

Ref:	NR/L3/CIV/0063
Issue:	2
Date:	1 June 2024
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Level 3

Work Instruction

Piling, Drilling, Crane, MEWP, SPMT and similar plant operations on or adjacent to the Railway.

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This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – no variations permitted

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – variations permitted subject to approved risk analysis and mitigation

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

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- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

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Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 7 September 2024.

Where it is considered not reasonably practicable¹ to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation, they shall be complied with irrespective of a project's Project Acceleration in a Controlled Environment (PACE) phase or equivalent governance framework. In all other circumstances, projects that have formally completed PACE strategic development & project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when PACE phase 1 was completed.

NOTE 1: Legislation includes National Technical Specification Notices (NTSNs)

NOTE 2: The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.

NOTE 3: For more information on PACE see NR/L2/P3M/201.

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Issue record

Issue	Date	Comments
1	Dec 2021	Initial issue (replaces NR/L2/INI/CP0063)
2	June 2024	Title amended to align with revised scope. Provision of Figure 1 illustrating area at risk. Amendments to close out Post Implementation Review feedback, informal & formal standards challenges, and variations pending standard changes. Changes following liaison with the Construction Plant-hire Association to mutually align requirements & guidance. Removal of the need to design platforms for maximum crane/rig capacity, in favour of maximum utilisation, with utilization limits and foundation uplift depending on circumstances. Alignment to Annex E of BS7121-1-2016. Removal of need to use stays or twin masts to tower cranes. Hierarchy updated to include part lines blocked. Uprating of lifting accessories removed in favour of increased inspection frequency. Removal of requirement for certain plant not to exceed 7 years old, and minor amendments.

Reference documentation

Standard	Title
GE/RT8000	Rule Book (and associated changes)
NR/L2/CIV/003	Engineering and Architectural Assurance of Building and Civil Engineering Works
NR/L2/RSE/02009	Engineering Management for Projects
NR/L2/OHS/0044	Planning and Managing construction work.
NR/L2/MTC/089	Arrangements for the exchange of asset data and the continuing maintenance of assets undergoing change
NR/L2/CIV/177	Monitoring track over or adjacent to construction work

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NR/L2/OHS/0047	Managing Health and Safety in Construction (Application of the Construction (Design and Management) Regulations to Network Rail)
NR/GN/CIV/208	Ground Investigation.
NR/L1/CIV/094	National Asset Protection and Optimisation Delivery Framework
NR/L2/CIV/095	Asset Protection and Optimisation Management of Third Party Works on Network Rail Infrastructure
NR/L2/CIV/096	Asset Protection and Optimisation Management of Outside Party Works
NR/L3/OHS/005	Work Instruction; Design and Construction Management in a High Street Environment
NR/L2/RMVP/0200	Infrastructure Plant Manual
NR/L2/RMVP/0200/P503	Infrastructure Plant Manual; Lifting Operations
NR/L2/RMVP/0200/P508	Infrastructure Plant Manual; Mobile Elevating Work Platforms
NR/L2/RMVP/0200/P513	Infrastructure Plant Manual; Mobile plant (non-rail mounted) and road vehicles
NR/L2/CIV/1000/06	Competence Management for Assurance and Design of Buildings and Civils Infrastructure
Construction Plant Association (CPA)	Good Practice Guide: Requirements for Mobile Cranes Alongside Railways Controlled by Network Rail <i>NOTE: This CPA guidance is due to be republished in 2024 and it is intended that this will align with the hierarchy in this standard.</i>
Construction Plant-hire Association (CPA)	Good Practice Guide: Requirements for Tower Cranes Alongside Railways Controlled by Network Rail. <i>NOTE: This CPA guidance is due to be republished in 2024 and it is intended that this will align with the hierarchy in this standard.</i>
NR/L2/RSE/CONM/001	Construction Management for Projects (including associated modules)
Rail Safety and Standards Board (RSSB) M&EE COP0011	RSSB Mechanical & Electrical Engineer (M&EE) Networking Group Code of Practice for Planning and Executing Lifting Operations

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RSSB M&EE COP0032 issue 5	RSSB M&EE Networking Group Code of Practice; For Plant Any Line Open (ALO) Working
BS7121-1:2016	Code of Practice (CoP) for the safe use of cranes,
BS7121-2 (all parts)	CoP for the safe use of cranes; Inspection, maintenance and thorough examination
BS7121-3:2017 +A1:2019;	CoP for safe use of cranes; Mobile cranes
BS7121 part 4: 2010:	CoP for safe use of cranes: Lorry Loaders
BS7121-5:2019	CoP for safe use of cranes; Tower cranes
BS 5975: 2019	BS 5975; 2019 Code of practice for temporary works procedures and the permissible stress design of falsework
BS 8460: 2017	Code of practice for safe use of MEWPs
Temporary Works Forum TWf 2022.01	SPMT brief guide TWf 2022.01
European Association of Abnormal Road Transport and Mobile Cranes (ESTA)	Best Practice Guide for Self-Propelled Modular Transporters
NR/L2/OHS/CP0070	Principal Contractor Licensing Assurance
Highways England document CS 229;	Data for pavement assessment
Transport and Road Research Laboratory (TRRL) LR1132:	The structural design of bituminous roads
National Highways CD225/CD226;	Design for New Pavement Foundations and Design for New Pavement Construction
CPA TCIG TIN 031	CPA Tower Crane Interest group, Technical Information Note; Managing the design, construction and inspection of tower crane bases, grillages, and ties

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Legislation

This standard/control document has been reviewed to confirm it complies with the following legislation:

Construction (Design & Management) Regulations (CDM 2015)
 Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)
 Provision and Use of Work Equipment Regulations 1998 (PUWER)
 The Work at Height Regulations 2005 (WAHR)
 The Health and Safety at Work Act 1974
 The Management of Health and Safety at Work Regulations 1999.
 The Management of Health and Safety at Work (Amendment) Regulations 2006

Compliance with this standard/control document does not, on its own, provide compliance with the legislation listed.

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1 Purpose

This standard addresses risks where piling, drilling, crane, mobile elevated working platform (MEWP), self-propelled modular transport (SPMT) and similar temporary works operations* are taking place on, or adjacent** to, Network Rail Managed Infrastructure (NRMI).

NOTE 1: *Similar temporary works operations might include, amongst other things, construction hoists, transport platforms, mast climbing work platforms, telehandlers, rotating telehandlers, excavators undertaking suspended load lifting operations, lorry loaders, and mobile concrete pumps with placing booms.

NOTE 2; **See definition for “adjacent to” in clause 4.

This standard supports a safe system of work, relating to the piling, drilling, crane, MEWP, SPMT and similar temporary works operations, that maintains the safety of the railway so far as is reasonably practicable, in conjunction with other standards.

This standard outlines modern methods and procedures in order that the risk of undertaking operations on, or adjacent to, NRMI can be minimised to the extent that works may be progressed as far as practicable without resorting to possessions and electrical isolation.

This standard sets the requirements to be applied whenever piling, drilling, crane, MEWP, SPMT or similar temporary works operations are to be carried out on, or adjacent to, NRMI where, in the event of mishandling or failure, any part of the equipment in use or its load might collapse within 4m of the boundary to NRMI.

Measures include, but are not limited to, accounting for:

- a) hierarchy of risk,
- b) appropriate design check category,
- c) appropriate under-utilisation of capacity,
- d) appropriate measures for uprating loads,
- e) appropriate measures to prevent slewing,
- f) provision of tagging or similar measures,
- g) appropriate measures for the provision of adequate working platforms, to support all plant and equipment covered by this standard.

2 Scope

This standard applies to all piling, drilling, crane, MEWP, SPMT and similar temporary works operations to be undertaken on, or adjacent to, Network Rail Managed Infrastructure, including that which has been designated a High Street Environment, where applicable.

The standard applies to piling, drilling, crane, MEWP, SPMT and similar temporary works operations where the safety of the operational railway might be affected as a consequence of:

- a) Plant operator or workforce error;
- b) The failure of the ground/working platform/mats supporting the piling rig, crane or other supported equipment;
- c) Equipment or accessory failure;
- d) Inadequate interaction with the existing ground (including vibration, displacement and loosening affects);

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- e) Failure within compound collapse radius of the attendant crane(s) and load(s).
- f) Failure when in service or out of service,
- g) Failure during erection or deconstruction or during movement,
- h) Failure during inclement weather.

This standard covers the safe installation and removal of piles and working platforms but not the effect of piles and working platforms on the infrastructure.

This standard does not cover “on or near the line” operations e.g. use of On Track Plant (OTP).

This standard is complementary to, and should be read with, the following standards:

- a) NR/L2/RMVP/0200 Infrastructure plant manual, including (but not limited to) Module P513 - Mobile plant (non-rail mounted) and road vehicles, Module P503 lifting operations and Module P508 MEWPs;
- b) M&EE standard COP0011 code of practice for planning and executing lifting operations;
- c) M&EE standard COP0032 code of practice for plant any line open (ALO) working.

This standard is applicable to all projects where, in the event of mishandling or failure, any part of the equipment in use, and not in use (i.e. out of service), or its load, might collapse within a line drawn 4 metres (4m) to the outside of the boundary to Network Rail Managed Infrastructure, notwithstanding whether the works are for the railway infrastructure itself or for structures / developments adjacent to the railway. See Figure 1 on page 12.

It applies to designers and executors of works, of both Network Rail and Outside Party / Third Party constructors/developers.

NOTE 1: *The intention is for these parties to understand at an early stage the constraints imposed on the design solution selected.*

This standard does not cover signal sighting, radio signals and Overhead Line Equipment (OLE) implications, nor specialist equipment such as On Track Plant, Jack-Up-Barges, pontoons or cranes on waterways. In such cases specialist advice will need to be sought.

NOTE 2: *NR/L3/OHS/005, Work Instruction; Design and Construction Management in a High Street Environment, is for projects where there is no effect on NRMI. Standard NR/L3/CIV/0063 will apply, unless those persons determining whether a project comes within the scope of NR/L3/OHS/005 confirm in writing that there are no risks to NRMI.*

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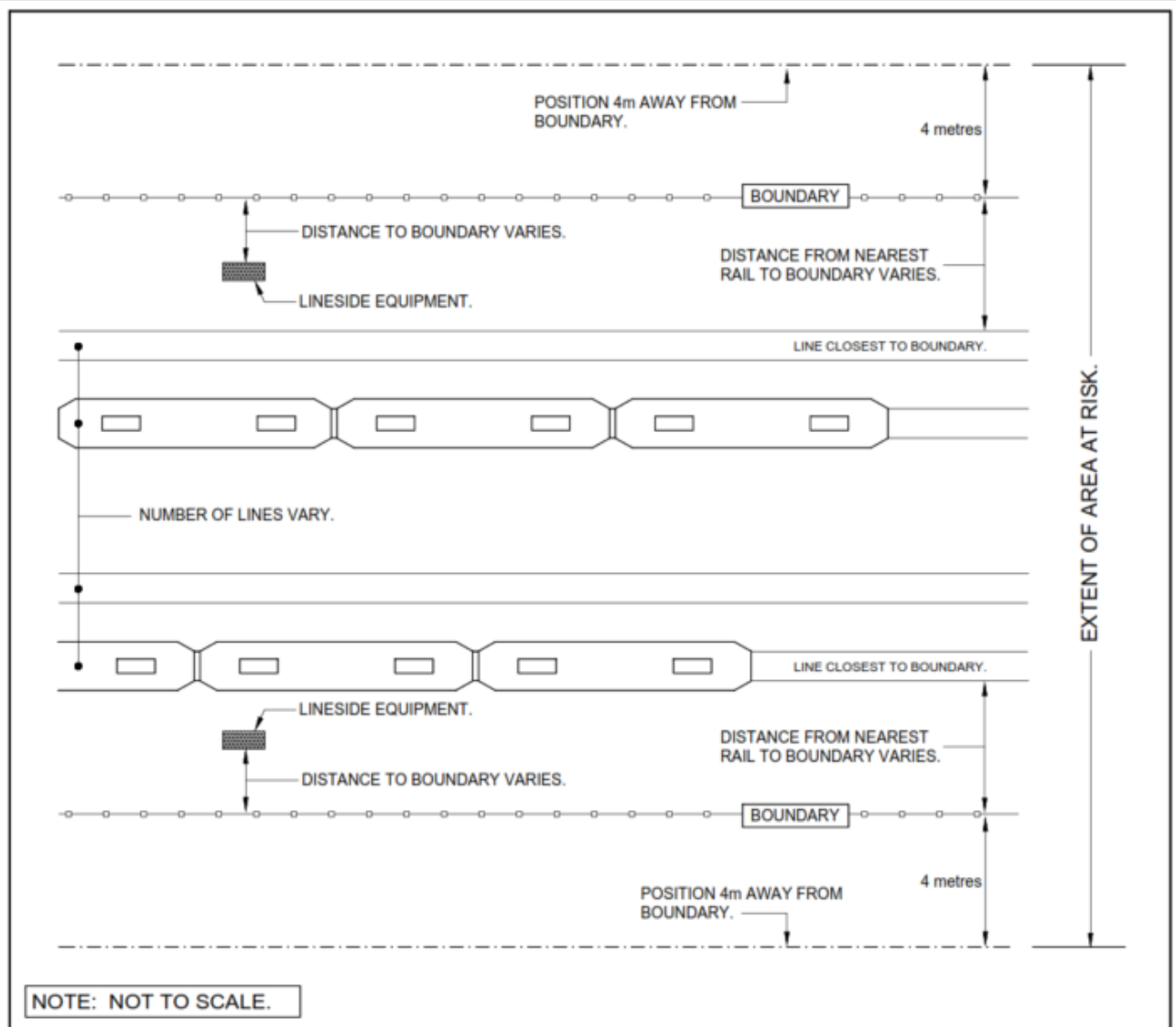


Figure 1. This illustrates a typical layout of NRMI, with positions drawn 4 metres (4m) outside the boundary to NRMI, with all areas between at risk.

3 Roles and responsibilities

Roles and responsibilities of the various duty-holders involved in piling, drilling, crane, MEWP, SPMT and similar operations adjacent to the Railway are defined in the following standards:

- NR/L2/OHS/0047; Managing Health and Safety in Construction (Application of the Construction (Design and Management) Regulations to Network Rail),
- NR/L2/RSE/02009; Engineering Management for Projects (formerly NR/L2/INI/02009),
- BS 5975; 2019 Code of practice for temporary works procedures and the permissible stress design of falsework,
- BS 7121; Code of Practice for the safe use of cranes,.

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- e) BS 8460; Code of practice for safe use of MEWPs,
- f) Highways England document CS 229; Data for pavement assessment.

4 Definitions

For the purpose of this document, the terms and definitions in table 1 and the abbreviations in table 2 apply.

Term	Definition
Access Road / Haul Road.	A temporary means of enabling access for plant, labour and materials to a place of work e.g. working platform. NOTE; <i>similar principles apply to the design of access/haul roads as for working platforms of various types, but applied forces will differ considerably, so efficiencies will be gained compared to working platform design and construction.</i>
Adjacent to	A position outside the boundary of Network Rail Managed Infrastructure.
Ancillary Plant	All Plant (apart from the primary listed plant that is addressed separately) involved in the processes covered by the scope of this standard. NOTE: <i>e.g., Concrete pumps, vibro-compactors, ancillary generators, excavators.</i>
Asset Management Plan	A documented agreement between a project and the maintainer produced in accordance with NR/L2/MTC/089 (Arrangements for the exchange of asset data and the continuing maintenance of assets undergoing change).
Boundary	A fence line, or outermost face of another NR asset if beyond the fence line, typically demarcating the extent of NRMI.
Crane	Item of lifting equipment used for lifting and lowering loads and moving them horizontally.
Crane Pad	Spreader plates/pads which spread crane outrigger loads onto the working platform or other suitable substrate NOTE: <i>There are various terms for crane pads including outrigger mats and others.</i>
Crane Rated Capacity	Load that the crane is designed to lift for a given operating condition taken from BS 7121 clause 3.23. NOTE 1: <i>e.g. configuration and position of the load.</i> NOTE 2: <i>Crane Rated capacity is often taken from manufacturer's data.</i>
Compound Collapse Radius	The crane collapse radius plus the load collapse radius, taken from Annex E of BS 7121 Part 1 & Construction Plant Association (CPA) guidance.

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Drilling	Activities involved in ground investigation or other similar activities, such as undertaking boreholes using rotary, percussive or other drilling equipment
Competent Person	An individual engaged in the work who is recognised by the organisation requiring the task(s) to be carried out as having sufficient training, knowledge, skills and experience, and the right behaviours to apply them, to complete the task(s) safely and efficiently. NOTE; Competence can be described as the combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely
High Street Environment (HSE)	An environment that exists, or can be created, where construction work, structures design, mineral exploration and extraction (or work preparatory to mineral exploration and extraction) can be undertaken by or on behalf of Network Rail Infrastructure Limited (NRIL) without creating or transferring safety risk to or from Network Rail Managed Infrastructure (NRMI) and adversely affecting its safe operation. NOTE: The requirements for high street working are set out in NR/L3/OHS/005
Isolation	Electrical isolations of the AC Overhead Line Equipment and/or DC 3rd" Rail. NOTE: The isolation certificate forms part of the Safe System of Work.
Method Statement	An independently checked document detailing a comprehensive step-by-step account for an activity, or range of activities which identifies hazards, resource requirements and method of working to control the risk from the work activity to the public, construction organisation's personnel, and Network Rail's operations and which demonstrates that the execution is in accordance with the Design. NOTE 1: Method Statement does not apply to Network Rail delivered projects; see Work Package Plan (WPP). NOTE 2: this might include reference to appropriate risk assessment and might also include design drawings and photographs and other documents, to communicate the safe system of work.
Movement Limiting Devices (MLDs)	A purpose designed device which limits the movement of the machine. This can include outriggers, lockable wheel chocks, slew restrictors (also known as slew limiter or angular limiter), reach limiters and height limiters. NOTE 1: They are electronic or physical devices that can be fitted to some items of lifting equipment. They can be working range limiting systems and may include anti-collision systems. Some devices can be linked together to monitor the equipment's relative

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	position and motion are monitored. Such systems prevent the approach of the load carrying device from entering a predetermined zone. NOTE 2: The control of the working envelope is more complex than simply a restriction on slew angles, and can include radius limitations concurrently to create a zone of any shape, as opposed to an arc of a circle. Controls could be a virtual wall, zoning system, border or an angular limiter, being either mechanical or electrical/electronic. NOTE 3: Also see information on MLDs in RSSB COP0032.
Network Rail Managed Infrastructure (NRMI)	Infrastructure that falls within the geographic boundaries of NRIL's operational railway, including the permanent way and land within the lineside fence, and plant used for signalling or exclusively for supplying electricity for traction purposes to NRIL's operational railway. It includes permanent way at stations and plant within these locations used for signalling NR's operational railway, or exclusively for supplying electricity for operational purposes to the operational railway. At stations managed by NR it also includes the means of access for passengers between the platforms and the exterior of the station premises. NMRI does not include the following; depots, yards or sidings owned by, or leased to, other parties; infrastructure managed by Network Rail High Speed Ltd; and infrastructure determined by the safety regulator Office of Rail and Road (ORR) to be excluded from the mainline railway. Structures such as tunnels, bridges, culverts, viaducts, covered cuttings, retaining walls, underpasses etc, are deemed to form part of NRMI only in relation to their potential to transfer risk onto, or from, the operational railway.
Lifting Accessories	Devices temporarily attached between lifting equipment and the load being raised or lowered. NOTE: equipment by which a load is suspended, for example slings and shackles. Lifting accessories are noted in Lift Plans and are a subset of Lifting Equipment.
Lifting Equipment	Mechanical equipment used for lifting or lowering loads NOTE: e.g. cranes
On or near the line	a) within 3 metres of the nearest rail; or b) on the line itself.
On the lineside	a) between the railway boundary fence and the point that is called on or near the line; and

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	b) in view of the driver of any approaching train or movement.
Piling	The installation of bearing, friction and lateral-restraint (wall) piles. This includes, but is not limited to, the following techniques: a) Continuous Flight Auger; b) Rotary Bored; c) Driven Cast-In-Situ; d) Driven Pre-cast Concrete; e) Driven Steel Sections; f) Auger Displacement and Helical Type (screw) piles; g) Ground improvement piles e.g. soil mixing. h) Vibro-displacement columns Additionally, retaining wall techniques including Diaphragm Walling, Secant and Contiguous Pile Walling, and Sheet Piling are included.
Piling Accessories	Specialist equipment used in the piling process. NOTE: e.g. casings and chisels.
Piling Rig	The principal machine used to install the piles as defined under piling.
Possession	A defined period of time and location on the network where engineering work is performed, and operation is ceased. It can contain one or more work sites belonging to one or more project(s).
Senior Engineer	As defined in NR/L2/RSE/02009
Suitable Industry Specialists	Consultant / Contractor with the required skills, qualifications, knowledge and experience to competently undertake tasks.
Spoil	Soil and waste arising from the piling/drilling operations together with general excavation and deconstruction activities.
Spragging	The means of steering a crawler-based machine by applying the brake to one track whilst driving with the other.
Work Package Plan (WPP)	A plan detailing the arrangements to safely manage all work. NOTE: Refer to NR/L2/OHS/0044.
Working Platform	The designed surface on which the Piling Rig, Drilling Rig, Crane, SPMT, MEWP and all Ancillary Plant is transported, supported and operated as appropriate.

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	In the case of travelling plant, such as (but not limited to) tracked plant and SPMT, the entire end to end travelling route. NOTE: <i>Piling works typically involve the concurrent use of lifting plant and piling plant on a working platform, in close proximity. This operation bears with it several inherent risks that if not properly managed can lead to the sudden catastrophic collapse of plant. NR/L3/CIV/0063 seeks to manage this risk by introducing requirements on the design and maintenance of Working Platforms. However, the same risks that are present in piling works are not present in lifting operations involving static mobile plant and the control measures such as extending the working platform with physical demarcation has no added benefit in terms of risk reduction in such cases. There are clear differences between the design of Working Platforms for piling works, Working Platforms for lifting works, working platforms for SPMT moves and those for other plant. The designer(s) might wish to maximise efficiency by recognising the difference between design requirements for each, and use the worst case scenario when operations use the same platform for multiple uses.</i>
Outside Party	An individual, member of the public or organisation other than Network Rail which promotes, funds, designs, constructs, owns and maintains the works but will not physically change the operation of railway infrastructure and will interface with the railway infrastructure. (For instance, an over-line structure that may also require incidental changes to NR infrastructure such as bonding, GSMR modifications, changes to lineside fencing, OLE modifications, changes to signalling etc.). NOTE: <i>for information see Asset Protection (ASPRO) standards NR/L2/CIV/094 and NR/L2/CIV/096.</i>
Third Party	Organisation other than Network Rail intending to undertake works that physically change or impact the operation, assets, design or other functionality of Network Rail's infrastructure. (Third Parties may include Train and Freight Operation Companies and Station Operators, Local Passenger Transport Executives, the DfT, DBFO, PFI, or commercial developers etc) NOTE: <i>for information see ASPRO standards NR/L2/CIV/094 and NR/L2/CIV/095.</i>

Table 1 – Terms and definitions.

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Abbreviation	Description
ASPRO	Asset Protection and Optimisation <i>NOTE: Outside Parties and Third Parties can find out more about ASPRO by visiting the below website: https://www.networkrail.co.uk/running-the-railway/looking-after-the-railway/asset-protection-and-optimisation/</i>
BRE	Building Research Establishment
CEM	Contractor's Engineering Manager to NR/L2/RSE/02009
CPA	Construction Plant-hire Association
CRE	Contractor's Responsible Engineer to NR/L2/RSE/02009
DPE	Designated Project Engineer to NR/L2/RSE/02009
FPS	Federation of Piling Specialists
ITP	Inspection and Test Plans to NR/L2/CIV/003 and NR/L2/RSE/CONM/001
LOLER	Lifting Operations and Lifting Equipment Regulations 1998.
MEWP	Mobile Elevated Working Platform.
NRMI	Network Rail Managed Infrastructure
OLE	Overhead Line Equipment
PC	Principal Contractor (CDM 2015)
PUWER	Provision and Use of Work Equipment Regulations 1998
SPMT	Self-Propelled Modular Transport
TWC	Temporary Works Coordinator to BS5975;2019

Table 2 – Abbreviations

5 Selection of methodology for piling, drilling, MEWP, and SPMT and similar operations

5.1 Overview

Cranes, piling rigs, MEWPs & similar plant*, SPMT and other operational equipment, such as, but not limited to, tracked excavators, shall be selected, controlled and operated such that they do not constitute a danger to operational infrastructure from overturning, collapse, use or failure.

NOTE 1: * Similar plant might include, amongst other things, construction hoists, transport platforms, mast climbing work platforms, telehandlers, rotating telehandlers, excavators undertaking suspended load lifting operations, lorry loaders, and mobile concrete pumps with placing booms.

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Advice shall 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.

The method selected shall not only be safe to construct, in particular with respect to the operational railway, but shall be appropriate for the geotechnical/ground conditions existing at the particular site, the site layout and the location of all railway assets which might be affected by the use or failure of the plant or loads carried.

The designer's methodology shall be based on the following hierarchy of risk:

- **Level 1.** No risk of collapse or oversail within 4m on plan from the railway boundary (see Figure 1).
- **Level 2.** Risk of collapse within 4m on plan from the railway boundary (see Figure 1), with full possession and all lines blocked.
- **Level 3.** Risk of collapse within 4m on plan from the railway boundary (see Figure 1), with partial possession and some lines blocked to railway traffic, and with other lines open.

***NOTE 1:** Level 3 has different requirements depending on circumstances; refer clause 10.3.*

- **Level 4.** Risk of collapse within 4m on plan from the railway boundary (see Figure 1), with no possession and all lines open to railway traffic.

***NOTE 2:** For further information on hierarchy levels see clause 10.3.*

Project specific risk assessment shall be undertaken in all cases, to determine that risks to the operational railway are eliminated or reduced so far as is reasonably practicable, accounting for the requirements of this standard.

***NOTE 3:** refer to clause 7, NR/L2/OHS/0047 and NR/L2/RSE/100/02 for details on undertaking project risk assessments for CDM and Common Safety Method respectively*

***NOTE 4:** For details of restrictions on oversailing, crane rated capacity underutilisation factors, movement limiting devices, slew restrictor requirements and foundation factors see clauses 5,6,7,8, and 10 of this standard.*

Unless specific written permission* is given by Network Rail, no part of any piling rig, crane and/or any part of the load shall oversail within 4m of NRMI property boundary under any circumstance without a possession/line block; also see clauses 6 and 10.

***NOTE 5:** * For Outside Party and Third Party works, "specific written permission" is gained by an Oversailing Agreement, granted by NR property, refer to ASPRO standards.*

Movement Limiting Devices (MLDs), such as slew restrictors, and limitations by controlling positioning, shall be used to protect NRMI, where required; see clauses 6 and 10.

Capacity limitation, such as crane rated capacity underutilisation factors, and enhanced foundation factors, shall be used to protect NRMI, where required; see clauses 6 and 10.

Work on NRMI shall only be carried out by Principal Contractors with a Principal Contractor Licence, to NR/L2/OHS/CP0070, where Network Rail is the client.

***NOTE 6:** There are requirements for temporary works for Principal Contractors undertaking works on NRMI, in clause 9.3 of NR/L2/OHS/CP0070, for documented management arrangements for*

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establishing, implementing and maintaining all temporary works, including the management of contractors who carry out and manage temporary works.

5.2 Design Check Category and Acceptance

5.2.1 Overview

All designs, where NRM1 could be affected, shall require an appropriate category of design check to NR/L2/CIV/003.

All methodologies, where NRM1 could be affected, shall be subject to Network Rail's acceptance.

NOTE: See table 2 for a link to the ASPRO website, and refer to ASPRO standards NR/L2/CIV/094, NR/L2/CIV/095 and NR/L2/CIV/096.

5.2.2 Piling, drilling and crane operations, excluding ASPRO controlled temporary works operations

All working platforms, where NRM1 could be affected, shall have a design check to the Design Check Categories in NR/L2/CIV/003, upgraded to the requirements of NR/L3/CIV/0063.

Designers shall include provision for the design of supporting structures for piling rigs, cranes and other such heavy equipment such that they are always adequate to support the proposed loads applied to them.

NOTE. Where poor ground or other features such as potentially unstable cuttings / embankments exist, additional measures might be needed to control the risk of unintended events from occurring.

5.2.3 Piling, drilling and crane operations for ASPRO controlled temporary works operations

Design Check Category III (DCCIII), to NR/L2/CIV/003, shall be applied when working on Outside Party or Third Party projects, except as stated below.

NOTE 1: This is in accordance with the Asset Protection Engineering Management Plan produced in compliance with NR/L1/CIV/094.

NOTE 2: This is due to the risk of construction alongside and/or on the railway, which is undertaken by external contractors.

The Network Rail ASPRO engineering team shall, in circumstances where the temporary works proposed are deemed by the Network Rail ASPRO engineering team as low risk, undertake an evaluation when determining if there should be any reduction in the checking category from Design Check Category III. This evaluation shall include the following assessment:

- If the works are low risk and adequate controls can be put in place by the contractor with adherence to appropriate Task Briefing documentation;
- If the Network Rail ASPRO engineering team has sufficient confidence in the Contractor's management/suppliers;
- If the Contractor works directly for NR and the design would otherwise be controlled under a reduced category;

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- d) That the design check category shall not be less than that stated in NR/L2/CIV/003, upgraded as necessary in accordance with the requirements of that standard.

5.2.4 SPMT operations

All SPMT working platform designs shall be checked to minimum Design Check Category II (DCCII), uplifted as necessary, to NR/L2/CIV/003.

The CRE/TWC, supported by the DPE, shall risk assess the Design Check Category depending on several factors including, but not limited to, utilisation factors, ground investigation findings and operational complexity.

A competent Designer shall be employed to produce a SPMT working platform design, to check the mat will accommodate all SPMT system loads and other parameters as set out in the ESTA guidance, e.g. limitations placed on load capacity, gradients, and deflections; see Appendix A.

For instance, if utilisation factors are very high and ground conditions very poor, or if operations are complex, there might be added value in seeking a fully independent Design Check Category III check to de-risk possible programme or cost implications of failure.

5.2.5 MEWPs and similar plant*.

The Infrastructure Plant Manual NR/L2/RMVP/0200/P508 Mobile Elevating Work Platforms provides guidance on the safe loading and operation of MEWPs.

NOTE 1: MEWPs are subject to The Lifting Operations and Lifting Equipment Regulations (LOLER, SI 1998 No. 2307). The regulations require that MEWPs are thoroughly examined at least every 6 months by a competent person and their certification be available.

NOTE 2: Zoning of MEWPs is not generally possible, so positioning and attention to working platform/ground conditions are key mitigations.

NOTE 3: * Similar plant might include, amongst other things, construction hoists, transport platforms, mast climbing work platforms, telehandlers, rotating telehandlers, excavators undertaking suspended load lifting operations, lorry loaders, and mobile concrete pumps with placing booms.

5.3 Matters to be reviewed

5.3.1 General

Matters to be reviewed during design shall include the following:

- a) Ground conditions;
- b) Available working space, including siting of equipment and temporary blockage of access or escape routes (lineside or other);
- c) Access to the site. Access needs shall be confirmed, including the height, weight, length and width of equipment;
- d) Buried or legacy assets;
- e) Strength of structures where assets are crossed or otherwise influenced by temporary works;

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- f) Shielding offered by surrounding structures, where such structures are determined (as recommended in BS7121-1-2016 clause E.2.3) and the shielding structure shall be present for the duration of the works;
- g) Location of Network Rail infrastructure, particularly if it might be sensitive to the works to be undertaken;
- h) Limitations to movement (lateral, heave or settlement) of ground and existing assets, these being specified at an early stage, together with any noise and/or vibration limits, as these have an ultimate bearing on the method selected;

NOTE 1: *It is noted that the effects of vibration are particularly important where driven, displacement or vibratory piling techniques are being proposed.*

- i) The effects of ground displacement and/or soil loosening;
- j) The frequency and speed of trains, which can in certain situations be a factor;;

NOTE 2: *This might include standing trains adjacent to the works, for example, in sidings or platforms.*

- k) The presence, and condition, of nearby statutory utilities, buried or legacy infrastructure elements/assets.
- l) The effects of changes in weather such as (but not limited to) changing seasons of year that works are proposed, temperature, wind, rain and solar gains.

5.3.2 Specifics for SPMT moves.

Self-Propelled Modular Transporter (SPMT) moves shall be reviewed by suitable industry specialists.

The risk of transporter failure due to settlement of the wheels is significant in determining whether the work can be completed within a road or rail possession.

The designer should comply with recommendations in the European Association of Abnormal Road Transport and Mobile Cranes (ESTA) Best Practice Guide for Self-Propelled Modular Transporters.

NOTE 1: *This can be found here: <https://estaeurope.eu/library/spmt/best-practice-guide-for-self-propelled-modular-transporters-spmt/>*

The designer should comply with recommendations in Temporary Works Forum SPMT brief guide TWf 2022.01.

NOTE 2: *The TWf guidance can be found here: <https://www.twforum.org.uk/viewdocument/self-propelled-modular-transporters>*

The Contractor's Engineering Manager, supported by the Contractor's Responsible Engineer(s), Principal Contractor's Temporary Works Coordinator and other Temporary Works Coordinators, shall coordinate all interfaces between the permanent works design, the temporary works design supported by the SPMT, the SPMT and the working platform.

The Principal Contractor shall liaise with the Principal Designer and designers throughout the construction phase on matters such as changes to the designs and the implications these changes might have for managing Health & Safety risks.

NOTE 3: *For further guidance on SPMT refer to Appendix A3*

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NOTE 4: Although multi-axle trailers for the transport of plant are not specifically mentioned, the same principles apply to such movements.

6 General Requirements

6.1 Overview

The Principal Contractor (PC) shall determine that the suitable industry specialists, or in-house specialists, have demonstrated their capability to carry out the work. The specialist contractor(s) shall provide: -

- a) evidence to the PC of a commitment to carry out the work safely,
- b) demonstration of having management competence with relevant experience and suitable & sufficient resources,
- c) ability to undertake the work in accordance with the requirements of this standard,
- d) ability to produce a methodology which is acceptable to the Principal Contractor and Network Rail.

6.2 Matters to be Addressed

In undertaking a review of the general requirements, the Principal Contractor in conjunction with the specialist contractors and Network Rail shall review the matters listed below:

- a) The management and planning of the site area shall include the arrangements for all of the ancillary operations;

NOTE 1: e.g. off-loading of materials, reinforcement fabrication areas, material storage areas, drilling fluid (bentonite) plant, accommodation units.

- b) An appropriate protection shall be placed between the piling, drilling or crane operation(s) and the track;

NOTE 2: This may simply take the form of a fence/barrier designed to prevent personnel straying on to the tracks.

- c) In situations where the machinery lights can distract and/or dazzle train drivers, then a more substantial screen to provide a visual barrier for train drivers shall be erected;

- d) For Outside Party and Third Party Works, unless specific written permission* is given by Network Rail, action shall be taken to prevent the over-sailing of the railway infrastructure and specifically prevent encroachment within 4m of the railway boundary, by any crane and its load, where there is no possession, with all lines open to railway traffic. Movement Limiting Devices, e.g. slew restrictors, shall be utilised to limit the working area (see clause 10 for further requirements).

NOTE 3: MLDs may be electronic, hydraulic or mechanical.

NOTE 4: * Specific written permission is gained by an Oversailing Agreement, granted by NR property; refer to ASPRO.

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- e) Wherever reasonably practicable, the risk to the railway in hierarchy levels 2, 3 and 4 shall be reduced by positioning cranes and planning works such that crane jibs are pointing away from the railway.

NOTE 5: *Where this is not reasonably practicable crane jibs may work parallel to the railway or, where justified by risk assessment, towards the railway.*

- f) In any scenario where collapse could be closer than 4m of the nearest line open to traffic, and/or 4m of the live OLE, and/or equipment which can affect the operational railway, a project specific risk assessment shall be undertaken to determine that risks are eliminated or reduced so far as is reasonably practicable;
- g) Matters such as arcing distances, that might apply on electrified railways (OLE/ 3rd Rail);
- h) Location of High Voltage/Low Voltage (HV/LV) and other (non-rail) overhead power cables, signalling and telecommunications cables and other services;
- i) Location of existing and proposed Road Rail Access Points (RRAP);
- j) Design Check Category shall comply with clause 5;
- k) Underutilisation of capacity limits and uplifts to foundations for cranes shall comply with clause 10.

NOTE 6: *Typical Diagrams for piling rigs and cranes are referenced in Appendix B.*

NOTE 7: *This document does not cover the actual methods by which movement, noise and vibration are monitored before, during and after the piling, drilling, crane or SPMT operations, including the monitoring of adjacent structures and the railway tracks. Refer to other standards such as NR/L2/CIV/177.*

7 Risk/Hazard Identification and Management

7.1 Introduction

Prior to any works commencing on site, a detailed Risk/Hazard Identification and Management Document shall be drawn up by the Principal Contractor together with a methodology in which the matters to be reviewed in 7.2 shall be addressed.

Designer's risk assessments shall be reviewed by the project team so that there is clear understanding of residual risks.

Appendix A summarises typical points which should be addressed by the PC and designers within the accepted construction methodology and associated risks and hazards.

7.2 Matters to be reviewed

The following matters shall be reviewed by the Principal Contractor, and/or the designers, and/or the competent person, as appropriate:

- a) The design, construction and maintenance of the Working Platform and/or Access Road/Haul Road

NOTE 1: *see clause 8.*

- b) All matters to be addressed in clause 6.2, 8 and clause 10

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- c) Normally working operations shall be undertaken during daylight hours. For works undertaken during hours of darkness, adequate lighting shall be provided with attention being paid to the position of these lights with reference to both the operations and the train drivers, including effects on infrastructure;

NOTE 2: *e.g. signal sighting, reflection, refraction, & secondary glare effects from equipment movements*

- d) Specific attention shall be paid to the orientation of all lifting operations. In general terms modern hydraulic piling rigs may sit at any orientation, including facing the railway track, but jib-cranes shall work with their jib either parallel to or pointing away from the railway wherever reasonably practicable;
- e) Piling rig misuse has been cited in various recent piling rig collapses and therefore the Principal Contractor / contractors shall assure that operators are competent to use rigs within operational parameters. Pile installation sequencing shall be considered to reduce risks to the railway so far as is reasonably practicable.

NOTE 3: *Refer to FPS guidance and comments in Appendix A and Appendix C.*

- f) The contractor shall assure that any piling methodology that is adopted, where the auger or mast of any rig can be inclined / plumbed, is inclined at the correct angle when the machine is being tracked. Care shall be taken when the drilling table is at height, as this raises the centre of gravity of the piling rig, making the equipment less tolerant to inclines/uneven ground. Attention shall be paid to having acceptable ground and working platform slopes across the site to allow safe operation of piling rigs.
- g) The Principal Contractor and designer(s) shall plan crane lifts to meet the requirements of the hierarchy in clause 10, in order to reduce risks to NRMI so far as is reasonably practicable.
- h) The general position of the piling rig, movement of the piling rig when undertaking pile installation and the sequencing of the works shall be planned to reduce the need for repeated changes in the orientation of the tracks of the piling rig and crane; in particular, the minimisation of “spragging”;
- i) The method for the lifting of pile / diaphragm wall cages, pile elements and other materials shall be reviewed in detail within the methodology. Where items could fall/collapse within 4m of the boundary with no possession in place, with lines open to railway traffic, the incorporation of a secondary restraint shall be required. Tag lines or equivalent** shall be used to control loads, these being properly deployed and controlled at all times, to eliminate risks so far as is reasonably practicable. The collapse radius of the attending crane shall also be assessed.

NOTE 4: *** There are other load handling devices currently being introduced to minimise the use of taglines - Vita Load Navigator / Verton / Torquer / Ganterud L, which might be deemed suitable alternatives subject to appropriate designer risk assessment.*

- j) All lifting operations shall be undertaken in accordance with the requirements of LOLER;

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- k) All risks shall be considered for all temporary conditions. This includes such matters as the utilisation of cranes, which will differ between crane erection, dismantling, out of service and in- service.

NOTE 5: *In cases risks to NRM1 might be greatest during erection and dismantling, rather than in operation.*

- l) Arrangements shall be in place so that, at the end of each shift, all plant is left in a safe and secure manner. Attendant jib cranes shall be left secured and be left in the manufacturer's correct out of service condition overnight, with their jibs facing away from the railway and retracted where appropriate.

NOTE 6: *Typical Diagrams for piling rigs and cranes are referenced in Appendix B.*

NOTE 7: *Tower cranes are usually allowed to free-slew when out of service (unattended by the crane operator), so the crane will be left facing away from the prevailing wind direction, which may be in the direction of the NRM1.*

8 Management of the working platform & access/haul road.

8.1 Introduction

A suitable and sufficient working platform, and where needed a suitable and sufficient access/haul road, shall be provided for all plant covered by the scope of this standard, where the plant supported might affect NRM1.

NOTE 1: *A key hazard to safe operations is failure of the platform supporting equipment, or by a failure in the maintenance of that platform, not by mechanical failure of the machine itself or by human error.*

A suitable and sufficient means of enabling access to the working platform shall be provided for all plant covered by the scope of this standard, with an access/haul road designed as appropriate to the site access requirements.

NOTE 2: *Means of providing access may be utilising existing structures where suitable and sufficient, or by the provision of a temporary access road / haul road. Similar principles apply to the design of access/haul roads as for working platforms, but applied forces will differ considerably, so efficiencies will be gained compared to working platform construction.*

A specification of workmanship and materials shall be provided as part of the working platform & access/haul road detailed design.

Inspection and Test Plans (ITP) shall be produced by the contractor and accepted by the designer, or produced by the designer to meet all requirements of the designer's specification so Ultimate Limit State, Serviceability Limit State and longevity criteria are met.

ITPs shall provide for all maintenance activities, so that temporary works are adequately maintained prior to and during operations until such time as they may be removed. The ITPs shall address the maintenance of the running surface and any drainage, as well how the integrity of any geotextiles that are piled through or cut through are maintained.

NOTE 3: *The ITP should be produced, checked and be executed in accordance with NR/L2/CIV/003 and NR/L2/RSE/CONM/001.*

The CRE (Construction Phase) shall sign the Certificate of fitness to be taken into use, NR/L2/CIV/003/FormE, in accordance with NR/L2/CIV/003, before taking the working platform into use.

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8.2 General Requirements

Installation of the platform, in accordance with the design, shall be undertaken by the Principal Contractor or a competent contractor appointed by the Principal Contractor as agreed with Network Rail.

The specialist contractor shall provide all relevant crane/rig/SPMT and equipment loadings and bearing pressure calculations in advance of the working platform being designed. If the crane/rig/SPMT and equipment which is delivered to site is not the same as that for which the loadings have been supplied, then the working platform shall be redesigned for the actual loads and assured and approved prior to any working platform being loaded.

8.3 Working platform & access/haul roads – Matters to be reviewed

The following matters shall be reviewed:

- a) The size and position of the crane mat shall be determined by the Principal Contractor and specialist sub-contractor and shall include for all temporary conditions such as the rigging and de-rigging of piling rigs, cranes, MEWP, SPMT and ancillary plant;
- b) All working platforms for tracked plant, e.g. for piling operations and tracked cranes, shall be designed and constructed to be at least 2m greater in overall width/length than the theoretical working area, i.e. 1m around all boundaries. Physical demarcation (typically timber baulks or similar) shall be placed to effectively delineate the edge of the working area.

NOTE 1: NR considers it good practice to add a minimum 1m strip around the periphery of the working area (plus any slope) to help assure the loaded area is fully engineered and avoid travelling plant getting too close to the edge.

- c) In all cases, for all plant, including for travelling and static plant, the designer shall account for working platform edge distance design, e.g. in accordance with Temporary Works Forum guidance 2019.02 ref 3.5.4; edge distances.

NOTE 2: As such, the minimum 1m strip for tracked plant in b) above might need to be greater.

- d) The effects of all plant and working platform loading on any containing/supporting structures which restrict such distances shall be considered as part of the design such that forces are accommodated by the existing containment/structure.
- e) Platforms shall be designed for the chosen maximum design utilisation of the piling rigs, cranes and other equipment proposed to be used, in all configurations, with additional requirements for underutilisation of capacity and foundation enhancements in clause 10 of this standard, depending on hierarchy.
- f) All working platforms and access/haul roads shall be constructed with positive drainage if appropriate, to assure that the working platform does not become waterlogged and gives satisfactory performance;
- g) Access to the working platform and in particular the provision of any sloped access shall allow for the delivery of materials as well as for the specialist rigs, cranes and other equipment;

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- h) The working platform design shall assure that if geogrids/geotextiles are used, such materials will not be an issue for piling activities, such that the working platform integrity, and piling operations, are not compromised;
- i) A programmed working platform inspection, testing and maintenance regime shall be proposed by the platform designer, including provision of an Inspection and Test Plan (ITP).

NOTE 3: Testing may include Plate Bearing Tests on completion of platform installation and/or when major repairs have been undertaken. Maintenance should include the levelling of the platform and building up where thickness has been reduced.

NOTE 4; requirements for the production of a specification and ITPs are in NR/L2/CIV/003.

- j) The frequency of inspections, which shall be approved by the Principal Contractor and accepted by Network Rail, may be daily, or no less than weekly, dependent on the programme of works and operations being undertaken.
- k) Deviation from the inspection, testing and maintenance regime shall result in the suspension of the works until such time that Network Rail accepts the proposed, revised regime and any additional restrictions;
- l) As the working platform is first loaded under trial, the PC shall inspect the working platform, using competent persons, to confirm that settlement is within design criteria as specified in the ITP. The trial shall include all expected turning movements;
- m) The project shall be planned such that there shall be no excavation/removal of the working platform until operations have been completed. In the event that an unforeseen obstruction / event necessitates the excavation/removal of a section of the platform, a procedure shall be put in place whereby an addendum to the Works Package Plan and Temporary Works submission documents to NR/L2/CIV/003 are produced and approved by the working platform designer, piling/crane Contractor and Principal Contractor and accepted by Network Rail, prior to the works recommencing;
- n) The working platform designer shall account in the working platform design for peak loading which might occur under any circumstances, e.g. the mast foot of piling rigs, as well as beneath the tracks. Similarly, where equipment with outriggers is being reviewed, the loading beneath these outriggers shall be assessed, including the use of any Crane Pads as part of the working platform design;
- o) Any unsupported pile shafts shall be correctly backfilled following the completion of pile construction such that no hole is left open at end of the shift so that there is no localised reduction in the bearing capacity of the piling platform.

NOTE 5: for example piles with low cut-off level.

- p) The ground around pile heads might become loose, so the platform designer / Principal Contractor shall make allowance in the design and execution methodology to assure the disturbed soil can bear all anticipated loads. This shall be included in the methodology, WPP and Safe System of Work and approved by the platform designer, Piling Contractor and Principal Contractor

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and accepted by Network Rail. Any pile bores in which concrete has been placed but not yet achieved sufficient strength to support plant shall be clearly demarcated by the provision of surrounding bunting or screening until such times that concrete has sufficiently cured to a designed value and backfill can be placed and compacted;

- q) Where required, monitoring of the track and other affected assets shall be carried out by the Principal Contractor in accordance with the approved Asset Management Plan (AMP), NR/L2/MTC/089 and NR/L2/CIV/177 (Monitoring track over or adjacent to Construction Works)

NOTE 6: *Surface water management and ground water monitoring of working platforms is essential to their performance.*

The following matters shall be reviewed as part of the design and execution:

- a. All unbound surfaces are subject to water ingress and softening, no matter how well compacted;
- b. Effective protection, continuous maintenance and proper drainage of any unbound surface

NOTE 7: *If standing water is allowed on an unbound working platform, access road or haul road, the material might become saturated and might no longer have the properties required by the design*

- c. Crossfalls shall be used on all working platforms, sufficient to prevent local ponding and softening, but flat enough so as not to destabilise plant;
- d. Surface water runoff shall be captured and disposed of appropriately;
- e. After heavy rain, continued use or when rutting/potholing occurs, the surface of the platform shall be scraped, proof rolled and topped up with clean stone in accordance with the design;
- f. Should pooling/ponding or saturation occur, the designer shall be informed.

NOTE 8: *Areas in question might need to be locally excavated and replaced with clean compacted fill, with appropriate testing.*

- g. Where wheel turns are expected, either a bound surface or surface protection (road-plates/track-mats) shall be provided;

NOTE 9: *Wheel turns and slewing might break up any unbound surface leading to saturation and the loss of capacity in that surface.*

Where it is proposed not to execute the works as per the accepted design, a suitable and sufficient risk assessment shall be undertaken by the Designer and Contractor in conjunction with the DPE, prior to making any alterations to the design, with any changes resubmitted for acceptance prior to execution, to NR/L2/CIV/003.

Where appropriate refer to Highways England document CS 229; Data for pavement assessment, aimed at technical requirements for pavement investigations on Motorways and trunk roads, should this support SPMT operations and working platform design.

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A bound bituminous surface or suitably designed mats shall be provided for SPMT working platforms unless otherwise agreed by the designer, Principal Designer and NR Senior Engineer.

For further guidance on working platforms supporting SPMT refer to Appendix A3.

8.4 Ground investigation for working platforms & access/haul roads

Adequate ground investigation shall be undertaken to enable working platform design to be undertaken and construction verified. The CEM/CRE and DPE/PE shall agree necessary ground investigation prior to working platform detailed design.

NOTE 1: *SPMT moves often include the need for the working platforms to withstand heavy sets of closely spaced point loads with axles which can turn about the vertical axis. Guidance on loadings is contained in the SPMT section references in Appendix C..*

Bespoke design of the working platform shall account for the recommendations in piling, crane & SPMT guidance and shall undertake satisfactory ground investigation to enable satisfactory working platform performance.

NOTE 2: *The Temporary Works Forum guidance ref TWf2019:02, April 2019, entitled "Working Platforms for construction plant; A guide to good practice", provides recommendations for the scope of the ground investigation which may be followed. This guidance is undergoing a full update for publication in 2024.*

NOTE 3: *The depth of investigation should be a minimum of 1.5 x largest dimension of the outrigger pad width, although it should be noted there is still a risk that weaker soil layers below this minimum depth could be affected by imposed loading, hence depth to be determined by designer dependant on ground conditions. If excavations are needed into the public highway to prove road capacity above normal limits any such works will require approval by the highway authority.*

NOTE 4: *BS EN 1997-2 Annex B (B.3) provides guidance for scoping ground investigations for a variety of structures including foundations, embankments, linear structures etc. There is guidance in BS EN 1997-2 which includes spacing along linear structures and minimum depth to enable design. Refer to Appendix B3 of BS EN 1997 -2 for examples of recommendations for the spacing and depth of investigations.*

NOTE 5: *BRE470 also provides guidance for ground investigations, stating investigations should investigate the upper 2m of ground across the likely area of the platform.*

Bespoke design of access / haul roads shall account for the recommendations in access road / haul road guidance and shall undertake satisfactory ground investigation to enable satisfactory performance for such temporary conditions.

NOTE 6: *Suitable methodology for such temporary conditions could include use of Road Note 29; A guide to the structural design of pavements for new roads, Transport and Road Research Laboratory (TRRL) LR1132; The structural design of bituminous roads, and National Highways CD225/CD226; Design for New Pavement Foundations and Design for New Pavement Construction, and Lees & Han (2024) A mobilised bearing capacity approach to the performance-based design of unpaved roads in Transportation Geotechnics v.44, recognising access/hauls roads are of a temporary duration, .*

Strength determination shall be carried out by Plate Load Tests, California Bearing Ratio (CBR) tests or vanes tests or as otherwise prescribed in the designer's specification and requirements for Inspection and Test Plans (ITPs) to NR/L2/CIV/003.

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9 Competency

9.1 Introduction

All personnel participating in piling, crane, MEWP or SPMT operations, and associated operations, shall be competent persons, for the design, checking, co-ordination and execution task(s) which they are performing.

Only competent specialist companies shall be used to undertake works adjacent to Network Rail Managed Infrastructure, which might affect NRMI.

9.2 Matters to be reviewed

The following matters shall be reviewed by the Principal Contractor and/or contractor(s) as appropriate:

- a) Only competent personnel who are experienced in the techniques/equipment shall be employed on the works;
- b) All Plant Operators shall be competent to operate the relevant type of plant. Evidence shall be provided by the specialist to the Principal Contractor to confirm recent experience on similar plant;

NOTE 1: for example, piling rig, drilling rig, handling crane, crane, SPMT, MEWP and similar.

- c) All operatives shall be competent to undertake their tasks. Experience and training records shall be provided by the Contractor for approval by the Principal Contractor prior to start on site.

NOTE 2: Regulation 8 of LOLER requires employers to ensure that every lifting operation is properly planned by a competent person, appropriately supervised, and carried out in a safe manner. The term 'appointed person' is often used to describe the person fulfilling the role of the competent person, who should have adequate practical and theoretical knowledge and expertise in planning the lifting operations being undertaken. The "appointed person" will in general be competent to provide a lift plan (i.e. above foundations/working platform) but may not be competent to provide engineering justification for working platforms. A team approach with designers and TWC(s) is recommended to enable adequate design and coordination for the supporting ground.

NOTE 3: NR Competency requirements for Engineering Assurance roles are provided through NR/L2/RSE/02009. Competency requirements for Engineering Assurance roles for NR Design Engineers (DE) (Buildings & Civils) (B&C) and all Project Engineers (PE) (B&C) is provided through NR/L2/RSE/02009 and NR/L2/CIV/1000/06.

10 Selection of Plant

10.1 Overview

The selection of Plant shall be primarily dependent on the work activity that is to be undertaken. A full understanding by all parties, including but not limited to Network Rail, Principal Designer, designer(s) and Principal Contractor and specialist contractors, of the range of equipment that shall be used and the positions from where it shall operate shall be required to identify those pieces of equipment which could adversely affect the safety of NRMI. Also see clause 6.

10.2 Matters to be reviewed

All equipment brought to site shall bear appropriate UKCA (UK Conformity Assessed) marking, indicating conformity with the relevant European Committee for

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Standardisation (CEN) standard, with relevant supporting paperwork, or CE marking where appropriate, in all cases to be compliance with current legislation/directives.

NOTE: UKCA marking requirements, and CE marking requirements where appropriate, are in a state of flux at date of publication of this standard.

The requirements in the below GOV.uk links, as updated, shall be followed:

[UKCA marking: conformity assessment and documentation - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/ukca-marking-conformity-assessment-and-documentation)

[Construction Products Regulation in Great Britain - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/construction-products-regulation-in-great-britain)

[CE marking - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/ce-marking)

All equipment brought to site shall be in a serviceable condition with documentary evidence of statutory requirements regarding thorough examinations having been complied with.

These documents may include:

- a) The Piling Company's Written Scheme for the Examination of Piling Equipment and Accessories;
- b) Where required, evidence of load testing to BS 7121 and as required by the manufacturer;
- c) A report of thorough examination, dated within one year, or 6-monthly if carrying people, or more frequently, as described within the Company's Written Scheme. Also see clause 10, for where more frequent frequencies are required.
- d) Once the equipment has been erected/assembled/installed into its working configuration: confirmation of "start-up" checks, as described in the Company's Written Scheme;
- e) For all lifting accessories a report of thorough examination within the previous 6 months, or more frequently, as described in the Company's Written Scheme. Also see clause 10, for where more frequent frequencies are required;
- f) Evidence of an appropriate specific pre-delivery plant inspection and any testing required.

All plant and equipment shall be carefully selected with due regard to its history and performance for the operation to be undertaken.

Piling rigs and cranes shall generally be modern hydraulic machines which comply to up to date standards, having been fully inspected, serviced and maintained to regulations and manufacturer's requirements. The machines being offered shall have a full service record and in particular have undergone a 'thorough examination', as defined under Regulation 9 of LOLER.

NOTE: Refer to HSE (and BS7121) for further information.

<https://www.hse.gov.uk/work-equipment-machinery/thorough-examinations-lifting-equipment.htm>

All plant and equipment/ancillaries shall be thoroughly maintained and inspected in accordance with PUWER and LOLER regulations, the operating company's plant and equipment testing procedures and appropriate standards.

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The stability of piling rigs, cranes, and other equipment shall be a main assessment in their selection. This shall be at minimum in accordance with the manufacturer's recommendations, accounting for the requirements in NR/L3/CIV/0063.

When it is possible for the load and boom of a crane or alternative lifting device to encroach within 4 metres on plan from the boundary to NRMI, when lines are open, then the crane shall be fitted with an appropriate MLDs to prevent this from occurring - also see clauses 6.2 and 10.3.

10.3 Levels of control for piling rigs and cranes.

10.3.1 Levels of control.

In certain cases piling rigs & cranes shall be underutilised from their normal rated capacity, and have uplifts to foundation design, together with other requirements, in accordance with the following hierarchy:

10.3.2 Level 1. No risk of collapse or oversail within 4m on plan from the railway boundary (see Figure 1);

Each project shall undertake site and project specific risk assessment to demonstrate that the adopted solution eliminates risks to the operational railway by satisfying the above requirement.

***NOTE:** No underutilisation is needed and no increase to foundation capacity is needed, as there is no risk to operational railway, and normal frequency of thorough examinations apply;*

10.3.3 Level 2; Risk of collapse within 4m on plan from the railway boundary (see Figure 1), with full possession and all lines blocked.

Each project shall undertake site and project specific risk assessment to demonstrate that the adopted solution eliminates or reduces risks so far as is reasonably practicable

Lifting operations shall not be planned over 90% of the rated capacity of the crane, unless approved by the NR Senior Engineer.

Foundation capacity shall be designed for planned maximum design utilisation (not exceeding 90%) uplifted by a factor of 1.1.

***NOTE 1:** With a full possession and all lines blocked, the slewing of loads over NRMI will not normally be permitted, but may be permitted only with the written permission of Network Rail.*

***NOTE 2:** The limit of utilisation not exceeding 90% is taken from COP0011 In limited cases there can be situations where underutilising a crane can result in a solution that introduces more risk, e.g. when there are geometrical restrictions. In such cases approval is required from the NR Senior Engineer.*

10.3.4 Level 3; Risk of collapse within 4m on plan from the railway boundary (see Figure 1), with partial possession and some lines blocked to railway traffic, and with other lines open.

Level 3 provides a myriad of potential scenarios depending on the relative location of plant, compound collapse radius, slewing restrictions, boundaries, location of blocked lines and running lines, location and span type of OLE and location of other assets, amongst other things. Any of these factors might

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affect open or closed lines, all of which shall be carefully determined in order to carry out project specific risk assessment

In level 3, careful consideration shall be made to all infrastructure potentially affected by the failure of the works*. Risk assessment shall consider all appropriate Railway infrastructure. In such cases the slew restrictions shall be set such that the crane / load cannot reach within 4m of the affected infrastructure. If this cannot be achieved, Level 2 shall apply i.e. full possession and line block shall be required.

NOTE: * For instance, OLE which is within reach of collapse on closed lines, might be structurally continuous with OLE which is not within reach of collapse on open lines, hence put at risk the OLE on open lines, which would not otherwise be affected by collapse.

Each project shall undertake site and project specific risk assessment to demonstrate that the adopted solution eliminates or reduces risks so far as is reasonably practicable.

In any scenario where collapse could be closer than 4m of the nearest rail open to traffic, and/or 4m from the live OLE, and/or other equipment which can affect the operational railway, a project specific risk assessment shall be undertaken to determine that risks are eliminated or reduced so far as is reasonably practicable.

In Level 3 the requirements shall differ depending on the positioning of plant with respect to lines which are blocked to traffic or open to traffic, thus:

a) For protection of the lines, where collapse will not affect open lines.

Where the compound collapse radius is not closer than 4m on plan from nearest rail to any line open to traffic, or is not closer than 4m from any other railway infrastructure whose collapse or failure could affect lines open to traffic, the following applies;

NOTE: Infrastructure whose collapse or failure could affect lines open to traffic might include, but is not limited to, track, signalling equipment, level crossing equipment, power supply equipment, OLE, and associated cable runs.

1. Lifting operations shall not be planned over 90% of the rated capacity of the crane, unless approved by the NR Senior Engineer.
2. Foundation capacity shall be designed for planned maximum design utilisation (not exceeding 90% of rated capacity) uplifted by a factor of 1.1.

b) For protection of the lines, where collapse might affect open lines.

Where the compound collapse radius is closer than 4m on plan from nearest rail to any line open to traffic, or is closer than 4m from any other railway infrastructure whose collapse or failure could affect lines open to traffic, the following applies:

NOTE 1: Infrastructure whose collapse or failure could affect lines open to traffic might include, but is not limited to, track, signalling equipment, level crossing equipment, power supply equipment, OLE, and associated cable runs.

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1. Lifting operations shall not be planned over 75% of the rated capacity of the crane, unless approved by the NR Senior Engineer, and use MLDs, e.g. slew restrictors, so no loads within 4m of the live operational railway.
2. Foundation capacity shall be designed for the highest loads applied to the foundation from either the in-service or out of service load cases, uplifted noting the following:
 - a) For tower cranes in service. The load used for the design of the foundation shall be for the crane working at 100% of the rated capacity, (even though lifting operations are limited to maximum 75% of the rated capacity. See note 2.)
 - b) For tower cranes out of service. Highest out of service loads shall be uplifted by a factor of 1.33, for foundation design.
 - c) For other lifting equipment, such as mobile cranes, which do not have a calculated out of service load case, the in-service load cases, (not exceeding 75% of rated capacity) shall be uplifted by a factor of 1.33 for foundation design.

NOTE 2: *Highest in-service foundation load cases might include, but are not limited to, the following examples: forces exerted during rigging, or from wind whilst partially erected, or when loads are carried with reduced utilisation.*

NOTE 3: *From CPA TCIG TIN 031: "...The design brief should include details of the loads that will be applied by the crane to the temporary works. This should include all of the loading cases – for example at each stage of a crane that is climbed as there may be a number of 'worst cases' that are not immediately evident. It should also include the loads from any part of the permanent structure that loads the foundation..."*

10.3.5 Level 4. Collapse within 4 metres on plan from the railway boundary (see Figure 1), with no possession and all lines open to railway traffic;

Each project shall undertake a site and project specific designer's risk assessment to demonstrate that the adopted solution eliminates or reduces risks so far as is reasonably practicable

Lifting operations shall not be planned over 75% of the rated capacity of the crane, unless approved by the NR Senior Engineer, and use MLDs, e.g. slew restrictors, so no loads pass over the live operational railway

In any scenario where collapse could be closer than 4m of the nearest rail open to traffic, and/or 4m of the live OLE, and/or equipment which can affect the operational railway, a project specific risk assessment shall be undertaken to determine that risks are eliminated or reduced so far as is reasonably practicable.

NOTE 1: *Infrastructure whose collapse of failure could affect lines open to traffic might include, but is not limited to, track, signalling equipment, level crossing equipment, power supply equipment, OLE, and associated cable runs.*

Foundation capacity shall be designed for the highest loads applied to the foundation from either the in-service or out of service load cases, uplifted noting the following:

- a) For tower cranes in service. The load used for the design of the foundation shall be for the crane working at 100% of the rated

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capacity, (even though lifting operations are limited to maximum 75% of the rated capacity. See note 2.)

- b) For tower cranes out of service. Highest out of service loads shall be uplifted by a factor of 1.33, for foundation design.
- c) For other lifting equipment, such as mobile cranes, which do not have a calculated out of service load case, the in-service load cases, (not exceeding 75% of rated capacity) shall be uplifted by a factor of 1.33 for foundation design.

NOTE 2: Highest in-service foundation load cases might include, but are not limited to, the following examples: forces exerted during rigging, or from wind whilst partially erected, or when loads are carried with reduced utilisation.

NOTE 3: From CPA TCIG TIN 031: "...The design brief should include details of the loads that will be applied by the crane to the temporary works. This should include all of the loading cases – for example at each stage of a crane that is climbed as there may be a number of 'worst cases' that are not immediately evident. It should also include the loads from any part of the permanent structure that loads the foundation..."

The Designer shall account for 3d environment in undertaking risk assessment*.

NOTE 1: * e.g. embankments or cuttings or deep excavations. In all cases, where there are significant differences in elevation between rail level and the plant, the risk profile might change compared with a flat site.

In all cases a site-specific risk assessment shall be undertaken to determine that risks are eliminated or reduced so far as is reasonably practicable.

NOTE 2: In many cases there can be situations where underutilising a crane can result in a solution that introduces more risk, e.g. when there are geometrical restrictions.

NOTE 3: Figures for mobile cranes are contained within the Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for mobile cranes alongside railways controlled by Network Rail", reference CPA 1801, December 2018. This CPA guidance is under review and due to be republished in 2024. It is intended that this will align with the hierarchy in this standard.

NOTE 4: Figures for tower cranes are contained within the Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for tower cranes alongside railways controlled by network rail", reference CPA 1402, June 2014. This CPA guidance is under review and due to be republished in 2024. It is intended that this will align with the hierarchy in this standard.

Where underutilisation of cranes to either 90% or 75% is required the recommendations of Annex E of BS 7121-1 E5.3 shall be followed for lifting accessories and cranes, with a reduced period between thorough examinations of 3-months for lifting accessories, and 6 months for cranes.

NOTE 5: The requirement in issue 1 of this standard for lifting accessories to be underutilised has resulted in conservative applications due to inherent large factors of safety built into such components. The above requirement has been made in its place, aligning with Annex E of BS7121-1-2016; additional recommendations for operation of cranes on or adjacent to sites of exceptional hazards.

11 Supervision and construction assurance

Projects shall allow for adequate supervision and construction assurance. The following areas shall be reviewed:

- a) Constructability reviews during the design shall include specialist subcontractors, Principal Contractor, designers and Principal Designer to

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provide guidance on viability, capacity and size of units needed for the proposed lift, with lifting plans in place;

- b) There shall be a formal ITP with witness & hold point to review the completed working platform prior to bringing the platform into use;
- c) SPMT movements shall be supervised to assure that the correct controls are in place as well as the correct path is being taken in accordance with the accepted design.

NOTE 1: Supervision and construction assurance helps to enable execution in accordance with the design.

NOTE 2: Also see requirements in NR/L2/RSE/CONM/001 and NR/L2/CIV/003

NOTE 3: Guidance on constructability reviews can be found in NR "Health and Safety by Design Guidance note: Early focus on Constructability and Temporary Works", issue 4; see Appendix C.

12 Additional comments and conditions to be observed in connection with cranes working adjacent to the railway

12.1 General conditions

Where cranes are required to work adjacent to the railway, method statements and risk assessments for crane working shall be provided to Network Rail for review.

These shall include a plan to a suitable scale showing the railway track and boundary in relation to the crane at its maximum working radius and combined collapse radius, together with requirements for underutilisation and increases to foundation loads to clause 10.

Cranes shall be supervised and operated by competent staff.

Lifts shall be carried out under fully supervised conditions.

When a crane arrives on site the Principal Contractor shall:

- a) Check the validity of the report of thorough examination for the machine and its lifting accessories;
- b) Check that operatives are in possession of the appropriate proficiency certificates;
- c) Check there are no hidden hazards below the machine, such as voids or services which might affect operation;
- d) Check that the safe load indicator is working and other pre-use checks have been carried out prior to crane use;
- e) Maintain a register of the lifting equipment and lifting accessories that are in use on the project.

Temporary Works Design and Check Certificates shall be required for all temporary works relating to the use of cranes and piling rigs in the vicinity of the railway.

NOTE: e.g. outrigger supports, working platforms, drainage. Refer to NR/L2/CIV/003.

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12.2 Special conditions for different types of cranes

12.2.1 Mobile cranes

Mobile cranes: (free to travel under own power), should comply with the following

- a) BS 7121-1-2016, BS7121-2 and BS7121-3:2017+A1:2019
- b) CPA Requirements for Mobile Cranes Alongside Railways Controlled by Network Rail; good practice guide December 2018.

NOTE 1: Above CPA guidance is due to be republished in 2024 and it is intended that this will align with the hierarchy in this standard.

For Levels 2, 3 and 4, a work package plan shall be submitted by the Principal Contractor, to NR/L2/OHS/0044 where appropriate*, containing details of crane erection, dismantling and operating procedures, together with drawings associated with the design and design check of any temporary works that might be required and the position of the crane relative to the railway, with all temporary works designs assured to NR/L2/CIV/003.

NOTE 2: * ASPRO Outside Party interface might be required to follow a different, but equivalent, process to NR/L2/OHS/0044 i.e. Risk Assessment / Method Statement submission, review and acceptance in place of WPP etc.

NOTE 3: ASPRO engineers may request, by exception, suitable calculations as part of design submissions, for outside or third party works, in order to assist with ASPRO engineer review.

Precautions shall be undertaken to clause 10, as appropriate to the hierarchy.

NOTE 4: Network Rail's DPE/PE/(B&C) and/or ASPRO Engineers require sufficient time to consider the proposals as defined in contract requirements.

12.2.2 Tower cranes

Tower cranes: (both fixed and luffing jib types), should comply with the following:

- a) BS 7121-1-2016, BS 7121-2 and BS 7121-5:2019
- b) Construction Plant-hire Association CPA TCIG TIN 031 Tower crane technical information note; managing the design, construction and inspection of tower crane bases, grillages and ties;
- c) CPA Requirements for Tower Cranes Alongside Railways Controlled by Network Rail; good practice guide June 2014.

NOTE 1: Above CPA guidance is under review and due to be republished in 2024. It is intended that these will align with the hierarchy in this standard.

For Levels 2, 3 and 4 a work package plan shall be submitted by the Principal Contractor, to NR/L2/OHS/0044 where appropriate *, containing details of crane erection, dismantling and operating procedures, together with drawings associated with the design and design check of any temporary works that might be required and the position of the crane relative to the railway, with all temporary works designs assured to NR/L2/CIV/003.

NOTE 2: * ASPRO Outside Party interface might be required to follow a different, but equivalent, process to NR/L2/OHS/0044 i.e. Risk Assessment / Method Statement submission, review and acceptance in place of WPP etc.

NOTE 3: ASPRO engineers may request, by exception, suitable calculations as part of design submissions, for outside or third party works, in order to assist with review

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No load shall be carried over the railway lines or railway public areas without a possession and line block or a closure of the area.

Where it is necessary to oversail a tower crane's structure within 4m of the NRM1 boundary, when out of service only, the proposals shall be agreed with Network Rail prior to construction commencing via a formal oversailing agreement.

Precautions shall be undertaken to clause 10, as appropriate to the hierarchy.

In all situations where the crane jib can slew closer than 4 metres to the NRM1 boundary, a zoning system shall be used, in accordance with the Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for tower cranes alongside railways controlled by Network Rail", reference CPA 1402, June 2014.

Tower cranes that are supported on kentledge bases shall have the ballast and base configuration as required by the crane's manufacturer, with appropriate underutilisation factors and foundation uplifts as required by Clause 10.

The requirements of Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for tower cranes alongside railways controlled by Network Rail", reference CPA 1402, June 2014, shall be complied with, including (but not limited to) clause 2.0 of that guidance, thus:

2.1; elimination of risk by position,

2.2; reduction of the risk of collapse by restraint, including tying to a structure, and shielding. When using shielding the capability of the structure providing shielding shall be determined (as recommended in BS7121-1-2016 clause E.2.3) and the shielding structure shall be present for the duration of the works.

2.3 reduction of the risk of collapse by configuration, including tower height requirements, under-utilisation of rated capacity and uplifting the base design.

NOTE 4: CPA-1402 guidance is under review and due to be republished in 2024. It is intended that this will align with the hierarchy in this standard

The Principal Contractor shall put in place quality control measures to assure that the tower crane and base/foundations are inspected, tested and certified in accordance with industry standards, and the designers Specification & accepted Inspection and Test plans are assured to NR/L2/CIV/003

NOTE 5: This is to assure that construction in accordance with the design and to assure there is no damage which could affect the integrity of the structure during erection or when in use.

NOTE 6: Network Rail's DPE/PE/(B&C) and/or ASPRO Engineers require sufficient time to consider the proposals as defined in contract requirements.

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Appendix A

A.1 Specific requirements for piling, geotechnical investigations and drilling

Federation of Piling Specialists (FPS) guidance listed in Appendix C contains information and guidance on what is required to be reviewed for:

- a) bored piles (including secant and contiguous piled retaining walls,
- b) Continuous Flight Auger (CFA) Piles (including CFA secant and contiguous piled retaining walls),
- c) Diaphragm walls,
- d) Driven Precast / Steel / Cast-in-Situ Piles,
- e) Driven sheet piles,
- f) grouting,
- g) mini piling,
- h) anchors, and
- i) helical piling.

Works should be carried out in accordance with Federation of Piling Specialists guidance and the Institution of Civil Engineers (ICE) Specification for Piling and Embedded Retaining Walls, third edition.

For further guidance refer to the references in Appendix C.

There are many different types of drilling rigs and techniques available within the industry. It is not possible to provide concise guidance for all these types of geotechnical drilling, which could include (but not limited to):

- a) Cable percussive drilling
- b) Rotary drilling
- c) Window sampling
- d) Dynamic probing
- e) Slope climbing rigs
- f) Cone Penetrometer Testing

For further guidance refer to the references in Appendix C.

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A.2 Specific requirements: Crane operations

The Construction Plant Association (CPA) has published codes of practice for the safe use of mobile cranes and mower cranes in close proximity to the railway. See references.

NOTE; *This CPA guidance is under review and due to be republished in 2024. It is intended that these will align with the hierarchy in this standard.*

Requirements are also provided in Annex E of BS7121-1-2016 and other parts of BS7121.

These codes of practice and standards should be followed at all times, unless otherwise modified by requirements of this standard.

Cranes should be selected according to the lifting duties they are required to undertake and the environment in which those lifting operations will be undertaken. Crane selection should take cognisance of the appropriate crane underutilisation rating and requirements to increase foundation loadings that need to be applied in certain circumstances. Matters that should be reviewed are:

- a) Ground Conditions and load bearing capacity;
- b) Safety critical infrastructure such as signalling systems;
- c) Proximity to operational railway;
- d) Risk of oversailing third party premises;
- e) Third party overhead power lines;
- f) Other railway infrastructure;
- g) Buried Services.

All cranes should be provided with a valid thorough examination, as required under LOLER and BS7121-2-1 8.3.3, with a copy of the report of thorough examination carried in the cab of the machine.

All lifting operations should be planned and supervised by appropriately competent persons as required under LOLER.

A site survey should be undertaken at the planning stage.

The risk of cranes and any suspended loads fouling the operational railway should be reviewed at the planning stage and where the risk is present, appropriate control measures such as physical barriers or movement limiting devices should be implemented to prevent it.

All cranes and associated lifting accessories should be regularly maintained and inspected in accordance with the Original Equipment Manufacturer's recommended maintenance procedures and the requirements of LOLER and PUWER.

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A.3 Specific requirements: SPMT operations

The European Association of Abnormal Road Transport and Mobile Cranes (ESTA) Best Practice Guide for Self-Propelled Modular Transporters (SPMT) is considered good guidance and should be followed on SPMT operations on Network Rail projects. Refer to references in Appendix C.

Examples of good practice from this document are below and should be read with the recommendations in that guide.

Key design criteria for the SPMT system are:

- a) Gross load;
- b) Centre of gravity;
- c) Permissible points of loading;
- d) Inclines and/or declines in the route;
- e) Road camber;
- f) Allowable ground bearing pressures.

Key questions for designers to address for the SPMT system are:

- a) How will the SPMT support the load and what does this support case to the load in this temporary stage?
- b) How will the load be distributed from the SPMT back onto the ground?
- c) What is the stability of the entire arrangement?
- d) What are the dynamic forces to be considered into the SPMT arrangement and into the load?
- e) What is the transport distance and route? (flat / sloped / camber).

All SPMTs work on similar principles but different makes and brands have different properties to take into account so guidance should be obtained from the chosen specialist supplier.

The designers should take into account all effects of the temporary works on the permanent works.

Various aspects should be reviewed by the designer, including, but not limited to:

- a) Gross load;
- b) Centre of gravity;
- c) Permissible points of loading;
- d) Inclines and/or declines in the route;
- e) Road camber;
- f) Allowable ground bearing pressures.

Method-led designs where the construction method has a significant influence on the design, such as bridge installation by launching, sliding or Self-Propelled Modular Transporter (SPMT) require assessment by the design team. In such cases the

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support conditions and load paths can change significantly during the construction process. The Permanent Works Designer should work closely with the Temporary Works Designer as well as those responsible for construction to check that all critical conditions for the installation are confirmed.

Key assumptions and requirements of the Temporary Works Design should be clearly communicated to construction workers and in a way that they can easily understand. This could be achieved by:

- a) Coordination between Designers, Contractors, Principal Contractor and Principal Designer;
- b) Using ERIC principles: eliminate, reduce, inform, control;
- c) Use warning triangles on drawings for particularly critical items;
- d) Incorporating Temporary Works Design assumptions and requirements (such as hold / check points) on the drawings. This may be via the Pre-Construction Temporary Works Schedule;
- e) Incorporating Temporary Works Design assumptions and requirements (such as hold / check points) within project specific Work Package Plan(s);
- f) Preparation of outline Inspection and Test Plans for control of Temporary Work designs. The outline ITP may include hold / check points for inspection. The TWC has responsibility to develop the final ITP for endorsement by the CEM;
- g) Using a Task Briefing to communicate the Temporary Works Design to construction workers.

The ESTA guidance illustrates two “degrees” or levels of engineering. The most appropriate level should be chosen on a site-specific basis by the designer.

SPMT operators should be responsible for the design of the swept path in conjunction with the working platform designer, accounting for the following:

- a) The horizontal and vertical tolerances of the SPMT are best understood by the SPMT operator. As such the SPMT operator should produce a swept path analysis of the proposed move;
- b) The swept path should inform the design of the proposed working platform. Both in terms of the spatial extent of the working platform, but also areas likely to suffer significant damage/wear due to wheel turns and slewing;
- c) The swept path should have setting out points and be physically marked out on site so that the operator has a clear path to follow. This is necessary, as the swept path might have been deliberately designed to avoid poor ground conditions, buried services or other unseen hazards which may not be obvious to the operator on the day of the move.

NOTE: for example, barriers, cones, road spray.

SPMT working platforms are not haul roads, and should be treated similar to crane working platforms or unbound highways;

- a) SPMT rolling surfaces should be flat (or any vertical deviations designed into the movement in advance);

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- b) As SPMTs roll on wheels, not tracks, the surface should be suitable not only for the load, but for a wheeled vehicle which has a much lower tractive capacity than standard construction traffic;
- c) A trial move under full load is recommended over a representative distance. This should be witnessed by the working platform designer and contractor, and observations made on the performance of the working platform under load;
- d) The performance of the working platform is critical to an effective and safe SPMT move. As such all materials used should be selected, stored, placed, compacted and tested rigorously and in accordance with the design. There should be a suitably knowledgeable person on the site team to check that the specification, which may be based on the Highways England Specification for Highway Works (HE/SHW) is understood and followed.

For repairs to working platforms, stockpiles of material should be avoided where possible, with clean stone (class to be specified by the designer) available at short notice being the preferred option.

Where stockpiles are unavoidable, they should be protected from water ingress and tested prior to use to check that the material is still in accordance with the specification provided by the working platform designer and in the SHW. Depending on the time of year, weather and material type, various options exist for stockpile protection. Examples include:

- a) Maintaining windrows with sealed and bladed batters;
- b) Covering stockpiles with plastic sheeting;
- c) Capping with an impermeable layer (clay for example).

Single sized stone (for example, ballast or pea gravel) is far less susceptible to deterioration through water ingress, whereas a Class 1a stone, which contains fines, would need more care. The Designer and Contractor should confirm the most appropriate material, given a preference for less sensitive material, in the design.

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Appendix B Typical Diagrams for piling rigs and cranes

B.1 Piling rig arrangements

The figures in the previous version of this standard have been removed in favour of the requirements and narrative in this issue.

Working platform shall be constructed and maintained throughout the duration of the works, in accordance with the specification, ITPs and the requirements of this standard

Artificial stability aids shall not be used.

B.2 Mobile crane and tower crane figures

Typical figures for mobile cranes are contained in the following:

- a) BS7121-1:2016; CoP for safe use of cranes.
- b) BS7121-3:2017 +A1:2019; CoP for safe use of cranes; Mobile cranes.
- c) the Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for mobile cranes alongside railways controlled by Network Rail", reference CPA 1801, December 2018.

NOTE 1; Above CPA guidance is under review and due to be republished in 2024. It is intended that this will align with the hierarchy in this standard

Figures for tower cranes are contained in the following:

- a) BS7121-1:2016; CoP for safe use of cranes.
- b) BS7121-5:2019; CoP for safe use of cranes; Tower cranes.
- c) the Construction Plant-Hire Association (CPA) Good Practice Guide "Requirements for tower cranes alongside railways controlled by network rail", reference CPA 1402, June 2014.

NOTE 2; Above CPA guidance is under review and due to be republished in 2024. It is intended that this will align with the hierarchy in this standard

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Appendix C References to typical applicable guidance

Listed below are references to typical applicable guidance which users should take into account in undertaking piling, drilling, crane, MEWP, SPMT and other operations on, or adjacent to, NRMI. They are not exhaustive, are correct at publication date and are subject to continuous updates. In each case the most up to date information should be utilised.

This guidance should be followed unless otherwise noted in this standard.

General

All temporary works should be managed to BS5975:2019 by a Temporary Works Coordinator; refer BS5975 “Code of practice for Temporary Works procedures and the permissible stress design of falsework”

RSSB Code of practice for planning and executing lifting operations; COP0011.

This Code of Practice concerns all lifting operations involving rail cranes, twin jib cranes, road-rail excavator cranes, and vehicle mounted knuckle boom cranes such as lorry loader cranes. This Code of Practice also concerns vehicle mounted lifting arms/gantries, Switches & Crossings panel lifting equipment and rail mounted gantries.

The Code of Practice also applies where road mobile cranes and lorry loader cranes are used, or have the possibility to encroach, “on or near the line” (as defined in the Rule Book).

NOTE: This Code of Practice does not apply to MEWPs, which are covered by COP0024.

RSSB Code of Practice for Plant Any Line Open (ALO) Working; COP0032.

This Code of Practice provides guidance on how to safely manage Plant Any Line Open (ALO) working.

NOTE: for other RSSB Codes of Practice refer to the RSSB standards catalogue.

NOTE; Links below are current at publication date.

ICE book “Temporary Works; principles of design and construction; second edition” 2019

<https://www.icevirtuallibrary.com/doi/book/10.1680/twse.63389>

For example, refer to section 5 on Working Platforms, section 20 on Heavy Moves and section 27 on bridge installation techniques.

Temporary Works Forum TW17.037.10.9.17, updated 9.1.2019; Principles for the management of temporary loads, temporary conditions and temporary works during the construction process (TW17.037)

<https://www.twforum.org.uk/viewdocument/principles-for-the-management-of-te>

Temporary Works Forum TWf2020.02. Constructability: A guide to reducing temporary works, October 2020

<https://www.twforum.org.uk/viewdocument/constructability-a-guide-to-reduci>

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Health and Safety by Design guidance.

<https://safety.networkrail.co.uk/safety/prevention-through-engineering-and-design/safe-by-design-groups/building-and-civils/>

In particular refer to the Health and Safety by Design Early Focus on Constructability and Temporary Works Guidance, V4 dated November 2023, which gives numerous examples of Good Practice and Lessons Learnt regarding temporary works and temporary conditions.

British Constructional Steelwork Association guide to the management of site lifting operations' Publication 47/09

https://www.steelconstruction.info/images/8/8a/BCSA_47-09.pdf

Working platforms

BS EN 1997-1 & National Annex; Geotechnical design

NR standard NR/GN/CIV/208 Ground Investigation Guidance Note.

Temporary Works Forum TWf2019.02. Working Platforms; Design of granular working platforms for construction plant; A guide to good practice, April 2019. This guidance is undergoing a full update for publication in 2024.

<https://www.twforum.org.uk/viewdocument/working-platforms-design-of-granu>

NOTE; Above TWf guidance is due to be republished in 2024.

Working platforms for tracked plant; BRE470, 2004

<https://www.brebookshop.com/details.jsp?id=146429>

Working platforms for tracked plant; alternative design approach, November 2015

<https://www.icevirtuallibrary.com/doi/abs/10.1680/ecsmge.60678.vol3.202>

Joint EFFC/DFi Guide to working platforms, first edition, January 2020

<https://www.effc.org/the-effc-dfi-guide-to-working-platforms/>

Federation of Piling Specialists (FPS) guidance.

<https://www.fps.org.uk/guidance/working-platform-guidance/>

Piling, geotechnical investigations and drilling

Federation of Piling Specialists guidance.

<https://www.fps.org.uk/>

<https://www.fps.org.uk/guidance/safety/>

<https://www.fps.org.uk/guidance/plant-guidance/>

<https://www.fps.org.uk/guidance/piling-specification/>

ICE Specification for Piling and Embedded Retaining Walls, Third edition, (SPERWall)

<https://www.icevirtuallibrary.com/doi/book/10.1680/icesperw.61576>

The Association of Geotechnical and Geoenvironmental Specialists (AGS)

<https://www.ags.org.uk/>

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British Drilling Association (BDA) including BDA manual for rotary drilling and BDA Health & Safety manual for land drilling 2015; a code of safe drilling practice.

<https://www.britishdrillingassociation.co.uk/>

Cranes (mobile cranes and tower cranes)

Construction Plant-hire Association (CPA) tower crane publications

<https://www.cpa.uk.net/safety-and-technical-publications/tower-crane-guidance>

Crane Interest Group (CIG) Publications & Guidance:

<https://www.cpa.uk.net/special-interest-groups/crane-interest-group>

Construction Plant-hire Association CPA TCIG TIN 031 Tower crane technical information note; Managing the design, construction and inspection of tower crane bases, grillages and ties.

CPA Requirements for Tower Cranes Alongside Railways Controlled by Network Rail; good practice guide June 2014

NOTE 1: Above CPA guidance has been prepared to provide clarity about oversailing of Network Rail infrastructures by tower cranes due to the inherent risks to Network Rail operations, personnel, the travelling public etc. Where there is risk of collapse onto the railway, and/or where it is necessary to carry out lifting operation over or adjacent to a live railway, Network Rail infrastructure or railway public areas, Network Rail should be consulted at the earliest stage of planning. They will then determine the measures required, which may well include a railway possession and, if appropriate, isolation for which the lead time will be considerable

NOTE 2; Above CPA guidance is under review and due to be republished in 2024. It is intended that these will align with the hierarchy in this standard

CPA 1801; CPA good practice guide: Requirements for Mobile Cranes Alongside Railways Controlled by Network Rail; December 2018

NOTE 1: Above CPA guidance has been devised to provide guidance on the use of mobile cranes alongside the railway with input and consultation undertaken with Network Rail. The requirements outlined in the document should be adhered to in preventing a potential catastrophic incident and applies to temporarily installed equipment such as wheeled and crawler cranes as well as lorry loaders, mini/compact cranes, truck-mounted self-erecting tower cranes, telehandlers and excavators used for lifting suspended loads. The guide does not introduce any additional requirements and is aimed at producing an easily accessible document endorsed by Network Rail. Where there is risk of collapse onto the railway, and/or where it is necessary to carry out lifting operation over or adjacent to a live railway, Network Rail infrastructure or railway public areas, Network Rail should be consulted at the earliest stage of planning. They will then determine the measures required, which may well include a railway possession and, if appropriate, isolation for which the lead time will be considerable.

NOTE 2; Above CPA guidance is under review and due to be republished in 2024. It is intended that these will align with the hierarchy in this standard

CIRIA C761; Guide to tower crane foundations and tie design Jan 2019

<https://www.ciria.org/ItemDetail?iProductcode=C761&Category=BOOK>

CIRIA C703D- Crane stability on site, 2nd edition.

<https://www.ciria.org/ItemDetail?iProductCode=C703D&Category=DOWNLOAD>

NOTE; Designer should choose most appropriate Factor of Safety from the choices in the above document to reduce risks SFAIRP.

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MEWPs

Network Rail's standard the Infrastructure Plant Manual - NR/L2/RMVP/0200 Module P508 Mobile Elevating Work Platforms gives guidance on the safe loading and operation of MEWPs and should be followed at all times.

BS 8460:2017 – code of practice for the safe use of MEWPs

NOTE: BS8460 is *being updated at date of publication of this standard*.

RSSB Code of Practice for Use and Loading of MEWPs COP0024

This Code of Practice details the use of MEWPs, particularly with processes for loads that should safely be permitted in the work platform of a MEWP. The use of work restraint anchor points. Getting in and out of the work platform at height. Emergency Recovery and misuse.

<https://www.rssb.co.uk/standards-catalogue/CatalogueItem/cop0024-iss-7>

HSE General Information Sheet Nr 6; the selection management and use of MEWPs.

[Selection and management of mobile elevating work platform in construction GEIS6 \(hse.gov.uk\)](#)

SPMT

ESTA Best Practise guide for SPMT

<https://estaeurope.eu/wp-content/uploads/2021/07/ESTA-BPG-SPMT-UK.pdf>

Concrete Bridge Development Group technical guidance.

<http://www.cbdg.org.uk/publications-technical-guides.asp>

US Federal Highway Administration manual on the use of SPMT; June 2007

<https://www.fhwa.dot.gov/bridge/pubs/07022/chap00.cfm>

This document gives further useful guidance on SPMT moves.

Concrete Bridge Development Group (CBDG) Technical Guide 16, Temporary Works for Concrete Bridges guidance, which has a small section 12 on offline construction and SPMT moves.

Steel Construction Information specialist transport link

https://www.steelconstruction.info/Design_for_steel_bridge_construction#Specialist_transport

SPMT learner design and specification guide

https://www.anstertrailer.com/spmt-self-propelled-modular-transporter-design-specifications/#11Applications_of_SPMT

Temporary Works Forum, SPMT brief guide

<https://www.twforum.org.uk/viewdocument/self-propelled-modular-transporters>

Standard and control document briefing note

Ref: NR/L3/CIV/0063	Issue: 2
Title: Piling, Drilling, Crane, MEWP, SPMT and similar plant operations, on or adjacent to the Railway	
Publication date: 1 June 2024	Compliance Date: 7 September 2024
Standard/Control Document Owner: Ian Brookes, Chief Engineer, Building & Civils	
Technical lead/contact for briefings: Steve Williams Engineering Expert Capital Delivery Buildings & Civils	Tel: 07515 628428
Purpose: This standard addresses risks where piling, drilling, crane, mobile elevated working platform (MEWP), self-propelled modular transport (SPMT) and similar temporary works operations* are taking place on, or adjacent** to, Network Rail Managed Infrastructure (NRMI). NOTE 1: * Similar temporary works operations might include, amongst other things, construction hoists, transport platforms, mast climbing work platforms, telehandlers, rotating telehandlers, excavators undertaking suspended load lifting operations, lorry loaders, and mobile concrete pumps with placing booms. NOTE 2: **See definition for “adjacent to” in clause 4 of the standard. This standard supports a safe system of work, relating to the piling, drilling, crane, MEWP, SPMT and similar temporary works operations, that maintains the safety of the railway so far as is reasonably practicable, in conjunction with other standards. This standard outlines modern methods and procedures in order that the risk of undertaking operations on, or adjacent to, NRMI can be minimised to the extent that works may be progressed as far as practicable without resorting to possessions and electrical isolation. This standard sets the requirements to be applied whenever piling, drilling, crane, MEWP, SPMT or similar temporary works operations are to be carried out on, or adjacent to, NRMI where, in the event of mishandling or failure, any part of the equipment in use or its load might collapse within 4m of the boundary to NRMI. Measures include, but are not limited to, accounting for: - hierarchy of risk, - appropriate design check category, - appropriate under-utilisation of capacity, - appropriate measures for uprating loads, - appropriate measures to prevent slewing, - provision of tagging or similar measures, - appropriate measures for the provision of adequate working platforms, to support all plant and equipment covered by this standard.	Scope: This standard applies to all piling, drilling, crane, MEWP, SPMT and similar temporary works operations to be undertaken on, or adjacent to, Network Rail Managed Infrastructure, including that which has been designated a High Street Environment, where applicable. The standard applies to piling, drilling, crane, MEWP, SPMT and similar temporary works operations where the safety of the operational railway might be affected as a consequence of: - Plant operator or workforce error; - The failure of the ground/working platform/mats supporting the piling rig, crane or other supported equipment; - Equipment or accessory failure; - Inadequate interaction with the existing ground (including vibration, displacement and loosening affects); - Failure within compound collapse radius of the attendant crane(s) and load(s). - Failure when in service or out of service, - Failure during erection or deconstruction, - Failure during inclement weather. This standard covers the safe installation and removal of piles and working platforms but not the effect of piles and working platforms on the infrastructure. This standard does not cover “on or near the line” operations e.g. use of On Track Plant (OTP). This standard is complementary to, and should be read with, the following standards: - NR/L2/RMVP/0200 Infrastructure plant manual, including (but not limited to) Module P513 - Mobile plant (non-rail mounted) and road vehicles, Module P503 lifting operations and Module P508 MEWPs; - Mechanical & Electrical Engineer (M&EE) Networking Group standard COP0011 code of practice for planning and executing lifting operations; - M&EE standard COP0032 code of practice for plant any line open (ALO) working. This standard is applicable to all projects where, in the event of mishandling or failure, any part of the equipment in use, and not in use (i.e. out of service), or its load, might collapse within a line drawn 4 metres (4m) to the outside of the boundary to Network Rail Managed Infrastructure, notwithstanding whether the works are for the railway infrastructure itself or for structures / developments adjacent to the railway. See Figure 1. It applies to designers and executors of works, of both Network Rail and Outside Party / Third Party constructors/developers. NOTE 1: The intention is for these parties to understand at an early stage the constraints imposed on the design solution selected. This standard does not cover signal sighting, radio signals and Overhead Line Equipment (OLE) implications, nor specialist equipment such as On Track Plant, Jack-Up-Barges, pontoons or cranes on waterways. In such cases specialist advice will need to be sought. NOTE 2: NR/L3/OHS/005, Work Instruction; Design and Construction Management in a High Street Environment, is for projects where there is no effect on NRMI. Standard NR/L3/CIV/0063 will apply, unless those

persons determining whether a project comes within the scope of NR/L3/OHS/005 confirm in writing that there are no risks to NRMI.

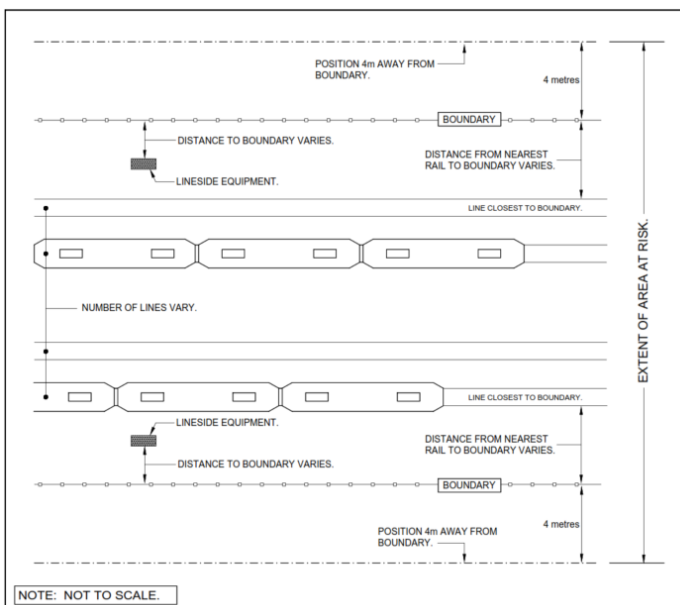


Figure 1. This illustrates a typical layout of NRMI, with positions drawn 4 metres (4m) outside the boundary to NRMI, with all areas between at risk.

What's new, what's changed and why

- Title of standard amended to align with revised scope, relating to operations on or adjacent to the railway.
- Provision of figure 1 illustrating all areas of NRMI at risk from the operations covered by the standard.
- Amendments to close out Post Implementation Review feedback on issue 1 of the standard, informal & formal standards challenges, and variations pending standard change. The amendments address Standards challenges STD000215 (relating to the definition of Working Platform) and CHL/37 (relating to requirements for use of stays or twin masts for tower cranes)
- Changes following liaison with the Construction Plant-hire Association (CPA) so that requirements in the standard are aligned with documents published by the CPA.
- Removal of the need to design platforms for maximum crane/rig capacity, in favour of maximum utilisation, with utilization limits and foundation uplift depending on circumstances.
- Alignment to Annex E of BS7121-1-2016; additional recommendations for operation of cranes on or adjacent to sites of exceptional hazards,
- Removal of need to use stays or twin masts to tower cranes,
- Hierarchy updated to include part lines blocked for these type of operations.
- Uprating of lifting accessories removed in favour of increased inspection frequency,
- Removal of requirement for certain plant not to exceed 7 years old
- Minor amendments.

Network Rail has worked collaboratively with the Construction Plant-hire Association, members thereof, High Speed 1 and others, to make improvements to this standard. This serves the primary function of aligning the document across industry stakeholders.

Network Rail has also accounted for informal and formal feedback and challenges made on issue 1, all of which have been accounted for in issue 2.

This standard offers further efficiencies, and is aligned to the principles of Project Acceleration in a Controlled Environment (PACE) and Swift, Pragmatic and Efficient Enhancement Delivery (SPEED), without diluting the need to robustly, and safely, design, check, assure and execute works of building and civil engineering, on or adjacent to, and which might affect, NRMI.

Affected documents

Reference	Issue	Impact	Document type
NR/L3/CIV/0063	1	Supersede	Standard

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? No

Briefings are given to those who have specific responsibilities within, or are directly affected by, this standard/control document.

A copy of the detailed briefing will be available from the Standards & Controls intranet site or the Network Rail Standards & Controls portal.

Requirements to cascade briefings are described within any implementation plans.

Briefing (O-Overview/ D-Detailed)	Post	Function	Responsible for cascade briefing? Y/N
D	Regional Head of Engineering & Asset Management [Civils]	Scotland Region	Y
D	Network Technical Head Structures	Technical Authority	Y
D	Regional Engineer [Buildings & Civils]	North West & Central Region	Y
D	Regional Head of Engineering & Asset Management [Build&Stcs]	Wales & Western Region	Y
D	Regional Engineer [Buildings & Civils]	Eastern Region	Y
D	Regional Engineer [Permanent Way]	North West & Central Region	Y
D	Regional Head of Engineering & Asset Management [Tk,Ge DnLn]	Wales and Western Region	Y
D	Head of Engineering [Eng Mgmt]	Scotland Region	N
D	Head of Engineering [Eng Mgmt][Southern]	Southern	N
D	Head of Engineering [Capital Delivery]	North West & Central Region	N
D	Head of Engineering [Eng Mgmt][Wales & Western]	Wales and Western Region	N
D	Head of Engineering [Capital Delivery]	Eastern	N
D	Head of Construction Management & ASPRO	Technical Authority	Y
D	Programme Manager (Delivery Services)	Route Services	Y
D	Network Technical Head Plant	Technical Authority	N
O	Director Engineering & Asset Management, Southern	Southern Region	N
O	Director Engineering & Asset Management, Wales & Western	Wales & Western Region	N
O	Director Engineering & Asset Management, North West & Central	North West & Central Region	N
O	Director Engineering & Asset Management, Scotland	Scotland	N
O	Director Engineering & Asset Management, Eastern	Eastern Region	N
O	Chief Buildings & Civils Engineer	Technical Authority	N
O	Network Technical Head Plant	Technical Authority	N
O	Network Technical Head Traction & Rolling Stock	Technical Authority	N
O	Network Technical Head System Compatibility	Technical Authority	N
O	Network Technical Head Contact Systems AC/DC	Technical Authority	N
O	Network Technical Head Power Distribution HV/LV	Technical Authority	N
O	Network Technical Head Buildings & Architecture	Technical Authority	N
O	Network Technical Head Drainage & Off-Track	Technical Authority	N
O	Network Technical Head Geotechnical	Technical Authority	N
O	Network Technical Head Mining & Tunnels	Technical Authority	N
O	Network Technical Head Structures	Technical Authority	N
O	Network Technical Head Switches & Crossings	Technical Authority	N
O	Network Technical Head Track	Technical Authority	N
O	Network Technical Head [Telecoms]	Technical Authority	N
O	Network Technical Head Level Crossings Engineering	Technical Authority	N
O	Network Technical Head Signalling	Technical Authority	N

D	Senior Engineer [Buildings & Civils]	Technical Authority	N
D	Principal Engineer [Buildings & Civils]	Technical Authority	N
Briefing (O-Overview/ D-Detailed)	Role	Function	
D	Project Engineering (Buildings & Civils) (B&C) All roles	All	
D	Design Engineering (B&C) All roles	All	
D	ASPRO engineering (B&C) All roles	All	
D	Lead Discipline Engineers (B&C) All roles	All (To Cascade)	
O	Programme and project management All roles	All	
O	Asset Management (B&C)	All	
O	Commercial	All	
O	Sponsorship	All	
O	Construction Management	All	

NOTE: Contractors are responsible for arranging and undertaking their own Detailed and Overview Briefings in accordance with their own processes and procedures.