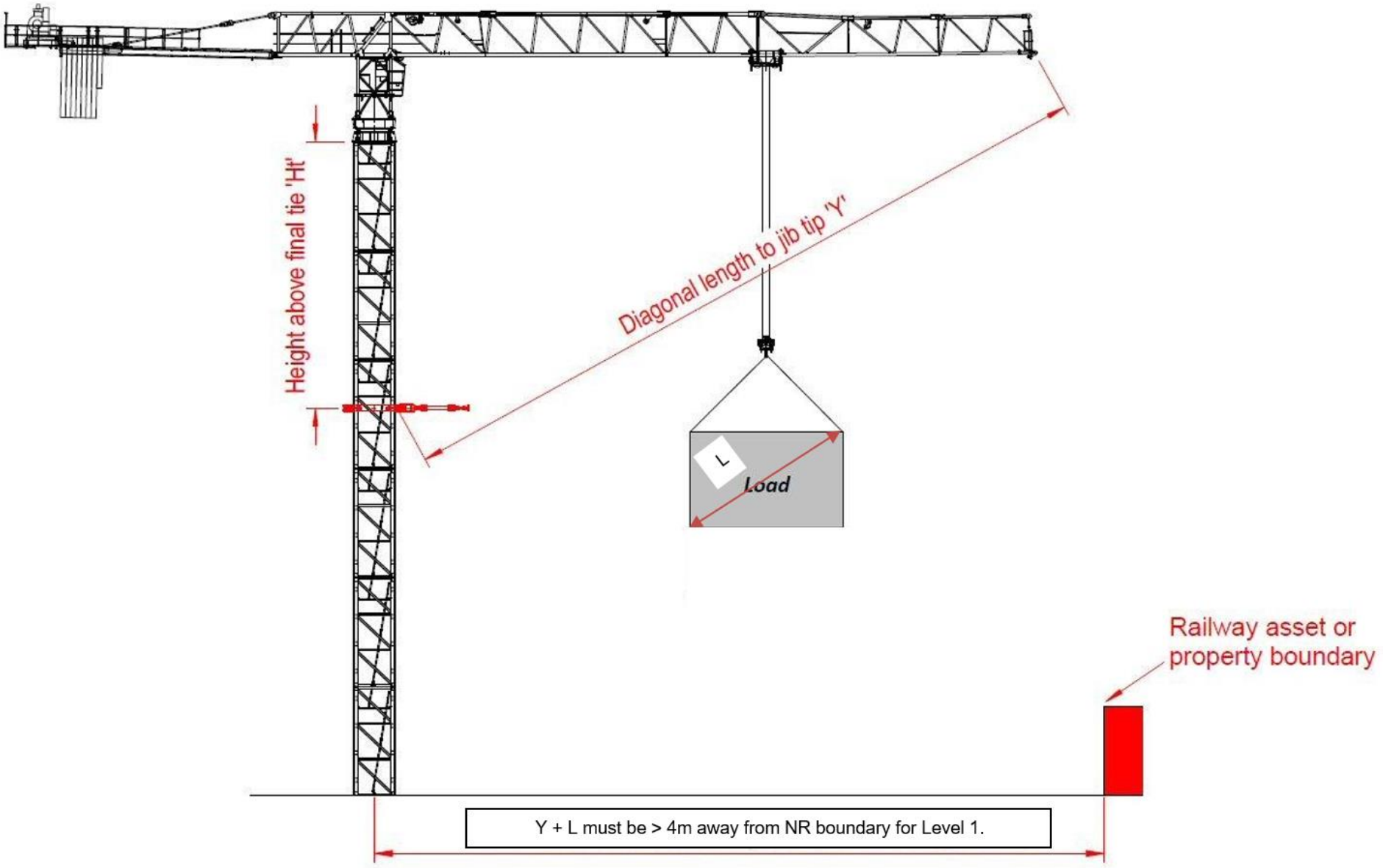


Figure 4 – Collapse Distance When Tied to an Adjacent Structure

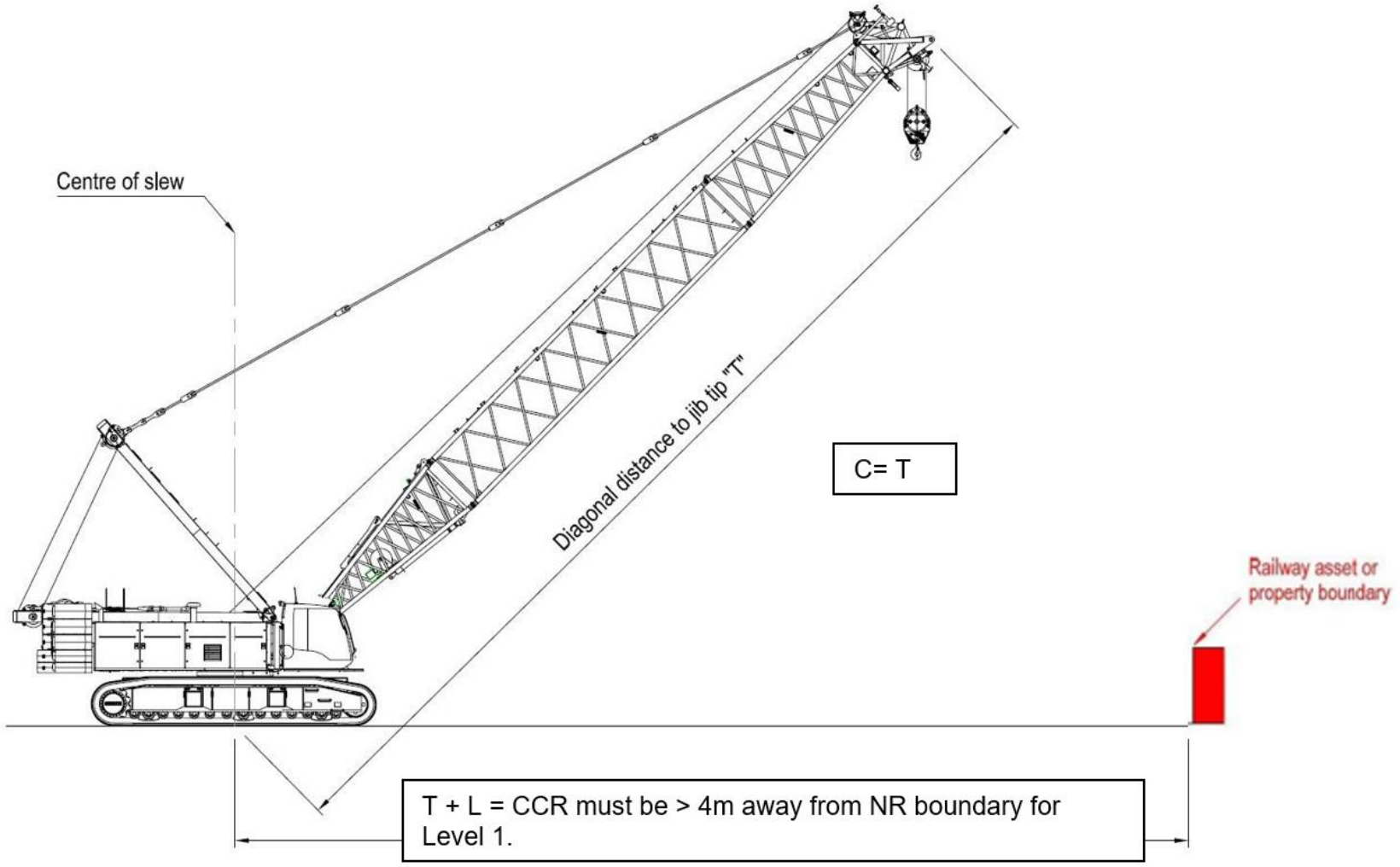
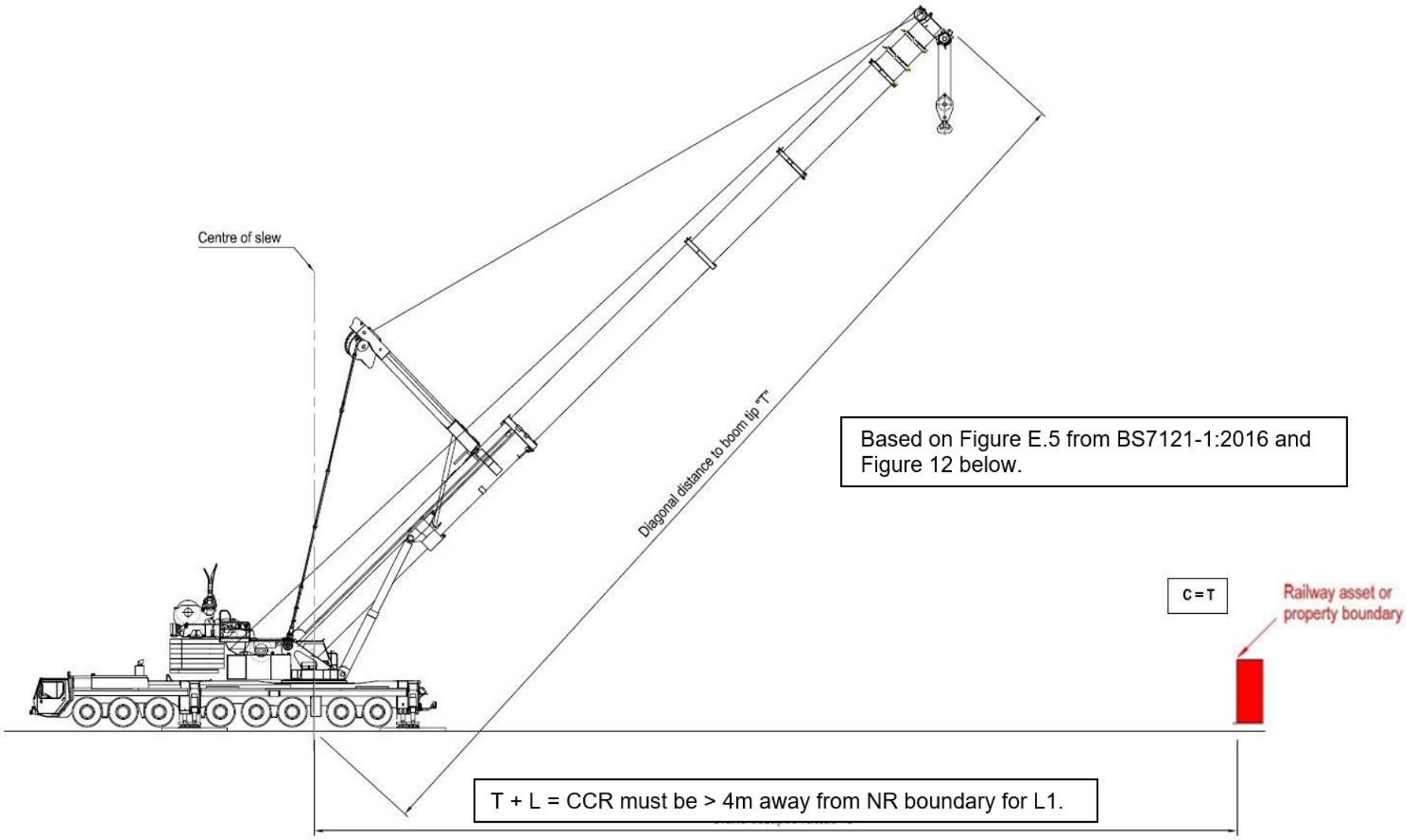


Figure 5 – Crawler Crane Collapse Radius 'C'



The boom length “T” shall be the planned length rather than the maximum possible extended boom length.

Figure 6 – Wheeled Mobile Crane Collapse Radius ‘C’

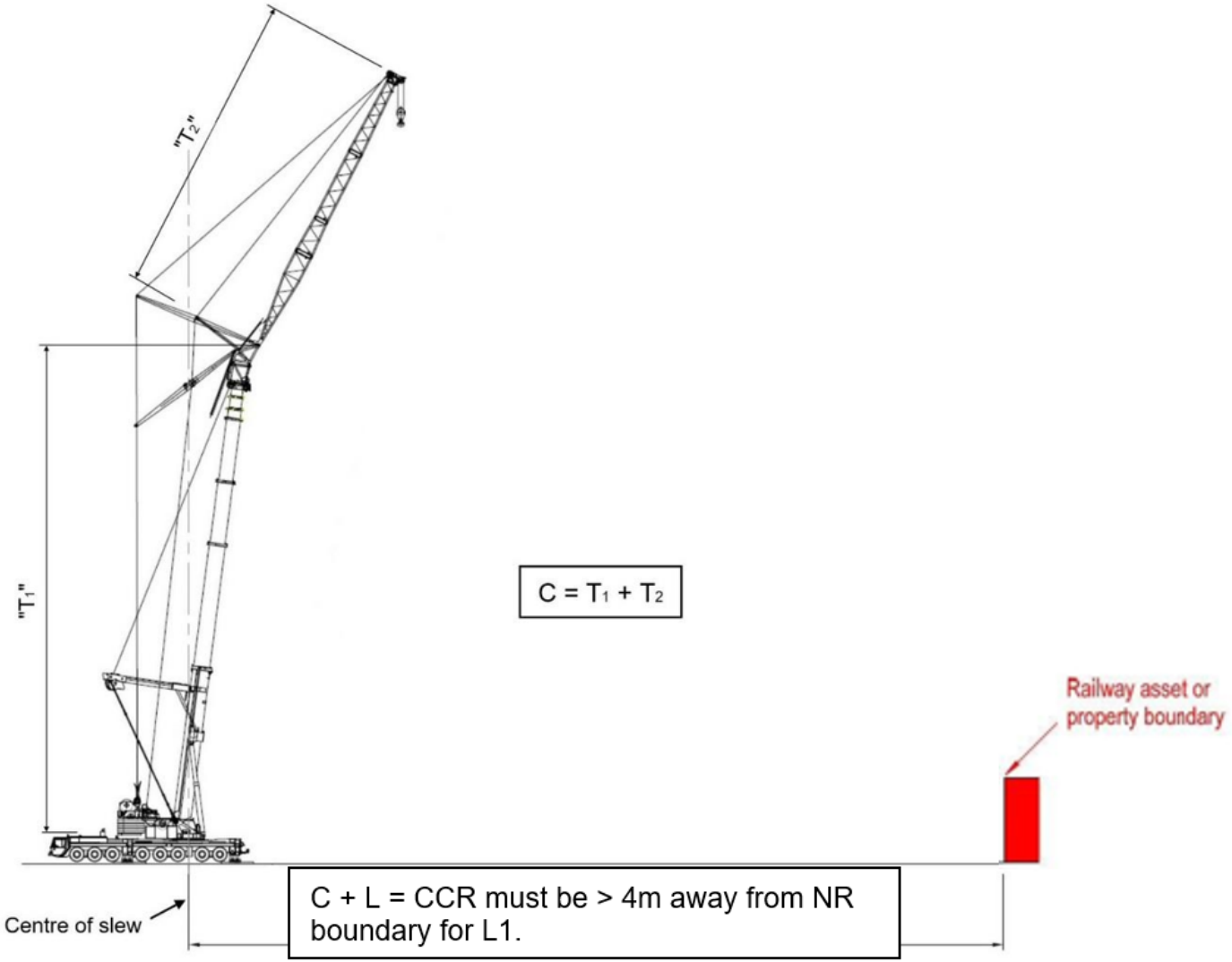
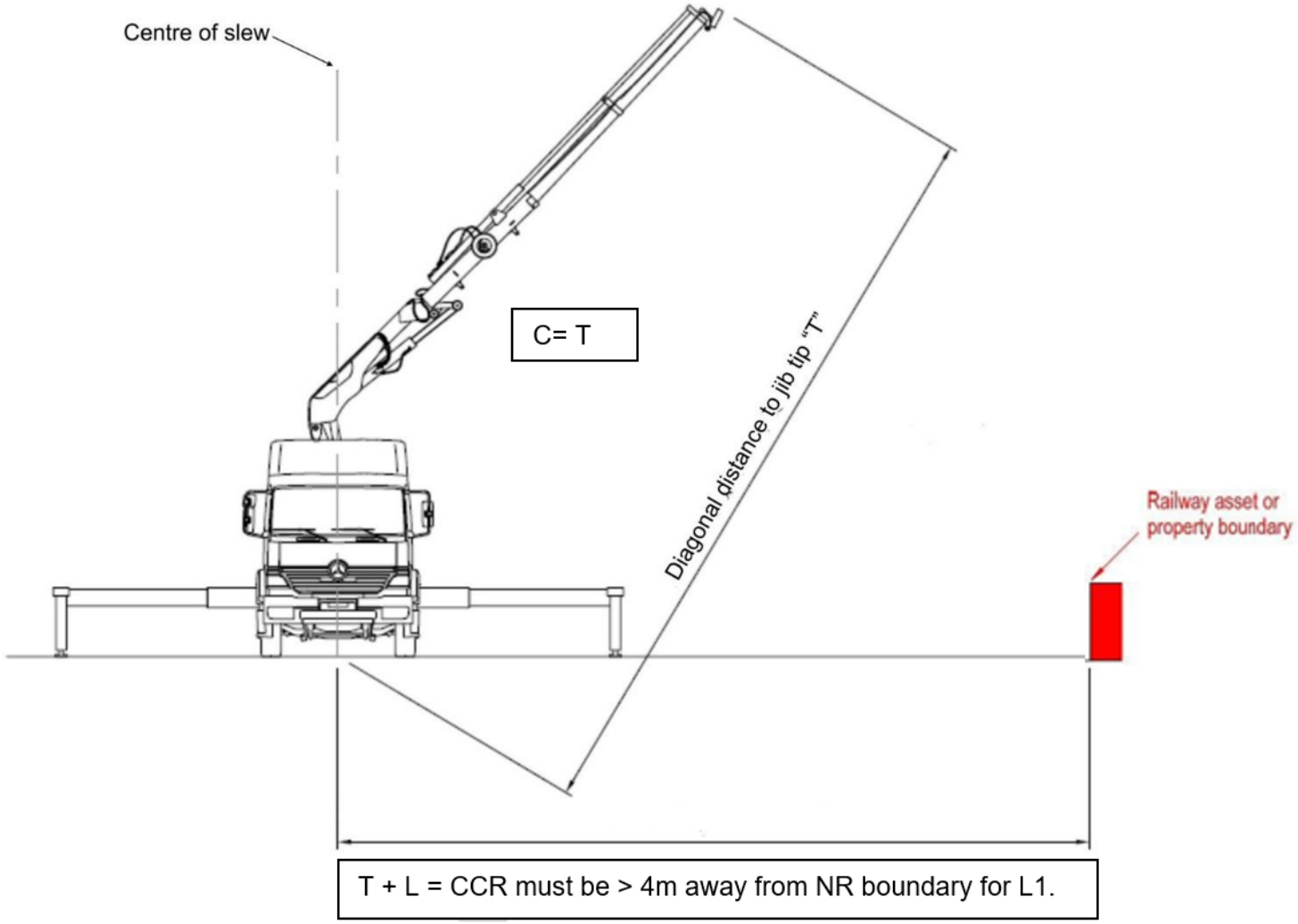


Figure 7 - Wheeled Mobile Crane (luffing rig) Collapse Radius 'C'



The boom length "T" shall be the planned jib length rather than the maximum possible extended boom length.

Figure 8 – Lorry Loader Collapse Radius 'C'

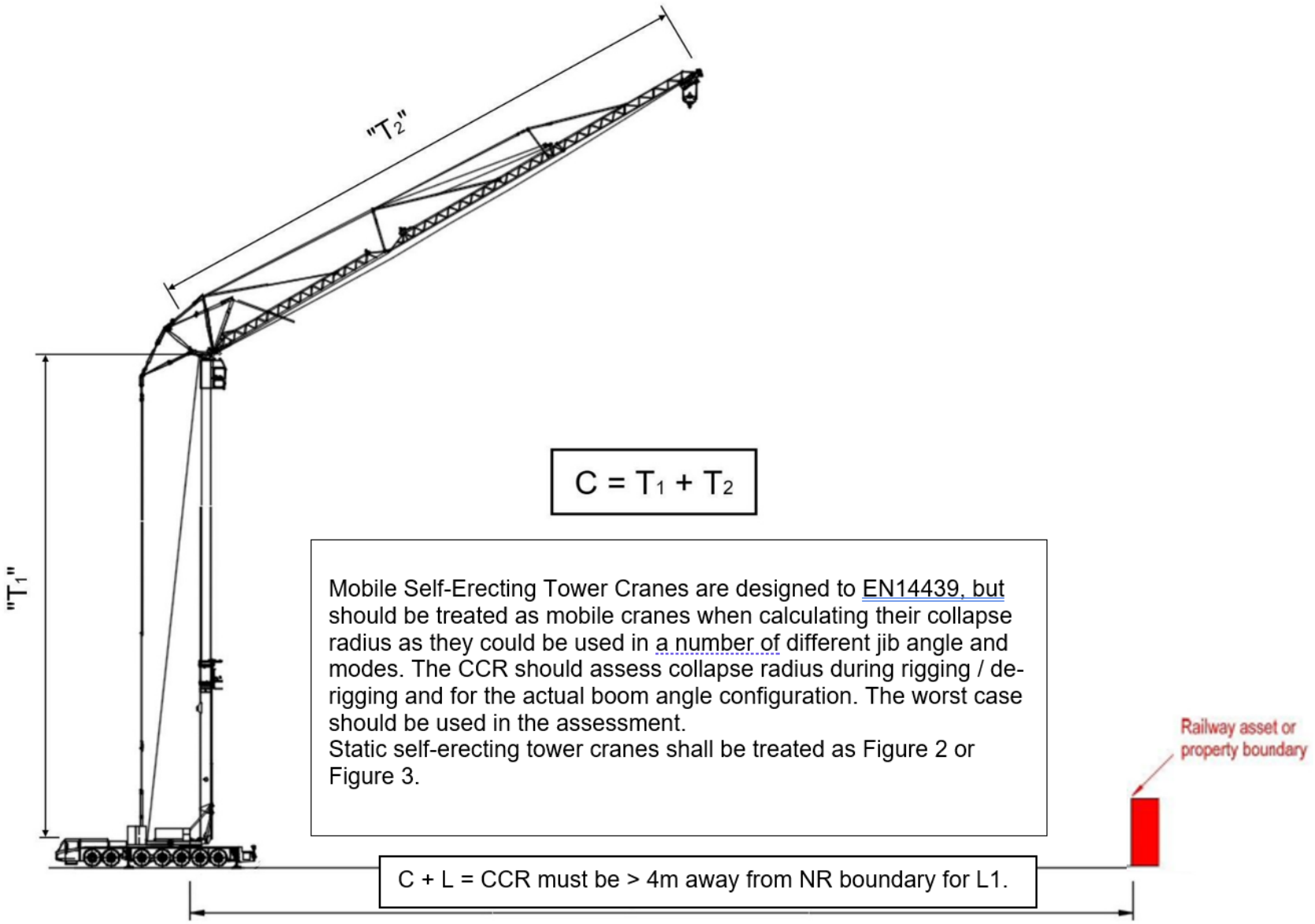
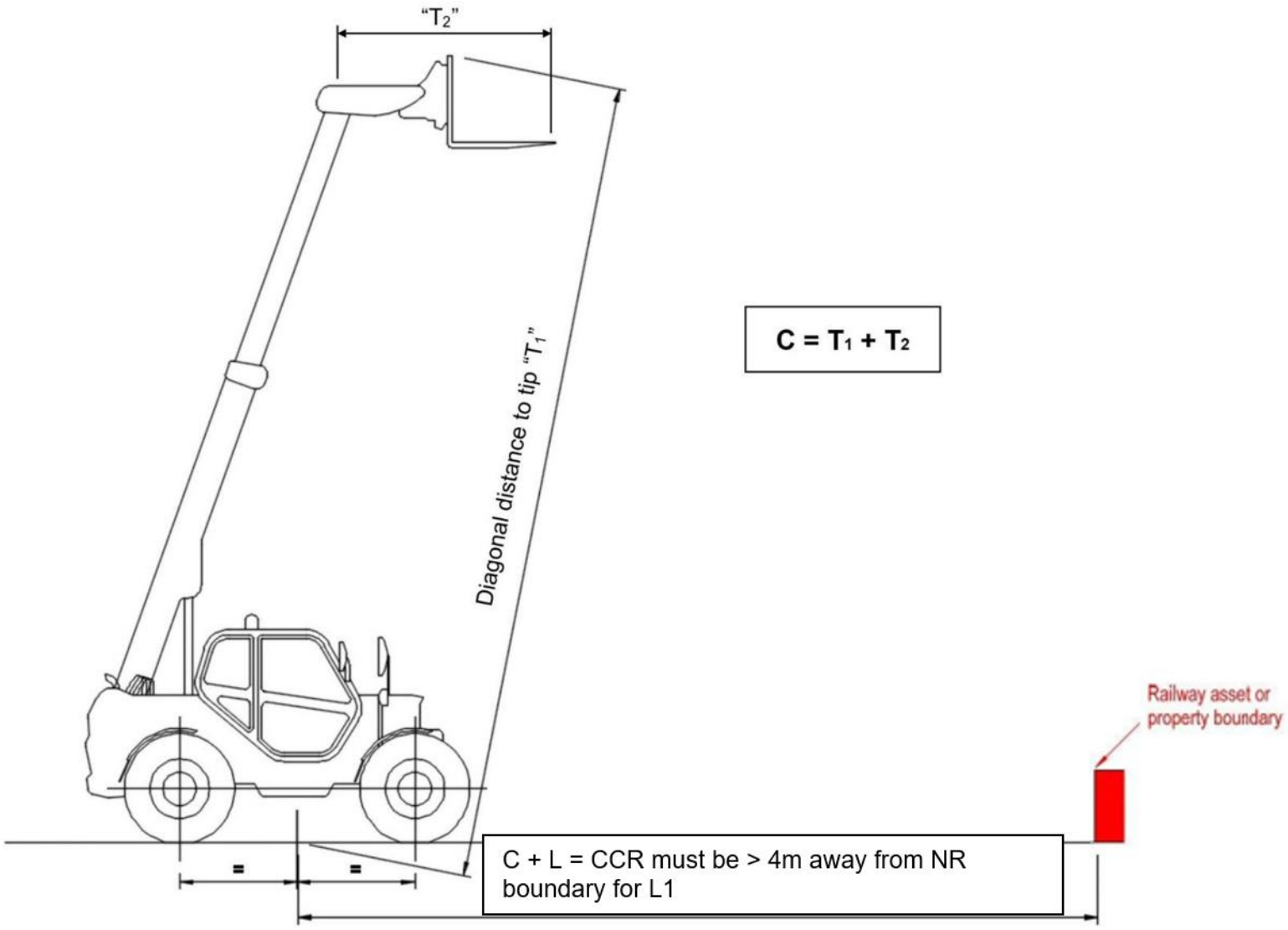
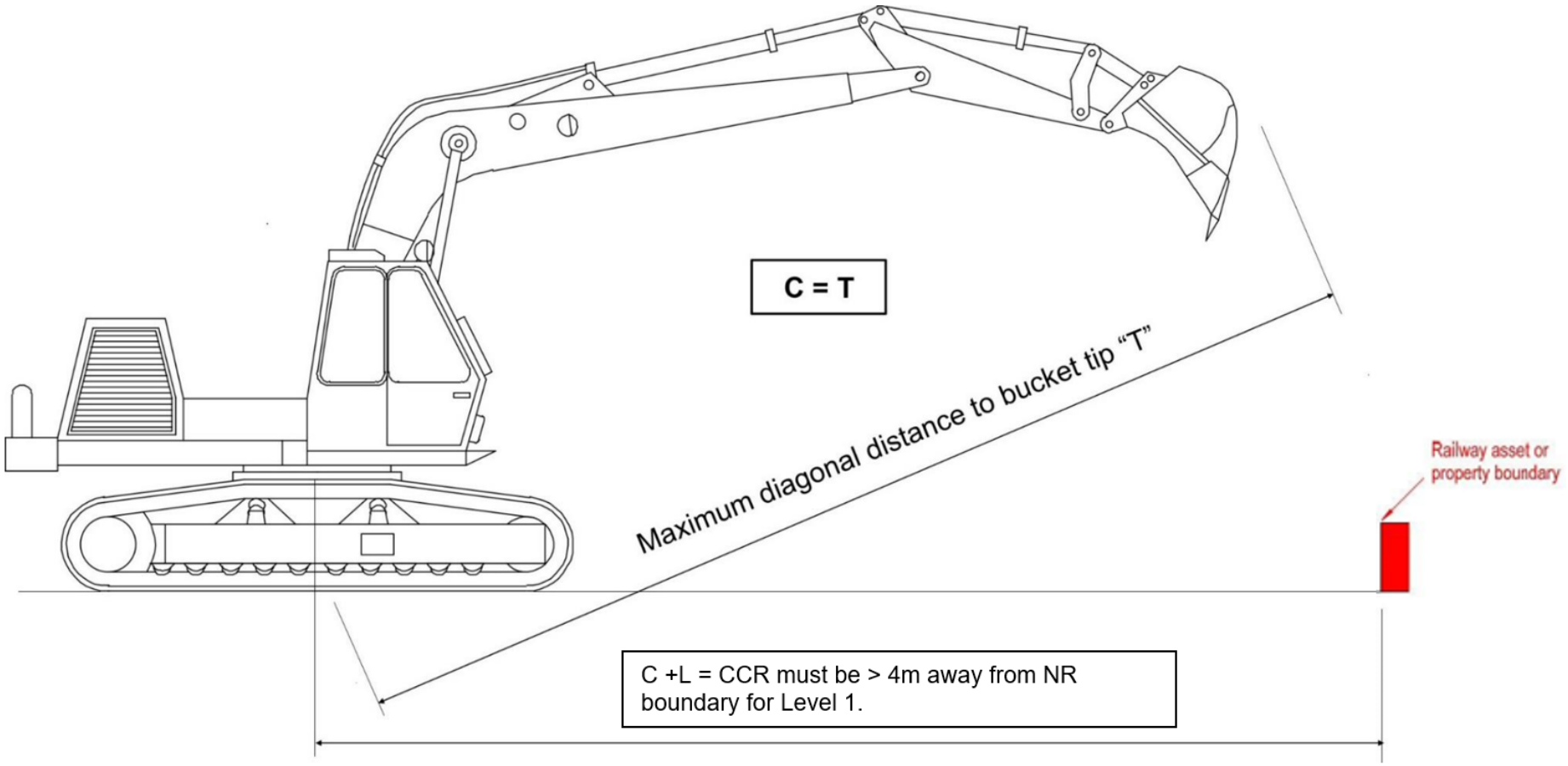


Figure 9 – Mobile Tower Crane Collapse Radius 'C'



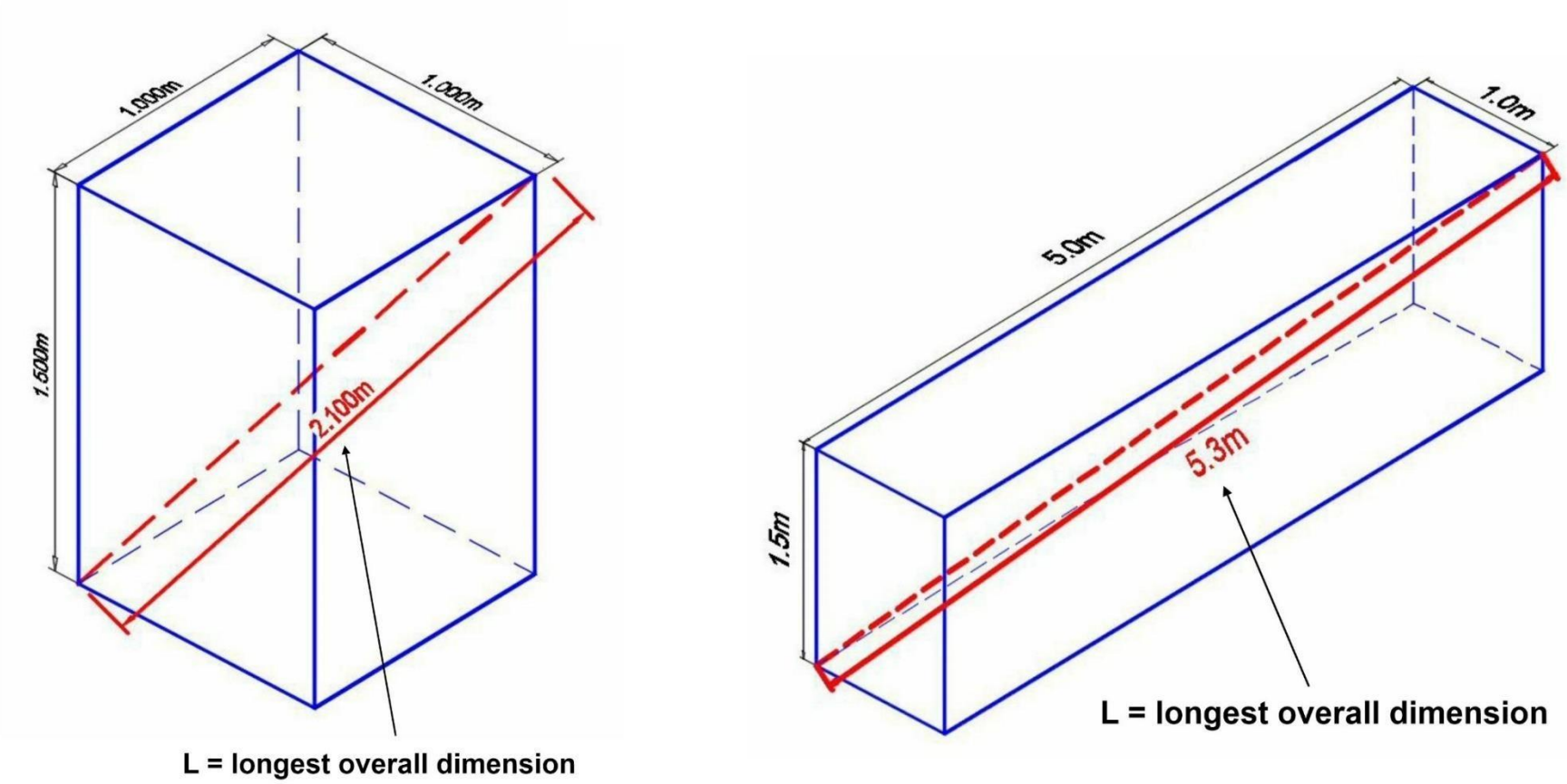
A telehandler with a suspended load, such as a rotating telehandler, should consider the length of the suspended loads as per Figure 12, to give them the 'L' component in the 'CR' calculation.

Figure 10 – Telehandler Collapse Radius 'C'



An excavator with a suspended load should consider the length of the suspended load as per figure 12, to give the 'L' component in the 'CR' calculation.

Figure 11 – Excavator with Collapse Radius 'C'



Note: *If the load is sling horizontally about the mid-point, 'L' may be halved.*

Figure 12 – Examples of Load Collapse Radius 'L' (longest overall dimension)

Requirements for Tower Cranes, Mobile Cranes & Other Mobile Lifting Equipment Adjacent to Railways Controlled by Network Rail

Annexes

Annex A – Documents to be held on site for Network Rail inspection

- Inspection and test plans for the works should be provided in accordance with NR/L3/CIV/0063;
- Approved Network Rail FormC / FormE for temporary works covering mobile crane base/foundation(s) to be provided to NR/L2/CIV/003;
- Rigging method statement;
- Outline de-rigging plan;
- In-service lift plan;
- Project specific risk assessment;
- Network Rail non-objections to rigging method statements and in-service lift plans;
- Complex foundation and pile drawings and construction photographs;
- Cube and pile test results (continuity) (if applicable);
- Complex foundation design and construction records (inc check certificates);
- Notification to airfields (if required);
- Notification to CAA (if required);
- Build configuration of crane and load charts;
- Drawings for zoning, radius and slew limiting systems;
- Certificate of setting of zoning, radius and slew limiting systems;
- Records of checking of daily zoning, radius and slew limiting system settings;
- Records of periodic checks of crane base;
- Lifting team training and competence assessment;
- Records of near-miss investigations;
- Reports of thorough examinations (crane and lifting accessories);
- Maintenance schedule and records.

NOTE: *It should be noted that Annex B and C are not explicitly required by network rail in NR/L3/CIV/003, although the contents may be required as part of the inspection and test plan required for the works. Discuss exact requirements with network rail during the design and approval phase.*

Annex B - Mobile Crane Base Form

Mobile Crane Complex Foundation Pre-rigging Inspection Report									
Site:									
Mobile Crane No/Location:		***Make:***		***Model:***					
Fly jib angle:		***Jib Length:***							
Outrigger base dimensions:		***Counterweight:***							
Base Type:									
Items Checked		***Measurement Results***	***As Specified?***			***Inspected By***	***Date***		
			Yes	**No**	**n/a**				
All Foundations	Compliance with design drawings/specification		☐	☐	☐				
	Level check - Within tolerance		☐	☐	☐				
Concrete	Correct grade		☐	☐	☐				
	Sufficient maturity		☐	☐	☐				
	Rebar- grade, diameter, quantity and position prior to pour		☐	☐	☐				
Piles	Satisfactory pile tests		☐	☐	☐				
	Reinforcement bond length		☐	☐	☐				
Steelwork	Steel grade		☐	☐	☐				
	Weld quality		☐	☐	☐				
	Bolts – grade, torque, tightness, quantity		☐	☐	☐				
Spreader Pads/Mats	Specified size of pad/mat		☐	☐	☐				
	Specified thickness of pad/mat		☐	☐	☐				
	Ground preparation as specified		☐	☐	☐				
	Location as specified		☐	☐	☐				
			☐	☐	☐				
Documents against which foundation has been checked (drawing nos./document references):									
Notes and Observations:									
I confirm the crane foundation has been constructed to the specifications and that a satisfactory post construction inspection has been carried out.									
Name:		***Signed:***				***Date:***			
Position:		***Company:***							

Annex C - Tower Crane Base and Tie Forms

Additional information on arrangements for the design of tower crane bases and ties, checking of designs and conformation of correct installation and/or construction is given in CPA Technical Information Note TIN 031 - *Tower Crane Bases and Ties*.

Tower Crane Foundation Pre-erection Inspection Report							
Site Details:							
Tower Crane No/Location:		***Make:***		***Model:***			
Height under Hook:		***Jib Length:***					
Base Type:							
Items Checked *(delete where not applicable)*			***As Specified?***		***Inspected By***	***Date***	
			Yes	**No**			
All Foundations	Compliance with design drawings/specification		☐	☐			
Cast-in Items	Supplied by tower crane manufacture or approved source		☐	☐			
	Level check		☐	☐			
	Verticality check		☐	☐			
	Within tolerance		☐	☐			
Concrete	Correct grade		☐	☐			
	Sufficient maturity		☐	☐			
	Rebar- grade, diameter, quantity and position prior to pour		☐	☐			
Piles	Satisfactory pile tests		☐	☐			
	Reinforcement bond length		☐	☐			
Steelwork	Steel grade		☐	☐			
	Weld quality		☐	☐			
	Bolts – grade, torque, tightness, quantity		☐	☐			
Rail Tracks	Bedding properly compacted		☐	☐			
	Rail and sleeper quality		☐	☐			
	Levels and gauge to tolerance		☐	☐			
	Limit ramps and end stops correctly positioned and firmly fixed		☐	☐			
	Rails correctly fixed and earthed		☐	☐			
Documents against which foundation has been checked (drawing nos./document references):							
Notes and Observations:							
I confirm the tower crane foundation has been constructed to the specifications and that a satisfactory post construction inspection has been carried out.							
Name:		***Signed:***			***Date:***		
Position:		***Company:***					

Tower Crane Foundation Approval/Completion Certificate					
Site Details:					
Tower Crane No/Location:		***Make:***		***Model:***	
Height under Hook:		***Jib Length:***			
Base Type:					
Foundation/Grillage Design					
Design Criteria and References:					
Drawings and Documents Issued:					
Limitations or Restrictions: ***NOTE:*** *If the foundation design relies on the use of permanent works, the designer should state whether the permanent works have been analysed.*					
I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
Foundation/Grillage Design Check*					
I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
NOTE: *A separate approval/completion certificate is required for each tower crane * Category 3 check , Table 2 of BS 5975*					
Permit To Erect					
I confirm the tower crane foundation has been constructed to the specifications detailed above and a post construction inspection has been carried out (recorded on the attached report), and that the tower crane may be erected.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
NOTE: *The tower crane cannot be erected until the completed form is returned to the Operations Department*					

Tower Crane Tie Fabrication and Installation Inspection Report							
Site Details:							
Tower Crane No/Location:		***Make:***		***Model:***			
Height under Hook:		***Jib Length:***					
Tie Type:		***Tie Position (from base):***					
Items Checked *(delete where not applicable)*		***As Specified?***		***Inspected By***	***Date***		
		Yes	**No**				
All Ties	Compliance with design drawings/specification	☐	☐				
Steelwork	Steel grade	☐	☐				
	Dimensional check	☐	☐				
	Weld quality	☐	☐				
	Bolts – grade, torque, tightness, quantity	☐	☐				
Structure Attachment Points	Confirmation that the tie attachment points on the supporting structure will take the design tie loads	☐	☐				
Tower Crane Mast	Verticality within tolerance	☐	☐				
Documents against which tie has been checked (drawing nos./document references):							
Notes and Observations:							
I confirm the tower crane tie has been manufactured to the design specifications and that a satisfactory pre-installation construction inspection has been carried out.							
Name:		***Signed:***		***Date:***			
Position:		***Company:***					

Tower Crane Tie Approval/Completion Certificate					
Site Details:					
Tower Crane No/Location:		***Make:***		***Model:***	
Height under Hook:		***Jib Length:***			
Tie Type:		***Tie Position (from base):***			
Tie Design					
Design Criteria and References:					
Drawings and Documents Issued:					
Limitations or Restrictions: ***NOTE:*** *Where the tie design relies on the use of permanent works for support, the designer should state whether the permanent works have been analysed.*					
I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
Tie Design Check*					
I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
NOTE: *A separate approval/completion certificate is required for each tower crane * Category 3 check , Table 2 of BS 5975.*					
Permit To Erect					
I confirm the tower crane tie and tie attachment point to the supporting structure has been constructed to the specifications detailed above and a pre installation inspection has been carried out (recorded on the attached report), and that the tie may be installed.					
Name:		***Signed:***		***Date:***	
Position:		***Company:***			
NOTE: *The tower crane cannot be erected until the completed form is returned to the Operations Department*					

Annex D - Management of Tower Cranes Leading Indicator Audit Form

Management of Tower Cranes Leading Indicator Audit		
Nature of construction project:		
Date(s) of audit:	**Tower crane number:**	
Proforma completed by:		
1.0	**Selection**	
1.1	Is the tower crane selected the correct type for the application?	Y/N
1.2	Is the model and size of tower crane selected correct?	Y/N
2.0	**Erection**	
2.1	Does the location of the tower crane take account of location hazards?	Y/N
2.2	Has the competence of the Erection Team been demonstrated?	Y/N
2.3	Has a site and job specific risk assessment been carried out, a method statement been written and all personnel involved briefed?	Y/N
2.4	Have measures been put in place to avoid collisions with other tower cranes and high reach plant?	Y/N
2.5	Has the tower crane base been designed and installed correctly (see Temporary Works question set)?	Y/N
2.6	Have any ties been designed and installed correctly (see Temporary Works question set)?	Y/N
2.7	Has a post installation test and through examination been carried out before handover?	Y/N
2.8	Does method statement for climbing operation contain hold points and contingency plans for rising wind speed and equipment failure during climbing?	Y/N
3.0	**Maintenance**	
3.1	Is daily, weekly and periodic preventive maintenance being carried out and are records available?	Y/N
3.2	Are defects being reported, investigated and rectified in a timely manner?	Y/N
4.0	**Thorough Examination**	
4.1	Are statutory periodic thorough examinations being carried out?	Y/N
4.2	Does the competent person have adequate independence?	Y/N
4.3	Are defects being reported, investigated and rectified in a timely manner?	Y/N
5.0	**Operation**	
5.1	Has the competence and medical fitness of the operators been demonstrated?	Y/N
5.2	Are there sufficient operators to allow for regular breaks and shift patterns?	Y/N
5.3	Are wind speed restrictions followed?	Y/N
5.3	Are communications between operator and slinger/signallers adequate?	Y/N
5.4	Are all lifts adequately planned and supervised?	Y/N
5.5	Is the operation of multiple cranes co-ordinated effectively?	Y/N
5.6	Are all cranes left out of service in the correct condition?	Y/N

Annex E - Additional Information

E.1 Legislation and Approved Codes of Practice

Health and Safety at Work etc. Act 1974. London: The Stationery Office.

The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).

The Provision and Use of Work Equipment Regulations 1998 (PUWER).

Management of Health & safety at Work Regulations 1999.

The Construction (Design and Management) Regulations 2015.

The Work at Height Regulations 2005.

L113 *Safe use of lifting equipment,* HSE Books (free download from www.hse.gov.uk).

L22 *Safe use of work equipment,* HSE Books (free download from www.hse.gov.uk).

E.2 Network Rail Publications

Revision numbers of Network Rail standards are not shown. Reference should be made to the most up to date versions of all standards.

NR/GN/CIV/208	*Ground Investigation*
NR/L3/CIV/0063	*Piling, Drilling, Crane, MEWP and SPMT operations adjacent to the railway (Jun 2024)*
NR/L3/RMVP/0200	*Infrastructure Plant Manual - https://standards.globalspec.com/std/13096427/nr-l2-rmvp-0200 (Dec 2018)*
NR/L2/OHS/0047	*Managing Health and Safety in Construction (Application of the Construction (design and Management) Regulations to Network Rail)*
NR/L2/RSE/100/02	*Network Rail Assurance Panel Processes: Application of the Common Safety Method for Risk Evaluation and Assessment*
NR/L2/RSE/02009 Module 1	*Assessment of Project Engineering Roles (issue 3, March 2023)*
NR/L2/CIV/003	*Engineering and Architectural Assurance of Building and Civil Engineering Works Issue 8 (Dec 23)*
NR/L1/CIV/094	*National Asset Protection and Optimisation Delivery Framework Issue 2; Mar 22*
NR/L2/CIV/095	*Asset Protection and Optimisation Management of Third Party Works on Network Rail Infrastructure Issue 2; Dec 22*
NR/L2/CIV/096	*Asset Protection and Optimisation Management of Outside Party Works Issue 2; Mar 22*

E.3 Rail Safety and Standards Board

COP0032 - Code of Practice for Plant Any Line Open (ALO) Working - https://www.rssb.co.uk/standards-catalogue/CatalogueItem/cop0032-iss-5

E.4 British Standards

BS 5975-1:2024, *Temporary Works Part 1: Management procedures for the control of temporary works – Code of practice.*

Multi-part Document
BS 7121 - Code of practice for the safe use of cranes:

Part 1:2016 Code of practice for safe use of cranes. General

Part 2-1:2012 Code of practice for the safe use of cranes. Inspection, maintenance, and thorough examination. General

Part 2-3:2012 Code of practice for the safe use of cranes. Inspection, maintenance, and thorough examination. Mobile cranes

Part 2-4:2025 Code of practice for the safe use of cranes. Inspection, maintenance, and thorough examination. Loader cranes

Part 2-5:2012 Code of practice for the safe use of cranes. Inspection, maintenance, and thorough examination. Tower cranes

Part 3:2017+A1:2019 Code of practice for safe use of cranes. Mobile cranes

Part 4:2010 Code of practice for safe use of cranes. Lorry loaders

Part 5: 2019 Code of practice for safe use of cranes. Tower cranes

BS EN 1997-2:2007 Geotechnical design. Ground investigation and

testing.

BS EN 62305-1:2011, *Protection against lightning, General principles*.

E.5 Other Publications

Construction Plant-hire Association (CPA) Publications

Best Practice Guide on the Maintenance, Inspection and Thorough Examination of Mobile Cranes.

Best Practice Guide on The Management of Lifting Operations with Lorry Loaders, CPA- ALLMI.

Mobile Crane Technical Information Note (TIN) series.

Best Practice Guide on the Climbing of Tower Cranes.

Best Practice Guide on the Maintenance, Inspection and Thorough Examination of Tower Cranes.

Tower Crane Operator's Handbook.

Best Practice Guide on the Safe Use of Top Slew Tower Cranes.

Best Practice Guide on the Safe Use of Self Erecting Tower Cranes.

Tower Crane Technical Information Note series inc.

- TIN 010 – *Tower Crane Anti-Collision Systems*
- TIN 031 - *Tower Crane Bases and Ties*
- TIN 036 - *Tower Crane Power Supplies, Earthing Arrangements and Lightning Protection*,

Construction Industry Plant Safety Group.(formerly the SFfc Plant Safety Group) Publications

Good Practice Guide on Ground Conditions for Construction Plant.

Good Practice Guide on Medical Fitness to Operate Construction Plant.

Good Practice Guide on Safe Use of Telehandlers, Construction Industry Plant Safety Group.

Good Practice Guide on Lifting Operations with 180° and 360° Excavators, Construction Industry Plant Safety Group.

Non-CPA Publications

Crane Stability on Site, 2003. CIRIA C703. Construction Industry Research and Information Association.

CIRIA RP999 (C761) *Tower Crane Foundation and Tie Design*.

RIS-1700-PLT, Rail Industry Standard for Safe Use of Plant for Infrastructure Work, Rail Safety and Standards Board (free download from http://www.rssb.co.uk/railway-group-standards).

RIS-1539-PLT Rail Industry Standard for Technical Requirements for On-Track Plant and their Associated Equipment and Trolleys. (free download from http://www.rssb.co.uk/railway- group-standards).

Influence of wind on crane operation, Liebherr-Werk Ehingen GmbH (free download from http://www.liebherr.com/AT/en-GB/default_at.wfw/measure-metric/tab-94354).

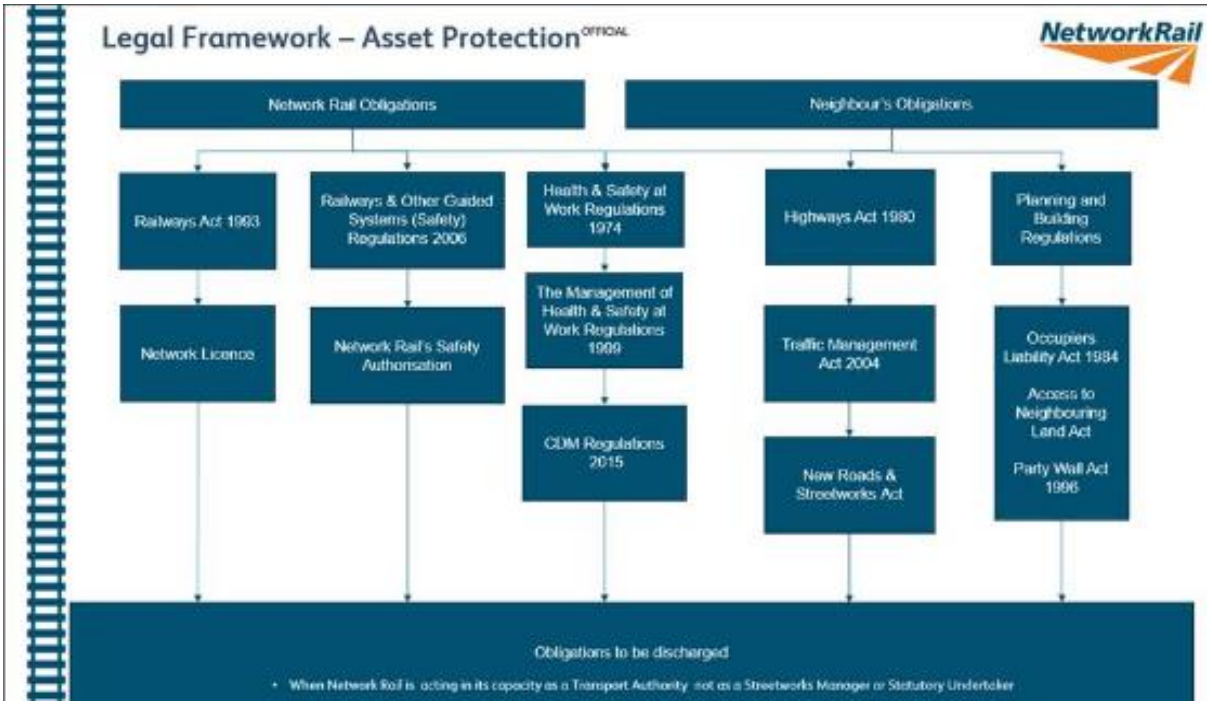
Temporary Works Forum Guidance - Working Platforms - Design of granular working platforms for construction plant: A guide to good practice (TWf2019:02, April 2019).

BR470 (Building Research Establishment) –Working platforms for racked plant: good practice guide to the design, installation, maintenance and repair of ground-supported working platforms.

NOTE: *all CPA and Construction Industry Plant Safety Group publications can be downloaded free of charge from www.cpa.uk.net*

Annex F – Legal basis for the protection of Network Rail Infrastructure

The powers to provide protection to the rail infrastructure were passed to Network Rail by the Railways Act, 1993. This is the main reason that Asset Protection services exist. Additionally, there are requirements placed on a developer and contractor by the HASW Act, the Construction (Design and Management) Regulations, amongst other legal obligations such as the Management of Health and Safety at Work Regulations. Risks introduced by projects adjacent to the railway can only be understood following engagement with NR.



The image above outlines the legislation relevant to ASPRO. Please note that Network Rail can only require third-party clients to comply with their standards where Network Rail are due to adopt the asset. For outside parties such as utility providers or housebuilders, the Network Rail approach is to recommend, advise, and share their standards as best practice guidance. Where compliance with Network Rail requirements is made a condition of planning consent, then care should be taken to explore that requirement fully. It is also of note that where Network Rail believe the travelling public are at risk, then trains may be stopped, and legal proceedings commence.

Network Rail have a legal obligation under their Network License to protect the railway. Network Rail believe that extending that duty to cover a 4-metre zone beyond their property boundary is a reasonable interpretation of how they discharge that responsibility, supported by other standards such as BS7121-1, Annex E.

Challenging that they cannot impose their safety requirements on land not owned by Network Rail is unlikely to withstand scrutiny in court. It is thought that the Health and Safety at Work Act would likely take precedence over land ownership in such matters.

Annex G - Working Group Membership *(2024/25 Revision)*

Name	Employer
Adam Hope	Costain Ltd
Andy Crago	CK Rail Ltd and M&EE Networking Group
Dave Baxter	Ainscough Crane Hire Ltd
Steve Williams	Network Rail - TA B&C Engineering Expert
Tom Pawson	Costain Ltd
Craig Hook (Writer)	CPA
Katie Kelleher & Peter Brown (Editors)	CPA

The Working Group would like to thank the NRIL Routes Senior Asset Protection Engineers forum for their reviews and comments.

NOTE: *The above list does not include all those who have kindly given freely of their time and expertise to contribute on this guidance document and does not necessarily reflect the current membership of the Working Group.*

Requirements for Tower Cranes, Mobile Cranes & Other Mobile Lifting Equipment Adjacent to Railways Controlled by Network Rail

CPA Good Practice Guide