

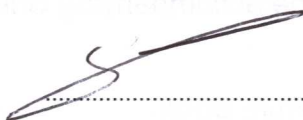
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## Level 3

# Piling adjacent to the running line

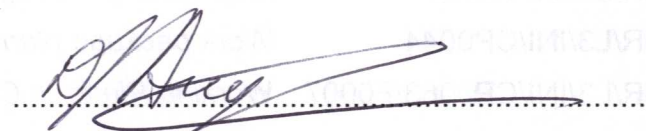
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## Issue record

Issue	Date	Comments
1	March 2010	First issue

## Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 05/06/2010.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

## Reference documentation

GE/RT8000	<i>Rule Book</i>
NR/SP/CIV/003	<i>Technical Approval of Design, Construction and Maintenance of Civil Engineering Infrastructure</i>
NR/L2/INI/02009	<i>Engineering Management for Projects</i>
NR/L3/INI/CP0044	<i>Work package plan process</i>
NR/L3/INI/CP0063/F0007	<i>Working Platform Certificate</i>
NR/L2/EBM/088	<i>Responsibility for the maintenance of changes assets</i>
NR/L1/AMG/1010	<i>Policy on working safely in the vicinity of buried services</i>
NR/BS/LI/045 (Issue 3)	Monitoring track over or adjacent to Civil Engineering works: procedure and intervention levels.

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## Introduction

The following methodology addresses the situation where piling operations are taking place adjacent to railway infrastructure that is operating normally. It is advised that only competent Piling Specialists companies should be used to undertake works adjacent to a live operational railway i.e. whilst trains are running. This standard has been developed in order to generate a safe system of work (relating to the piling operation) that maintains the safety of the railway so far as is reasonably practicable.

This standard has been prepared by Network Rail in conjunction with the Federation of Piling Specialists and defines the minimum standards and considerations for all piling works to be undertaken adjacent to an operational railway. It is also intended to assist designers and operational teams, of both Network Rail and outside party constructors/developers, involved in this type of construction to understand at an early stage the constraints imposed on the design solution selected.

Further, this document outlines modern methods and procedures in order that the risk of undertaking piling operations adjacent to an operational railway can be minimised to the extent that works may be progressed as far as practicable without resorting to possessions and electrical isolation.

## 1 Purpose

This document is mandatory and sets the minimum standards and processes to be applied whenever piling operations are to be carried out on or adjacent to Network Rail's Operational Infrastructure where, in the event of mishandling or failure, any part of the equipment in use or its load may fall within 3m of Network Rail's infrastructure during normal train operations.

This document covers the safe installation of piles and not the effect of piles on the infrastructure.

## 2 Scope

This standard applies to all piling operations adjacent to the operational railway and does not cover on **or near the line** piling operations.

The contents of the document are applicable to all projects where, in the event of mishandling or failure, any part of the equipment in use, or its load, may fall within 3 metres of the nearest rail of Network Rail's operational infrastructure, notwithstanding whether the works are for the railway infrastructure itself or for structures / developments adjacent to the railway.

This document does not cover Signal sighting, radio signals and OLE implications.

The document specifically considers piling works where the safety of the operational railway may be affected as a consequence of:

- a) Plant operator or workforce error.
- b) The failure of the ground supporting the piling or support equipment.
- c) Equipment or accessory failure.

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- d) The piling system and its interaction with the existing ground (including vibration, displacement and loosening affects).
- e) Collapse radius of the attendant crane(s).

### 3 Abbreviations

#### **BRE**

Building Research Establishment

#### **DPE**

Network Rail's Designated Project Engineer

#### **LOLER**

Lifting Operations and Lifting Equipment Regulations 1998

#### **OLE**

Overhead Line Equipment

#### **PUWER**

Provision and Use of Work Equipment Regulations 1998

### 4 Definitions

#### **Adjacent**

For the purpose of this standard adjacent refers to piling works being undertaken in areas defined as 'on the line side and/or 'high street environment.

#### **Ancillary Plant**

All Plant (apart from the Piling Rig that is addressed separately) involved in the piling process (e.g. crane, concrete pump, RRV (Road Rail Vehicles etc).

#### **Asset Management Plan**

A documented agreement between a project and the maintainer produced in accordance with NR/L3/EBM/089.

#### **Competent Person**

An individual engaged in the Piling work who is recognised by the organisation requiring the task(s) to be carried out as having sufficient training, knowledge and experience to complete the task(s) safely and efficiently.

#### **Form C**

A certificate of Design and Checking of Temporary Works as defined in Network Rails Technical Approval Process.

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### **High Street Environment (in the Network Rail context)**

A 'High Street' environment in the Network Rail context is a site of work outside Network Rail managed infrastructure (NRMI) which may be created at a station, structure or depot where safety risks arising from the work cannot be transferred to NRMI or to activities carried out on it. The site is segregated from NRMI by a physical barrier or a Site Keeper.

### **Isolation**

Electrical isolations of the AC Overhead Line Equipments and/or DC 3<sup>rd</sup> Rail. The isolation certificate forms part of the Safe System of Work.

### **Method Statement (does not apply to Network Rail delivered projects see WPP)**

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 will be in accordance with the Design.

### **Lifting Accessories**

Devices temporarily attached between lifting equipment and the load being raised or lowered, i.e. equipment by which a load is suspended, for example slings and shackles. Lifting accessories shall be noted in Lift Plans.

### **Lifting Equipment**

Mechanical equipment used for lifting or lowering loads (e.g. cranes).

### **On or near the line**

- a) within 3 metres of the nearest rail
- b) on the line itself

### **On the lineside**

- a) between the railway boundary fence and the point that is called
- b) on or near the line and
- c) in view of the driver of any approaching train or movement.

### **Piling**

The installation of bearing, friction and lateral-restraint (wall) piles. For the purposes of this document, this includes, but is not limited to, the following piling techniques: Continuous Flight Auger, Rotary Bored, Driven Cast-In-Situ, Driven Pre-cast Concrete, Driven Steel Sections, Auger Displacement and Helical Type (screw) piles and ground improvement piles e.g. soil mixing. Additionally retaining wall techniques including Diaphragm Walling, Secant and Contiguous Pile Walling, and Sheet Piling are included. The relevance of this document to other piling systems such as mini-piling, soil nailing and soil anchors, requires consideration on a project by project basis due, typically, to the smaller scale of equipment involved.

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### **Piling Accessories**

Specialist equipment used in the piling process eg casings and chisels.

### **Piling Platform**

The designed surface on which the Piling Rig and Ancillary Plant is supported and operated.

### **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. A possession can contain one or more work sites belonging to one or more project.

### **Protection**

Protection is a process of allowing limited access on or about the railway, either by stopping train movements or working between train movements to allow certain activities to take place. To set up a protected system of work extensive planning will be required and could typically be up to 1 year ahead of the works.

### **Spoil**

Soil and waste arising from the piling operation.

### **Sprag**

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. This includes description of the work, risk assessments and/or Risk Control Sheets, process, interfaces, competencies, and equipment.

## **5 Selection of the Piling Method**

### **5.1 Introduction**

In order that the most appropriate solution can be identified at the earliest opportunity and prior to finalising the design concept, it is recommended that advice is sought from a piling specialist.

In particular it is noted that the method finally selected shall not only be safe to construct, in particular with respect to the operational railway, but also be appropriate for the geotechnical/soil conditions existing at the particular site.

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## **5.2 Design Check and Acceptance**

All piling platforms shall require a Category 3 design check and shall be in accordance with the requirements of Network Rail's Technical Approval Process or the equivalent Technical Approval Process of similar bodies for outside parties schemes.

All piling methodologies are subject to Network Rail's acceptance and shall be in strict compliance with this document.

## **5.3 Factors to be Considered**

### **5.3.1**

Ground conditions.

### **5.3.2**

Available working space and access to the site.

### **5.3.3**

Location of Network Rail infrastructure, particularly if it may be sensitive to the works to be undertaken.

### **5.3.4**

Limitations to movement (lateral, heave or settlement), these being specified at an early stage, together with any noise and/or vibration limits, as these will have an ultimate bearing on the method selected. It is noted that the effects of vibration are particularly important where driven, displacement or vibratory piling techniques are being proposed.

### **5.3.5**

The effects of ground displacement and/or soil loosening.

### **5.3.6**

The frequency and speed of trains can in certain situations be considered to be a factor. This can also include standing trains adjacent to the works, for example in sidings or platforms.

## **6 General Requirements**

### **6.1 Introduction**

The piling contractor shall demonstrate to the Principal Contractor and/or Network Rail, that they have the capability to carry out the work. The piling contractor shall provide evidence of a commitment to carry out the work safely, of having management competence, relevant experience and adequate resources, together with the ability to undertake the work in accordance with the requirements of this document and the ability to produce a methodology which is acceptable to the Principal Contractor and/or Network Rail.



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## 6.2 Factors to be Addressed

*NOTE: The actual methods by which movement, noise and vibration are monitored before, during and after the piling works, including the monitoring of adjacent structures and the railway tracks are not part of this document.*

### 6.2.1 Review of requirements

In undertaking a review of the general requirements, the Principal Contractor in conjunction with the Piling Contractor and Network Rail shall consider the factors 6.2.2. to 6.2.9.

### 6.2.2

The management and planning of the site area shall include the arrangements for all of the ancillary operations (e.g. off-loading of materials, reinforcement fabrication areas, pile storage areas, drilling fluid (bentonite) plant, accommodation units).

### 6.2.3

An appropriate protection shall be placed between the piling operation and the track. This may simply take the form of a fence/barrier designed to prevent personnel straying on to the tracks. Alternatively in situations where the piling 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.

### 6.2.4

Action shall be taken to prevent the over-sailing of the railway infrastructure and specifically prevent encroachment within 3 metres of the nearest rail, by any crane and its load attendant to the piling rigs. Slew restrictors shall be utilised that will limit the arc of rotation in their working position. These may be electronic, hydraulic or mechanical. Cranes may operate with their boom either facing away from the running line, parallel to it or slightly obliquely provided that the collapse radius of the jib or its load is prevented from falling within 3 metres of the nearest running rail.

### 6.2.5

Additional measures shall be taken where it is not possible to prevent the boom of attendant cranes from facing the railway.

### 6.2.6

Particular considerations, such as arcing distances, that may apply on electrified railways (O.H.L.E. / 3<sup>rd</sup> Rail).

### 6.2.7

Location of HV and signalling and telecommunications cables.

### 6.2.8

Location of existing and proposed Road Rail Access Points (RRAP).

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## **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 following points in **7.2.1** to **7.2.7** shall be addressed.

Appendix A summarises, but not limited to, the specific points which shall be addressed within the Work Package Plan (Method Statement for 3<sup>rd</sup> party schemes) for specific piling operations.

### **7.2 Factors to be Considered**

#### **7.2.1**

The design, construction and maintenance of the Piling Platform (see Section 8 of this document).

#### **7.2.2**

Normally piling operations shall be undertaken during daylight hours. For works undertaken during hours of darkness adequate lighting is shall be provided with attention being paid to the position of these lights with reference to both the piling operations and the train drivers.

#### **7.2.3**

Specific attention shall be paid to 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 facing away from the railway. A slew restrictor shall be used to limit the permitted arc of operation of all cranes and their load in situations where the collapse radius of the jib or its load could fall within 3 metres of the nearest rail.

#### **7.2.4**

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 elimination of frequent "spragging").

#### **7.2.5**

The method for the lifting of pile / diaphragm wall cages, pile elements (e.g. precast concrete, steel sections) and other materials shall be reviewed in detail within the methodology. Where items could fall within 3 metres of the nearest rail, the incorporation of a secondary restraint shall be required (e.g. back-up sling). Tag lines shall be used to control loads, these being properly deployed and controlled at all times. The collapse radius of the attending crane should also be taken into account as in 7.2.3.

#### **7.2.6**

All lifting operations shall be undertaken in accordance with the requirements of LOLER.

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### 7.2.7

Arrangements shall be in place to so that, at the end of each shift, all plant is left in a safe and secure manner. Attendant jib cranes shall be stabled overnight with their jibs facing away from the railway.

## 8 Management of the Piling Platform

### 8.1 Introduction

In analysing accidents reported by its members to the FPS, it has been noted that the most serious accidents involving the failure of a piling rig, or a crane whilst on piling duties, have been caused by a failure of the platform supporting that rig or crane or by a failure in the maintenance of that platform, not by mechanical failure of the machine itself or by human error.

In recognition of this the FPS, with the support of the HSE, have introduced a procedure outlining the responsibilities for the design, construction and maintenance of piling platforms. This procedure, which is detailed in BRE document 'Working platforms for tracked plant', together with the FPS 'Working Platform Certificate'(see NR/L3/INI/CP0063/F0007) have together become a standard construction industry requirement.

### 8.2 General Requirements

Completion of the 'Working Platform Certificate' shall be mandatory for all Network Rail projects to which this document applies. This 'Working Platform Certificate' shall be issued in conjunction with a Form C.

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.

Once the installation of the piling platform has been completed, the "Working Platform Certificate" shall be completed and a copy shall be held on site.

The piling contractor shall provide all relevant rig and equipment loadings and bearing pressure calculations in advance of the piling platform being designed. If the rig and equipment which is delivered to site is not the same as that for which the loadings have been supplied, then the piling platform shall be redesigned for the actual loads.

### 8.3 Piling Platforms - Factors to be Considered

#### 8.3.1

The size and position of the piling platform shall be determined by the Principal Contractor and the Piling Contractor and shall include for the rigging and de-rigging of the piling rig and ancillary plant.

#### 8.3.2

All piling platforms shall be designed and constructed to be at least 2m greater in width/length than the theoretical working area. Physical demarcation (typically timber baulks or similar) shall be placed to effectively delineate the edge of the working area.

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### 8.3.3

Platforms shall be designed for the full capacity of piling rigs, cranes and other equipment proposed to be used. Where appropriate consideration can be given to the use of lean mix/reinforced concrete platforms as these can provide additional safety margins. Special consideration should, however, be given to the use of rigid platforms when ground collapse beneath the platform can be a factor. Also the bearing pressure for tracked plant may be greater for a rigid platform than for a flexible granular platform.

### 8.3.4

All piling platforms shall be constructed with positive drainage.

### 8.3.5

Access to the piling site and in particular the provision of any sloped access. This access shall allow for the delivery of materials as well as for the specialist rigs, cranes and other equipment.

### 8.3.6

A programmed piling platform inspection, testing and maintenance regime shall be proposed by the platform designer. The frequency of inspections, which shall be approved by the Principal Contractor and accepted by Network Rail, may be daily or at the most weekly dependent on the programme of works and operations being undertaken. 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. Deviation from this regime shall result in the suspension of the works until such time that Network Rail accepts the proposed, revised regime and any additional restrictions.

### 8.3.7

The project shall be planned such that there shall be no excavation/removal of the piling platform until piling 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 Form C is produced and approved by the Platform Designer, Piling Contractor and Principal Contractor and accepted by Network Rail, prior to the works recommencing.

### 8.3.8

It is noted that peak loading often occurs under the mast foot of piling rigs and not always beneath the tracks. Similarly where equipment with outriggers is being considered, the loading beneath these outriggers shall be taken into account. These factors to be taken in to account by the platform designer.

### 8.3.9

Any unsupported pile shafts (for example piles with low cut-off level) shall be correctly backfilled following the completion of pile construction such that no hole is left open at end of the shaft so that there is no localised reduction in the bearing

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capacity of the piling platform. This shall be included in the methodology, WPP and Safe System of Work and approved by the Platform Designer, Piling Contractor and Principal Contractor 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.

### **8.3.10**

Where required monitoring of the track and other affected assets shall be carried out by the Principal Contractor in accordance with the approved AMP (Asset Management Plan), NR/L2/EBM/088 and NR/BS/LI/045 (Issue 3): Monitoring track over or adjacent to Civil Engineering works: procedure and intervention levels.

## **9 Competency**

### **9.1 Introduction**

All personnel participating in the piling works and associated operations shall have as a minimum the industry accepted competencies for the task(s) which they will be performing.

### **9.2 Factors to be Considered**

#### **9.2.1**

Only competent personnel who are experienced in the techniques/equipment shall be employed on the works.

#### **9.2.2**

All Plant Operators (piling rig, handling crane etc) shall prove they are competent to operate the relevant type of plant. Evidence shall be provided by the Piling Company to confirm recent experience on similar plant.

#### **9.2.3**

All piling operatives shall prove they are competent to undertake their tasks. Experience and training records shall be provided by the Piling Contractor for approval by the Principal Contractor prior to start on site.

## **10 Selection of Plant**

### **10.1 Introduction**

The selection of Plant shall be primarily dependent on the system of piling that is to be undertaken. A full understanding by all parties, including but not limited to Network Rail, Designer and Principal and Piling Contractors, of the range of piling 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 the operational railway.

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## 10.2 Factors to be Considered

### 10.2.1

All piling equipment brought to site shall bear the CE mark indicating conformity with the relevant CEN standard.

### 10.2.2

All equipment brought to site shall be in a serviceable condition with documentary evidence of statutory controls regarding thorough examinations having been complied with. These documents shall include:-

- a) The Piling Company's Written Scheme for the Examination of Piling Equipment and Accessories.
- b) Where required evidence of a 4-yearly load test.
- c) Written report of Thorough Examination (dated within one year or more frequently, as described within the Piling Company's Written Scheme).
- d) Once the equipment has been erected into its working configuration: confirmation of "start-up" checks, as described in the Piling 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 Piling Company's Written Scheme).
- f) Evidence shall be provided of an appropriate specific pre-contract plant inspection.

### 10.2.3

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

### 10.2.4

Piling rigs and cranes shall generally be modern hydraulic machines not greater than seven years old. In the case of piling rigs, where it has been demonstrated that either there is a specialist requirement for which only a unique piece of equipment can undertake the works or alternatively that no machine is available which is less than seven years old, then the machine being offered shall have a full service record and in particular have undergone a 'thorough examination', as defined under Regulation 9 of LOLER, following erection on site and that an 'overload test' has been undertaken within the twelve months prior to the machine arriving on site. Further, at all times, whilst the machine is working on site, the period since the last test shall not exceed 18 months.

### 10.2.5

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

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#### **10.2.6**

The stability of piling rigs, cranes, and other equipment shall, at all times be a main consideration in their selection. This shall be at minimum in accordance with the manufacturer's recommendations. No artificial aids shall be used to increase their capacity or stability.

#### **10.2.7**

All cranes and lifting accessories shall be down-rated from their normally rated capacity to 75% of Safe Working Load.

#### **10.2.8**

When it is possible for the boom of a crane or alternative lifting device to encroach within 3 metres of the nearest rail, then the crane shall be fitted with an appropriate slew restrictor to prevent this from occurring.

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## Appendix A: Specific requirements

The following shall be specifically considered when assessing the following piling operations:

### A .1 Bored Piles (including bored secant and contiguous piled retaining walls)

- a) Torque capability/size/bearing pressure of piling rig required.
- b) Capacity of equipment.
- c) Working space requirements.
- d) Protection when 'spinning off' spoil.
- e) Guarding as may be required of any rotary parts of the piling equipment.
- f) General handling of spoil / positioning of ancillary plant (excavators, dumpers etc).
- g) Handling of temporary/permanent casing.
- h) Method of placing temporary casings (e.g. rotate in, drive, vibrate).
- i) Management of fluids (e.g. bentonite, polymer).
- j) Length/weight of reinforcement cages.
- k) Placing of reinforcement cages.
- l) Method of placing concrete (e.g. direct discharge from readymix truck, pump, skip, tremie).
- m) Management of any water or other fluids displaced during concreting operation.
- n) Extraction of temporary casings...see note below.
- o) Construction and stability of guide walls including potential effects of forces from oscillators and extractors.

*NOTE: The extraction of temporary casing may involve the application of significant forces and has been the cause of crane jib failures in the past. The method of temporary casing to be adopted for the works together with the equipment selected should be the subject of a specific detailed assessment. Casing must only be freed by the use of jacking mechanisms, torsional devices, vibrating devices or upwards impact extractors. The piling rig may be used for this application where appropriate. Additionally the piling rig or attendant crane may be used to support the casing whilst it is being freed and thereafter for its subsequent removal. Where long casings are required the use of sectional casings should be considered as an alternative to single wall casings. The assessment, which should be undertaken by the piling contractor, should include but not be limited to; the diameter and depth of the casing, the type of casing (single wall, segmental etc), the soil parameters, the depth of concrete within the casing, the method of installation of the casing. The assessment should include consideration of the use of casing extractors and the capacity of any craneage and lifting accessories to be used. Serious consideration shall be given to leaving the casings in place (un-extracted), which will be subject to detail design, if deemed necessary for the safety of the operational railway.*



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### **A .2 Continuous Flight Auger Piles (including CFA secant and contiguous piled retaining walls)**

- a) Torque capability/size/bearing pressure of piling rig required.
- b) Capacity of equipment.
- c) Working space requirements.
- d) Guarding as may be required of any rotary parts of the piling equipment.
- e) Selection of auger cleaner.
- f) Concrete pumping operation including age/condition of concrete hoses and any secondary restraint techniques (e.g. double-bagging).
- g) General handling of spoil / positioning of ancillary plant (excavators, dumpers, etc).
- h) Method to be adopted should a blockage occur.
- i) Auger extraction forces.
- j) Stiffness of reinforcing cage and method of placement.
- k) Construction and stability of guide walls including potential effects of forces from CFA auger.
- l) Method and control of cleaning of concrete lines at interruptions in the work or at close of shift.

### **A .3 Diaphragm Walls**

- a) Control of diaphragm wall grabs
- b) Site planning including location of support fluid plant, laydown area for reinforcing cages.
- c) Construction of guide wall.
- d) Temporary propping of guide wall.
- e) Length of panel.
- f) Capacity of equipment.
- g) General handling of spoil / positioning of ancillary plant (excavators, dumpers etc).
- h) Management of support fluid (bentonite, polymer).
- i) Placing of reinforcement cages.
- j) Placing and removal/extraction of stopends.
- k) Management of spoil.
- l) Method of placing concrete (e.g. direct discharge from readymix truck, pump, skip, tremie).

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#### **A .4 Driven Precast / Steel / Cast-in-Situ Piles**

- a) Capability/size/bearing pressure of piling rig required including hammer size/energy.
- b) Area for offloading piles – consideration of position/orientation of rig/crane in undertaking this operation.
- c) General handling of pile elements to the rig and subsequently by the rig.
- d) Pitching of piles.
- e) Height of hammer in the leaders whilst moving between pile positions (recommended in lower third).
- f) For driven cast-in-situ piling the following should also be considered: method of placing reinforcement cage; method of placing concrete; extraction of casing.

*NOTE: The extraction of temporary sheet / steel piles may involve the application of significant forces and the method of removal, where required, to be adopted for the works together with the equipment selected should be the subject of a specific detailed assessment. Sheet/steel piles must only be freed by the use of jacking mechanisms, vibrating devices or upwards impact extractors. The piling rig or attendant crane may be used to support the pile whilst it is being freed and thereafter for its subsequent removal. The assessment, which should be undertaken by the piling contractor, should include but not be limited to; the size and depth of the pile, the type of pile (sheet, 'H' etc), the soil parameters, the method of installation of the pile. The assessment should include consideration of the use of pile extractors and the capacity of any craneage and lifting accessories to be used.*

#### **A .5 Driven Sheet Piles**

In addition to A.4 the following shall be considered:

- a) Where a specialist rig is to be used its capacity/size/bearing pressure together with hammer size/energy.
- b) Where a crane and pitching frame are to be used the size and positioning of the crane and location of pitching frame.
- c) Position of any attendant craneage.
- d) Method of setting piles into frame – clutching of piles.
- e) Wind speed limitations.

*NOTE: The extraction of temporary sheet / steel piles may involve the application of significant forces and the method of removal, where required, to be adopted for the works together with the equipment selected should be the subject of a specific detailed assessment. Sheet/steel piles must only be freed by the use of jacking mechanisms, vibrating devices or upwards impact extractors. The piling rig or attendant crane may be used to support the pile whilst it is being freed and thereafter for its subsequent removal. The assessment, which should be undertaken by the piling contractor, should include but not be limited to; the size and depth of the pile, the type of pile (sheet, 'H' etc), the soil parameters, the method of installation of the pile. The assessment should include consideration of the use of pile extractors and the capacity of any craneage and lifting accessories to be used.*

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## **A .6 Grouting, Mini-piling, Anchors**

*NOTE: It is not intended within this document to address in detail the above activities. However, in so far that these operations may be undertaken in association with piling operations the following should be considered:*

- a) Torque capability/size/bearing pressure of piling rig required.
- b) Fluid flush.
- c) Working space requirements.
- d) Guarding as may be required of any rotary parts of the piling equipment.
- e) Placing anchors.
- f) Manual handling.
- g) Stability of access platforms.
- h) Handling of grout.

## **A .7 Screw/Helical Piling**

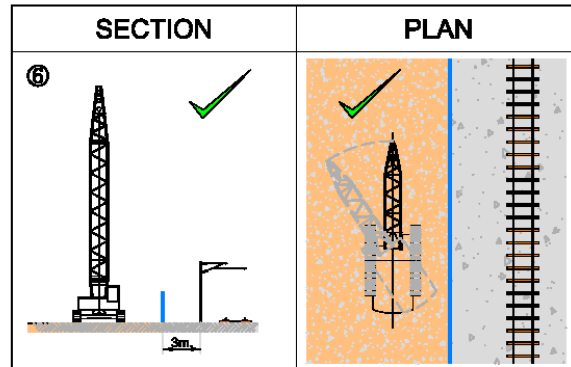
As for Grouting, (see A.6), is not intended within this document to address in detail screw piling. However in so far that these operations may be undertaken in association with piling operations the following should be considered:

- a) Where used type of RRV and capabilities.
- b) Manual handling.
- c) Placing of grillages.
- d) Fitting and handling of Torque head attachments and adaptor plates.

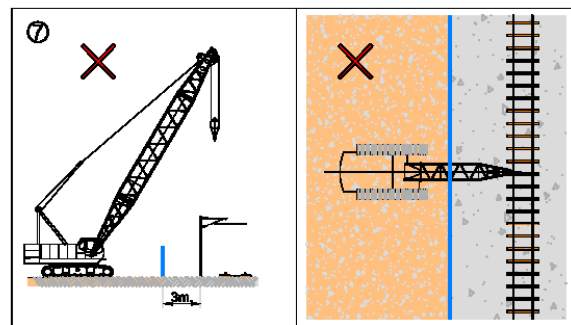
Ref:	NR/L3/INI/CP0063
Issue:	1
Date:	06/03/2010
Compliance date:	05/06/2010

## Appendix B: Diagrams

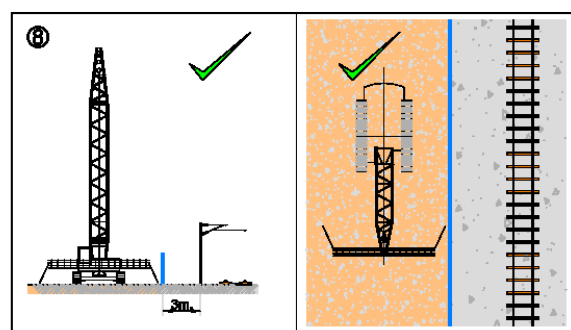
### ORIENTATION OF CRANE ADJACENT TO THE RAILWAY INFRASTRUCTURE DURING NORMAL RAILWAY OPERATIONS.



**SLEW RESTRICTOR ENGAGED TO PREVENT OVERSAILING OF 3m ZONE**



**BOOM OVERSAILING 3m ZONE**



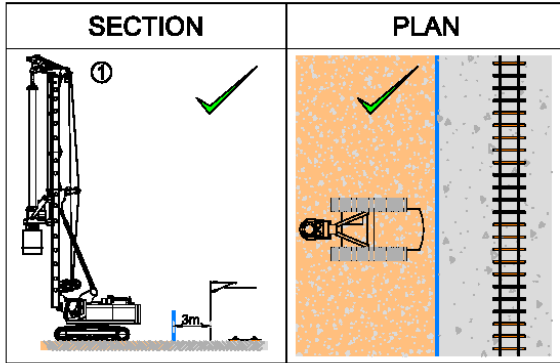
**TAG LINES TO BE DEPLOYED BOTH ENDS OF LOAD**

#### NOTE :-

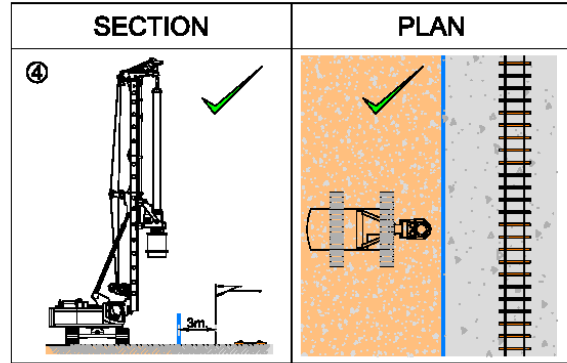
- 1.) IN ALL CASES APPROPRIATE MITIGATION MEASURES SHOULD BE IMPLEMENTED - PARTICULARLY WITH REGARD TO THE PILING PLATFORM CONSTRUCTION.
- 2.) PLATFORM TO BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATION.
- 3.) NO ARTIFICIAL AIDS ALLOWED TO INCREASE STABILITY - REFER TO DIAGRAM 5.

Ref:	NR/L3/INI/CP0063
Issue:	1
Date:	06/03/2010
Compliance date:	05/06/2010

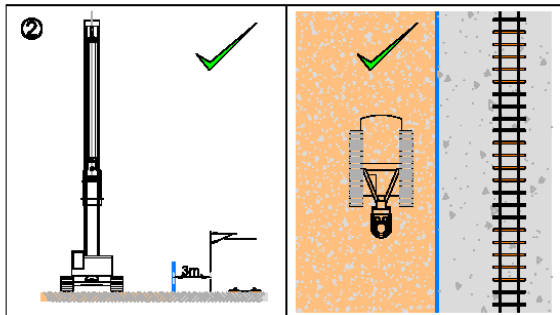
## ORIENTATION OF PILING RIG ADJACENT TO THE RAILWAY INFRASTRUCTURE DURING NORMAL RAILWAY OPERATIONS.



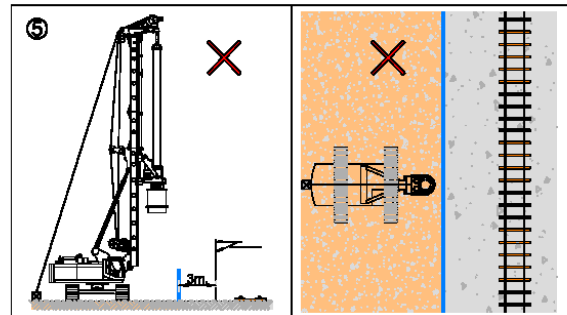
**RIG MAY SIT AT THIS ORIENTATION**



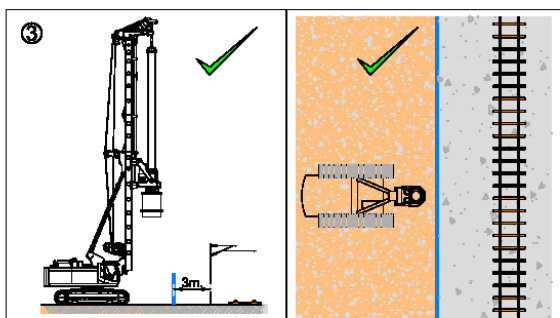
**RIG MAY SIT AT THIS ORIENTATION  
(SUBJECT TO MANUFACTURERS SPECIFICATION)**



**RIG MAY SIT AT THIS ORIENTATION**



**INDEPENDENT TIE BACKS OR ANY OTHER ARTIFICIAL STABILITY AIDS MUST NOT BE UTILISED**



**RIG MAY SIT AT THIS ORIENTATION**

### NOTE :-

- 1.) IN ALL CASES APPROPRIATE MITIGATION MEASURES SHOULD BE IMPLEMENTED - PARTICULARLY WITH REGARD TO THE PILING PLATFORM CONSTRUCTION.
- 2.) PLATFORM TO BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATION.
- 3.) NO ARTIFICIAL AIDS ALLOWED TO INCREASE STABILITY - REFER TO DIAGRAM 5.

