The Safe Operation of Cranes
# THE SAFE OPERATION OF CRANES

## CONTENTS

<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>1. MANAGEMENT OF LIFTING OPERATIONS</strong></td>
<td>2</td>
</tr>
<tr>
<td>1.1 Management Responsibilities</td>
<td>2</td>
</tr>
<tr>
<td>1.2 Safe Systems of Work</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Establishing the Organisation</td>
<td>2</td>
</tr>
<tr>
<td><strong>2. PERSONNEL AND THEIR DUTIES</strong></td>
<td>4</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>4</td>
</tr>
<tr>
<td>2.2 Project Manager</td>
<td>4</td>
</tr>
<tr>
<td>2.3 Appointed Person</td>
<td>4</td>
</tr>
<tr>
<td>2.4 Crane Supervisor</td>
<td>5</td>
</tr>
<tr>
<td>2.5 Crane Co-Ordinator</td>
<td>6</td>
</tr>
<tr>
<td>2.6 Operators</td>
<td>6</td>
</tr>
<tr>
<td>2.7 Slinger/Signallers</td>
<td>7</td>
</tr>
<tr>
<td>2.8 Fitters/Erectors</td>
<td>7</td>
</tr>
<tr>
<td><strong>3. PLANNING OF LIFTING OPERATIONS</strong></td>
<td>8</td>
</tr>
<tr>
<td>3.1 Tender Planning</td>
<td>8</td>
</tr>
<tr>
<td>3.2 Project Planning</td>
<td>8</td>
</tr>
<tr>
<td>3.3 Lift Planning</td>
<td>8</td>
</tr>
<tr>
<td>3.4 Contractual Considerations</td>
<td>10</td>
</tr>
<tr>
<td>3.5 Selection of Cranes</td>
<td>10</td>
</tr>
<tr>
<td>3.6 Siting of Cranes</td>
<td>11</td>
</tr>
<tr>
<td>3.7 Safe Working Load</td>
<td>11</td>
</tr>
<tr>
<td>3.8 Grabbing, Demolition and Piling Operations</td>
<td>12</td>
</tr>
<tr>
<td>3.9 Operating in High Winds</td>
<td>12</td>
</tr>
<tr>
<td>3.10 Multiple Crane lifting Operations</td>
<td>13</td>
</tr>
<tr>
<td><strong>4. SPECIALIST LIFTING</strong></td>
<td>14</td>
</tr>
<tr>
<td>4.1 Raising or Lowering Personnel (Man Riding)</td>
<td>14</td>
</tr>
<tr>
<td>4.2 Vacuum Lifting Devices</td>
<td>15</td>
</tr>
<tr>
<td>4.3 Magnetic Lifting Devices</td>
<td>16</td>
</tr>
<tr>
<td>4.4 Deep Shaft Working</td>
<td>16</td>
</tr>
<tr>
<td><strong>5. CRANES (Other than Tower Cranes)</strong></td>
<td>17</td>
</tr>
<tr>
<td>5.1 Site Based Mobile and Crawler Cranes</td>
<td>17</td>
</tr>
<tr>
<td>5.2 Visiting Mobiles</td>
<td>18</td>
</tr>
<tr>
<td>5.3 Excavators</td>
<td>18</td>
</tr>
<tr>
<td>5.4 Forklifts and Telescopic Handlers</td>
<td>19</td>
</tr>
<tr>
<td>5.5 Lorry Loaders</td>
<td>20</td>
</tr>
<tr>
<td>5.6 Beam and Trestle Hoists</td>
<td>21</td>
</tr>
<tr>
<td>5.7 “TAG” Jib Cranes &amp; Mini Tower Cranes</td>
<td>21</td>
</tr>
<tr>
<td>5.8 Other Types of Crane</td>
<td>21</td>
</tr>
<tr>
<td>5.9 Operators of Hired Cranes</td>
<td>22</td>
</tr>
<tr>
<td><strong>6. TOWER CRANES</strong></td>
<td>23</td>
</tr>
<tr>
<td>6.1 Introduction</td>
<td>23</td>
</tr>
<tr>
<td>6.2 Appointments</td>
<td>23</td>
</tr>
<tr>
<td>6.3 Tower Crane Planning Procedure</td>
<td>23</td>
</tr>
<tr>
<td>6.4 Foundation Design</td>
<td>25</td>
</tr>
<tr>
<td>6.5 Foundation Design Check</td>
<td>27</td>
</tr>
<tr>
<td>6.6 Foundation Design Review</td>
<td>28</td>
</tr>
<tr>
<td>6.7 Ties</td>
<td>28</td>
</tr>
<tr>
<td>6.8 Installation</td>
<td>28</td>
</tr>
<tr>
<td>6.9 Operation</td>
<td>30</td>
</tr>
<tr>
<td>6.10 Inspection and Testing</td>
<td>33</td>
</tr>
<tr>
<td>6.11 Operator Access/Egress</td>
<td>35</td>
</tr>
<tr>
<td>6.12 Gotcha Rescue Kit</td>
<td>35</td>
</tr>
<tr>
<td><strong>7. INSPECTION, TESTING AND MAINTENANCE</strong></td>
<td>36</td>
</tr>
<tr>
<td>7.1 Introduction</td>
<td>36</td>
</tr>
<tr>
<td>7.2 Daily Checks</td>
<td>36</td>
</tr>
<tr>
<td>7.3 Weekly Inspections</td>
<td>36</td>
</tr>
<tr>
<td>7.4 Maintenance</td>
<td>36</td>
</tr>
<tr>
<td>7.5 Thorough Examinations</td>
<td>36</td>
</tr>
<tr>
<td>7.6 Testing</td>
<td>36</td>
</tr>
<tr>
<td>7.7 Examination Schemes</td>
<td>37</td>
</tr>
<tr>
<td>7.8 Hired Mobile Cranes</td>
<td>37</td>
</tr>
<tr>
<td>7.9 Competent Person</td>
<td>37</td>
</tr>
<tr>
<td><strong>8. RADIOS</strong></td>
<td>38</td>
</tr>
<tr>
<td>8.1 Use of Radios</td>
<td>38</td>
</tr>
<tr>
<td>8.2 Radio Licences and Frequencies</td>
<td>38</td>
</tr>
<tr>
<td><strong>9. ELECTRICAL MATTERS</strong></td>
<td>39</td>
</tr>
<tr>
<td><strong>10. ADVICE AND ASSISTANCE</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>11. APPENDICES</strong></td>
<td>41</td>
</tr>
<tr>
<td>Appendix 1 Bibliography</td>
<td>41</td>
</tr>
<tr>
<td>Appendix 2 Lifting Operations Assessment Form</td>
<td>42</td>
</tr>
<tr>
<td>Appendix 3 Tower Cranes – Method Statement</td>
<td>44</td>
</tr>
<tr>
<td>Appendix 4 The Inspection of Tower Crane Foundations</td>
<td>47</td>
</tr>
<tr>
<td>Appendix 5 Glossary</td>
<td>52</td>
</tr>
<tr>
<td>Appendix 6 TIS 157</td>
<td>53</td>
</tr>
<tr>
<td>Appendix 7 Lifting Accessories Procedures</td>
<td>54</td>
</tr>
<tr>
<td>Appendix 8 Vacuum Lifting Guidance</td>
<td>56</td>
</tr>
</tbody>
</table>
THE SAFE OPERATION OF CRANES

This document is issued with the authority of Laing O’Rourke. It must be adhered to on every site or other place of work in the United Kingdom where the company, its subsidiaries and/or their sub-contractors are using cranes.

This document follows the requirements of the British Standard BS 7121 series.

The use of cranes necessitates compliance with Provision and Use of Work Equipment Regulations 1998 (PUWER) and the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER). Health and Safety legislation also imposes additional duties on all concerned. Furthermore, accidents involving cranes can have serious cost and programme implications for the site concerned, as well as considerable adverse publicity. Finally, a mishap with a crane is likely to lead to serious injury or death. Legally, every individual concerned with cranes carries full personal responsibility for their part in its selection and operation.

Except where otherwise stated, this document refers to all cranes whether internally or externally hired, or supplied as part of a contract. Where the company is operating on sites under the control of third parties, or in partnership with other companies, then this booklet is the minimum standard which will apply.

Advice may be sought on the application of LOLER and the contents of this document from the Select Safety Department at St. Neots.
THE SAFE OPERATION OF CRANES

1. MANAGEMENT OF LIFTING OPERATIONS

1.1 MANAGEMENT RESPONSIBILITIES

Unless otherwise directed by Business Unit Managing Directors, the Project Manager is responsible for ensuring that the requirements of this document are discharged.

The Project Manager may delegate duties to other members of staff and will retain any not so delegated, provided he is qualified to do so by holding the appropriate AP or CS CPCS card. The Project Manager must ensure their Appointed Person will have adequate time and resource to discharge their duties, commensurate with extent or type of lifting. This delegation will be in writing, and will be recorded in the Project Health, Safety & Environmental Plan.

The Project Manager will ensure that all external organisations responsible for any lifting operations on a Laing O’Rourke site are clearly informed, in writing, of the parts of this document relevant to their operation.

1.2 SAFE SYSTEMS OF WORK

It is a basic requirement of Health and Safety legislation that, in any work situation, there must be a safe system of work. Most accidents happen because of the absence of such a system or because it has been ignored.

The development of the safe system of work for lifting shall include the following main steps:

- Defining the lifting requirements
- Gathering information
- Establishing the organisation
- Identifying hazards and assessing risk
- Planning the operation
- Communicating the system
- Crane advice notes on larger projects e.g. T5
- Implementing the plan
- Monitoring to ensure that what should happen does happen

1.3 ESTABLISHING THE ORGANISATION

1.3.1 The Appointed Person

In order to ensure effective development and implementation of such systems, one person, the “Appointed Person”, will be appointed to act on behalf of the site management and have overall control of lifting operations on each site. Where the company is the Principal Contractor, then the Appointed Person will be a company employee. As a rule, there will be only one company Appointed Person on each project. The exception to this is on the very largest of projects that are sub divided into substantially autonomous sections.

Each trade and sub contractor carrying out significant lifting operations will normally be required to provide their own Appointed Person. These Appointed Persons are subordinate to the Laing O’Rourke Appointed Persons, who must be satisfied with their competence.

All Appointed Persons must have a Construction Plant Competence Scheme (CPCS) Card and adequate experience to carry out their duties competently (see Section 2.3).

All Appointed Persons, by virtue of their appointment, have the necessary authority for the performance of their duties. In particular, to stop an operation whenever they consider that danger is likely to arise if the operation were to continue. Duties, but not responsibilities, may be delegated to other persons where considered appropriate.

1.3.2 The Crane Team

Any lifting operation will involve a number of people with specialist skills and knowledge. To effectively implement the safe system of work, the Appointed Person will establish and lead the Crane Team. This will include:

- The Laing O’Rourke Appointed Person (CPCS)
- Crane Supervisors (CPCS)
- Crane Co-ordinator
- Crane Operators (CPCS)
- Slinger / Signallers (CPCS)
- Other personnel as deemed necessary by the Appointed Person
It is essential that all members of the Crane Team be given adequate time and resources to enable them to discharge their duties effectively.

Regular meetings are essential to ensure that the team communicates effectively, and that advice and comments from all members of the team are heard. A suitable meeting agenda is given in the lifting operations section of the template Health and Safety Plan contained in Section 8 of the Laing O’Rourke Safety Management System.

1.3.3 The Crane Supervisor

A crane supervisor must be appointed to direct and supervise the lifting operation, ensuring that these are carried out in accordance with the method statement. The crane supervisor should be competent and suitably trained and should have sufficient experience to carry out all relevant duties. The crane supervisor must have sufficient authority to stop the lifting operation if they consider it dangerous to proceed.

The crane supervisor must hold a CPCS card and have adequate experience to carry out his role.

1.3.4 The Crane Co-ordinator

A crane co-ordinator must be appointed to plan and direct the sequence of operations of tower cranes to ensure that they do not collide with other cranes and other equipment i.e. concrete placing booms, telehandlers and pilings rigs.

The role may be combined with another. It does not currently have a CPCS card.

On sites with a high density of cranes, serious consideration should be given to the appointment of a full time crane co-ordinator dedicated to that role.

The composition of this team will change as contractors, cranes and equipment arrive on, and leave, site and will include all sub contractor’s Crane Team personnel as deemed appropriate by our company’s Appointed Person.

Typical Organisation on a Multi Crane Site Structure (Derived from BS 7121 Pt 5 Fig 2)
THE SAFE OPERATION OF CRANES

2. PERSONNEL AND THEIR DUTIES

2.1 INTRODUCTION

Safe lifting requires suitable, competent, adequately trained personnel, whose appointments are made in writing and recorded in the Project Health and Safety Plan. All personnel involved in lifting operations should be adequately organised into an effective team and given regular opportunities to meet, as a team, to review past lifts and plan future ones. All personnel in the team should be aware of their own and each others duties, with trainees being suitably supervised.

2.2 PROJECT MANAGER

2.2.1 Duties

The Project Manager will:

• Be responsible for ensuring that this document is followed
• Ensure that the Lifting Operations Plan is drawn up at the start of the Project
• Appoint the Appointed Person, in writing, and ensure that they hold a CPCS card in the (Management of Lifting Operations Course, Appointed Person) and are competent
• Appoint the Crane Supervisors, and ensure that they are trained (Management of Lifting Operations Course CPCS) and competent
• Make arrangements for the provision of a deputy to ensure continuity of operations in the event of the absence of the Appointed Person
• Monitor and review appointments regularly, particularly in the event of changing site conditions, complexity or workload
• Delegate duties to other staff
• Perform duties not delegated provided they are suitable qualified to do so
• Check any pre-contract planning

2.3 APPOINTED PERSON

2.3.1 Selection

When selecting and assessing an Appointed Person, the variety and complexity of the lifting operations to be undertaken should be considered, as well as all the problems that may arise from proximity hazards and the environment. The appointment must be made formally in writing, confirming that the appointee has the necessary authority to undertake the role. The appointee must also be given the time and resources to carry out the duties involved. This will include consulting others with specialist knowledge and experience, and delegating duties and tasks for any part of the safe system of work to suitably qualified individuals or organisations.

The Project Manager must monitor and review the appointment at suitable intervals to ensure that the Appointed Person is still fulfilling the requirements of this document, and that every lifting operation has a safe system of work. Changes in the workload or in the type and complexity of lifting operations may make it necessary to select a different Appointed Person, or provide the existing appointee with additional training.

2.3.2 Duties

The duties of the Appointed Person shall include the following:

• Assessment of lifting operations to provide such planning, selection of cranes, lifting accessories and equipment, instruction and supervision as is necessary for the tasks to be undertaken safely. This will include liaison with the site crane team and may include consultation with Select Plant Technical Department
• Responsibility for the organisation and control of the lifting operations
• Ensuring that appointments to the crane team are made, and leading that team
• Producing, reviewing and updating the Lifting Operations Plan (a section of the Project Health and Safety Plan)

• Ensuring that adequate examination, inspection and maintenance is carried out and maintaining records of examinations, inspections, tests, etc. of all cranes and lifting accessories

• Ensuring that the certification for all Crane Operators and Slinger/signaller is valid

• Ensuring that there is an effective procedure for reporting defects and incidents, and taking appropriate action

• Liaison with the subcontractor’s crane teams

• Ensuring that Method Statements for general lifts are drawn up, as well as specific statements for complex operations

• Ensuring that the Lifting Operations Assessment Forms are completed (see Appendix 2)

• Selecting high visibility clothing for Slingers/Signallers

• Liaison with the Temporary Works Co-ordinator to ensure adequate foundations are provided for all cranes and all permits to load are in place

• Issuing the Tower Crane Pre-Erection Inspection Certificate

• Selecting the method of signaling, (radios, hand, etc.) and ensuring that a crane operator cannot follow the instructions intended for another

• Carrying out duties of Crane Co-ordinator or delegate

• Carrying out duties of Crane Supervisor, or delegation of these to a competent individual

• Liaison with local airfields, if required

• Liaison with local authorities, police, etc., if road closures required or abnormal loads traveling to site

• Liaison with local authorities, highways authorities, railway operators, etc. if cranes will over sail or be erected close to public highways or railways

• Liaison with the owners of neighboring properties for over sailing rights, if required

• Responsibility for the operators of hired in cranes

• Responsibility for appraisals of any operations that may affect the erection or dismantling of tower cranes

• Monitoring, reviewing, reassessing and revising the Lifting Operations Plan, Method Statements and Risk Assessments

• Attend Appointed Person forums to keep abreast with industry best practice and new regulations or standards

The Appointed Person should consult all parties involved in the selection and hire of the crane, especially the experienced persons in the crane team. Delegation of duties to competent persons will generally occur, especially on large sites, but the Appointed Person will maintain overall responsibility for these duties.

2.4 CRANE SUPERVISOR

Each lifting operation must be properly supervised to ensure that Method Statements are being followed and the operation is being carried out safely. The person carrying out this supervision will be the Crane Supervisor whose attributes are set out below. The degree of supervision required will depend on the risk and complexity of the lift to be carried out: for example a basic lift, frequently repeated, for which a standard method has been established would not require constant supervision, whereas a complex lift involving multiple cranes would.

Crane Supervisors must:

• Be authorised to undertake these duties

• Be competent, suitably trained and have sufficient experience to carry out these duties (Management of Lifting Operations, Crane Supervisor CPCS)

• Be fully conversant with the duties of all persons involved in the lifting operation

• Give clear, unambiguous instructions to all members of the team under their control
THE SAFE OPERATION OF CRANES
PERSONNEL AND THEIR DUTIES (cont)

• Identify any danger to the lifting operation from changed circumstances on site
  - Inform AP of changes to approved method statement & LOAF Pts 1&2
• Stop operations if they consider them unsafe and report any problems to the Appointed Person
  - Attend crane team meetings and briefings

The Appointed Person in consultation with the Project Manager may decide to carry out the duties of the Crane Supervisor. The Project Manager as stated in section 2.2.1 will appoint the Crane Supervisor in writing. The Crane Supervisor is not usually an exclusive role, and may form part of the duties of a foreman or supervisor.

It is essential that each contractor or sub contractor engaged in lifting operations on site should have a Crane Supervisor in order to provide channels for effective communications.

2.5 CRANE CO-ORDINATOR

British Standard BS 7121-1 states that where there is more than one crane and there is a possibility of collision between cranes, a Crane Co-ordinator should plan the sequence of crane movements to prevent collisions.

There is currently no CPCS card for Crane Co-ordinators, therefore they should be identified and selected taking into consideration the competencies below.

The Crane Co-ordinator must be:
• Over 18 years old
• Competent to perform the tasks required of them
• Adequately trained and /or successfully assessed
• Fit particularly possessing good eyesight, hearing, reflexes and agility
• Able to give clear, unambiguous instructions, especially on audio equipment/radios
• The Crane Co-ordinator may have other duties

The duties of the Crane Co-ordinator will include the following:
• The Crane Co-ordinator should plan the sequence of operations of cranes on sites having more than one crane
• Through planning and co-ordination, the Crane Co-ordinator should ensure that cranes, components and loads do not collide

2.6 OPERATORS

Crane operators must be medically assessed at least every five years to ensure that they are fit to carry out their duties.

Note: All Select Plant tower crane operators are medically examined at three yearly intervals.

Operators of all cranes on company sites must be:
• Competent, and hold a current CITB Certificate of Training Achievement CPCS card for operating the appropriate category of crane
• Fit; with eyesight, hearing and reflexes being most important
• Physically able to operate the crane safely
• Able to judge distances, heights and clearances
• Conversant with the duties of Slingers/signallers and understand the signals given to the standards of BS 7121
• Adequately trained for the type of crane being driven and have sufficient knowledge of the crane, its controls and its safety devices
• Familiar with any means for emergency escape provided
• Authorised to operate the crane

2.6.1 Duties of the Crane Operator

Operators must:
• Check the crane before the start of each shift
• Inspect the crane weekly and record the results of the inspection in the appropriate register
• Carry out routine maintenance as instructed
• Leave the crane in a safe condition when unattended, i.e. power or engine switched off and keys removed
• Leave the crane when out of service (e.g. overnight or in high winds) in a safe and secure condition in accordance with the manufacturers’ instructions
• Operate the crane in a safe manner in accordance with the Slinger/signaller’s directions, and the Method Statement for the current operation
• Not operate the crane unless they are confident that both they and the Slinger/signaller can handle the load safely in the prevailing wind conditions
• Report incidents and defects to the crane owner, site management and the AP See Section 6.9 for additional requirements for tower crane operators

The Slinger/signaller must be:
• Competent and hold a valid CPCS card for Slinging/signalling
• Fit, particularly in respect of eyesight, hearing, reflexes and agility
• Physically able to handle the lifting accessories
• Able to establish weights, balance loads and judge heights, distances and clearances
• Trained in the techniques of slinging and signalling
• Capable of directing the safe movement of the crane and load, with clear, precise instructions
• Aware of his responsibilities and their limits
• Authorised to carry out his duties

2.7 SLINGER/SIGNALLERS
Every crane used on our sites must have at least one Slinger/signaller allocated to it. They must hold a current CPCS card for slinging and signalling, and are responsible for attaching and detaching the load to and from cranes and for the use of the correct lifting accessories in accordance with the Lifting Plan / Method Statement.

The Slinger/signaller is also responsible for initiating and directing the safe movement of the load and the crane.

They are required to wear items of high visibility clothing that will uniquely identify them to the crane operator. This clothing, which will generally be either high visibility helmets or jackets, will be approved by the Appointed Person and recorded in the Lifting Plan.

The recommended hand signals for use by Slinger/signallers (from BS 7121) are shown in the Guide to Safe Slinging and Signalling. Where continuity of signaling is required and the slinger is not visible to the crane operator, another slinger/signaller may be necessary to relay signals to the crane operator. Alternatively, other audio or visual methods may be used. (see Section 8).

2.8 FITTERS/ERECTORS
All fitters and erectors will be trained and competent in all aspects of their work, including the need for the use of fall protection equipment and the Gotcha Rescue Kit (Erectors only). Anyone operating a crane for the purposes of erection, maintenance or testing must be authorised, but will not be required to hold a CPCS card covering the duties of a crane operator.
3. PLANNING OF LIFTING OPERATIONS

3.1 TENDER PLANNING

It is essential that lifting operations are considered and planned, at least in outline, at the tender or feasibility stage. This will ensure that substantive safety and construction issues are highlighted and taken into account to avoid cost and programme problems later on.

Consideration must be given to the appointment of an appropriately trained appointed person to the tender team with specific responsibilities for planning all lifting operations where lifting is envisaged. If such a person is unavailable, then a person who has experience of dealing with lifting operations should be used and the level of experience will need to be assessed. They will give full consideration to the need for full time crane team appointments.

Planners/estimators may need to consult with designers and other parties to ensure that adequate allowance for lifting operations is made in the tender. This will include planning both for sufficient general cranage, and for significant individual lifts. Consideration should be given to the provision of common lifting facilities provided by the main contractor, or the provision of individual cranes by sub contractors, or a mixture of both. A tender checklist is available in SMS App. 8D. Detailed advice is given for tower crane planning in Section 6.3.

On sites which plan to erect two or more cranes which will over sail each other, it is strongly recommended that anti-collision systems are installed. A suitably robust risk assessment will be required to prove why the project has decided not to use an anti collision system.

3.2 PROJECT PLANNING

3.2.1 Lifting Operations Plan

At the start of a project, the tender/feasibility stage planning must be developed into a detailed project specific Lifting Operations Plan in the form set out in the Health and Safety System.

This will include:
- The crane team organisation chart
- Authorisation of Slinger/signallers
- Identification and initial assessment of lifting operations
- Schedule of common lifts
- Index of Method Statements for special lifts
- Lifting Operations Assessment Forms (LOAF)
- Project arrangements for procurement of lifting equipment
- Register of lifting equipment
- Site cranage layouts (where applicable)
- Communications:
  - Signalling systems / radios
  - Identification of Slinger/signallers

3.2.2 Briefing Sessions

a. Crane team Meetings

Crane team meetings should be held at least monthly and formally recorded. They may be held more frequently, depending on the work in hand.

It is accepted not every crane team member can attend each meeting so the Appointed person should prepare notes and issue copies to each Crane Supervisor.

b. Daily Activity Briefings.

All members of the crane team should be briefed at the beginning of each day or shift, where specifics of the scheduled work are discussed. The briefing should include the planning of low risk aerial transit routes for loads to minimise risks in lifting over unprotected workers. The briefing must be formally recorded and records maintained. A template is available in the SMS Section 8 App. 8E.

3.3 LIFT PLANNING

All lifting operations must be planned to ensure that they are carried out safely and that all foreseeable risks have been taken into account. In cases of repetitive or routine operations, periodic review may be required to ensure no factors have changed.
Planning will include consideration of the following:

- The load, its characteristics and method of lifting (Note: It may be necessary to make allowance for any adhesion between the load and its support)
- The selection of a suitable crane appropriate to the operation, ensuring that adequate clearances are maintained between the load(s) and the crane structure

Special consideration must be given to traveling with loads.

- The selection of lifting accessories, the weight of which must be taken into account when assessing the load on the crane
- The positions of the crane and load before, during and after the operation
- The site of the operations, taking into account proximity hazards, space availability and suitability of the ground or foundations
- Any necessary erection and dismantling of the crane
- The environmental conditions that exist or may occur at the site of operation, which may necessitate stopping the operation when conditions are unsuitable
- Any interface with other operations on site that may present a hazard and means of controlling these issues
- The proximity of the crane and load to the public

The amount and detail of planning required for a lifting operation will depend on the complexity and risk involved. Lifting operations can be divided into the three categories detailed in Sections 3.3.1, 3.3.2 and 3.3.3 on the next page. In each case a risk assessment must be carried out as part of the planning process and the results of the assessment and planning be recorded in a Method Statement, which may well take the form of the Lifting Operations Assessment Form (see Appendix 2).

The detail required in the Method Statement will vary with the complexity of the lift. For commonly lifted items on a site such as pallets of blocks and scaffold tubes, generic solutions are provided in the Guide to Safe Slinging and Signalling and further generic solutions may be included in the Project Lifting Plan. At the other end of the spectrum, a single lift of a large prefabricated roof for a building housing a nuclear reactor might have a Method Statement running to several volumes.

To summarise - before any lift takes place, one or more of the following must be produced in addition to Lifting Operations Assessment Form Part 1 and communicated to all relevant parties:

- Schedule of common lifts covering the lift to be carried out. A template to assist in the production of a schedule of common lifts is available in a link from SMS Section 8
- Lifting Operations Assessment Form Part 2 for the lift to be carried out
- A lift specific risk assessment and Method Statement

3.3.1 Basic Lifts

Where the load to be lifted is of established weight, and there are no hazards or obstructions within the area of operation. Typical examples of the type of load are:

- Pallets of bricks or blocks
- Bundles of rebar
- Scaffold tubes

3.3.2 Standard Lifts

Where the load to be lifted is of established weight and there are hazards to be considered, either within the working area of the crane, or on the access route to the working area, but no multiple crane lifting is involved.

Typical examples of hazards are:

- Pick and carry duties
- Oversailing other cranes
- Lifting persons
3.3.3 Complex Lifts
Where the lifting operation requires more than one crane to lift the load, or a crane using load enhancement attachments (Superlift etc.) or the lift is to take place at a location with exceptional hazards such as a chemical plant. All complex lifts require Risk Assessments and Method Statements and the approval of the crane Appointed Person.

3.3.4 Prohibited Lifts
All lifts are required to be carried out in accordance with “Best Practice”. However, specific attention is drawn to the following lifts, which within the industry have proven problematic and necessarily prohibited.

- Pallets without pallet forks and net
- Waste skips lifted by lugs with chains
- Gas bottles without lifting cage
- Loads with loose components or other material
- Tandem lifts with Tower Cranes
- Tailing lifts with Tower Cranes

If there is an Appointed Person working for the Principal Contractor, they would be expected to check that the methods, certification of all lifting equipment and lifting accessories appear to be complete.

3.4 CONTRACTUAL CONSIDERATIONS
Any main contractor or sub contractor needing to move a load may select one of the following options:

3.4.1 Fully Sub Contracted Lift
The organisation (main contractor or sub contractor) requiring the load or loads to be moved enters into a contract with another party (the contract lift party) who will undertake the work on their behalf. This contract will encompass all necessary planning, provision of personnel and equipment, and the actual execution of the lift. It must state that all work will be carried out in accordance with all relevant parts of BS 7121, and that the contract lift party will appoint a person (the Appointed Person CPCS) as in Section 2.3.

When entering into such a contract the employing organisation must satisfy themselves that the contract lift party has the necessary competence to carry out the work required in accordance with all relevant parts of BS 7121.

3.4.2 Hired and Managed
The organisation (main contractor or sub contractor) requiring the load or loads to be moved uses a hired crane and carries out their own planning and execution of the lift.

The owner of the hired crane has a duty to provide a competent operator and a crane that has been properly maintained and inspected, thoroughly examined, tested and certified and evidence of this must accompany it.

However, notwithstanding any advice offered by the crane owner, the responsibility for ensuring that the crane is of a suitable type, size and capacity for the task to be undertaken, and for planning and executing the operation and ensuring periodic thorough examinations are undertaken, remains with the hirer (main contractor or sub contractor).

3.5 SELECTION OF CRANES
Advice on the selection of suitable types and sizes of cranes is available from both crane suppliers and Select Plant Technical Services. Cranes are available in different forms, and the characteristics of each must be considered in relation to the contract and task requirements. Points to be considered include:

- Weight, dimensions and characteristics of the load and lifting accessories
- Number, frequency and types of lifting operations
- Operational speeds, radius, height of lift and areas of movement
- Task duration
- Site, ground and environmental conditions and restrictions arising from other buildings etc
- Space available for crane access, erection, travelling, operation & dismantling
- Any special conditions imposed
Particular care must be taken to ensure that any specification sheet consulted applies to the particular crane to be used. In any event, the manufacturer’s duty plate/charts in the crane takes precedence over other published data. When calculating the capacity of the crane it may be necessary to allow for the weight of any accessory equipment fitted, the hook block and whatever slings or lifting gear are required.

3.6 SITING OF CRANES

The siting of the cranes must take into account:

- Ground conditions, including any slope
- Proximity to other cranes
- Proximity to other hazards
- Creation of a hazard by poor siting of the crane
- The effect of wind (particularly out of service)
- Access for erection and dismantling or for movement across the site
  - Access and egress to the crane
  - The delivery zone

3.6.1 Ground Conditions

The Appointed Person must ensure that the loads imposed by the crane can be safely transmitted into the ground, if necessary, by seeking the assessment of a competent engineer. Advice on the size of the imposed loads must be sought from the crane supplier or from Select Plant Technical Services. Laing O’Rourke Technical Information Notes 42 and 42S covering the assessment of ground for siting cranes are available via iGate.

A CIRIA guide, “Crane Stability on Site” (Special Publication 131) also deals with this subject.

Similar consideration of ground bearing capacities should also be made for other major items of plant and equipment relying on outriggers for stability (concrete pumps, aerial platforms, lorry loaders etc.).

There should be a TW permit system applied where cranes are sited on suspended slabs or near retaining walls and excavations.

3.6.2 Proximity to Hazards

Hazards best avoided, where possible, include:

- Overhead electric lines
- Nearby structures
- Other cranes
- Railways
- Public access areas
- Airfields

Where any part of the crane or its load cannot be kept clear of these hazards, the appropriate authority, e.g. a local electricity supplier or Railtrack, must be consulted.

Danger from vaults or underground services must not be overlooked, and suitable precautions must be taken where they cannot be avoided.

Where the crane or its load passes closer than 600mm to an obstacle, effective precautions must be taken to avoid crushing, by preventing personnel accessing the area.

Where a crane is to be used within 15 metres plus the length of its jib, from overhead power lines on steel towers, (or 9 metres plus the length of the jib, from overhead lines on wood, concrete or steel poles) the guidance given in HSE Guidance Note GS6 must be followed.

Where a crane will work close to railway property (i.e. if it fell over and any part of it, or any load being lifted by it, could fall on railway property), consult the railway property owner and CPES.

If the crane is within 6 km of an airfield, and its height exceeds 10 m or that of the surrounding structures or trees, then the Appointed Person should seek the permission of the airfield manager before starting operations.

3.7 SAFE WORKING LOAD

The manufacturer’s safe load tables for a crane are generally applicable in more than one country, where the regulations and standards may vary. This results in the confusing situation where there may be more than one safe working load for a certain crane configuration. The columns in the safe working load
tables will generally be headed 75% or 85%. The other statement that frequently appears is that “the 75% crane ratings comply with DIN 15019.2 (test load =1.25 x lifted load + 0.1 x dead weight of boom reduced to jib point)”. In all cases, the 75% ratings are the ones to use; do not use 85% ratings.

The safe working load (SWL) must not be exceeded other than for the express purpose of testing the crane under the supervision of a competent person. There are no exceptions to this. Calling an overload a “test load” or an “engineered lift” is both illegal and dangerous.

Safe working loads apply only to freely suspended loads: loads must not be dragged along the ground, and before any lift takes place, the hoist rope must be plumb.

Travelling with a load can affect the safe working load / radius and stability of the crane. Failure to ensure this can result in collapse or overturning of the crane without warning.

3.8 GRABBING, DEMOLITION AND PILING OPERATIONS

Crawler mounted excavator/cranes used for grab work, demolition balling or for pile driving or extraction need to be designed for these applications as the dynamic loads encountered are generally higher than those on lift cranes.

Older mechanical cranes tend to have more robust structures than modern hydraulically driven machines and may be more suitable for such operations. Before using any cranes for these duties, both the manufacturer and owner must be consulted to establish the suitability of the specific crane for the particular operation.

3.9 OPERATING IN HIGH WINDS

All cranes have a maximum design wind speed for safe operation. When the wind speed exceeds this limit the crane must be taken out of service. Different types of crane, different models of the same type of crane and different configurations of the same model may operate with different maximum wind speeds. The operating wind speed for the crane will allow for the load having a certain wind area; if this is exceeded then the working wind speed will need to be reduced (see the manufacturer’s manual for information on this).

Typical maximum operating wind speeds are:

<table>
<thead>
<tr>
<th>Crane Type</th>
<th>Maximum Wind Speed</th>
<th>Beaufort Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Cranes</td>
<td>9.8 m/s (22 m.p.h.)</td>
<td>5</td>
</tr>
<tr>
<td>Crawler Cranes</td>
<td>14 m/s (31 m.p.h.)</td>
<td>6</td>
</tr>
<tr>
<td>Tower Cranes</td>
<td>20 m/s (45 m.p.h.)</td>
<td>8</td>
</tr>
</tbody>
</table>

The following descriptions may be used for the Beaufort Scale values shown below:

<table>
<thead>
<tr>
<th>Beaufort Scale</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Fresh Breeze Small trees in leaf begin to sway,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>crested wavelets form on inland waterways</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Strong Breeze Large branches in motion,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>whistling heard in telephone wires, umbrellas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>used with difficulty</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Gale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breaks twigs off trees; generally impedes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>progress</td>
<td></td>
</tr>
</tbody>
</table>

Anemometers (wind speed meters) should be used when high or gusting winds are likely. These may be either hand held or fixed to the top of tall structures or plant. If there is a tower crane on site, the anemometer fitted to that crane can be used as a guide to wind speeds affecting other cranes. All tower cranes on company sites must be fitted with an anemometer.

Operators must not operate cranes unless they are confident that both they and the Slinger/signaller can handle the load safely in the prevailing wind. For large, light loads such as shutters, this limit may apply some way below the crane’s design wind speed. For example, with a wind speed of 14 m/s (31 m.p.h.) the wind load on an 8’ x 4’ sheet of ply will be 38 kg!

Due allowance should be made in the programme of works for lost time due to high winds, taking into account the degree of exposure of both crane and load, and of the degree of precision required.

Note: This can affect the erection and dismantle of tower cranes, causing a delay that may extend until the next opportunity for a road closure.
The manufacturer’s manual should be consulted for advice on taking the crane out of service and securing it in high winds.

3.10 MULTIPLE CRANE LIFTING OPERATIONS

Multiple lifting (i.e. lifting a load with more than one crane at one time) should only be carried out when the physical dimensions, characteristics, weights, required movement of the load or access restrictions, prevent the operation from being carried out by a single crane.

Multiple lifting must be planned with extreme care, and a written Method Statement produced. It must include an accurate assessment of the share of the load to be carried by each crane, which may change as the load is lifted.

The crane configuration and lift must be planned to ensure that the hoist ropes remain vertical at all times. The cranes must not be subjected to forces that would not occur if they were handling their SWL in a single lift.

It is good practice to de-rate each crane by at least 20%. In exceptional circumstances, the cranes may be used up to their SWL if Select Plant Technical Services and the Appointed Person are absolutely satisfied that all the relevant factors have been accurately identified and effectively monitored by instruments.

One competent person, the Crane Supervisor, must be in overall control of a multiple lifting operation. Only this person should give instructions to the crane operators.

Radio communication between the Crane Supervisor and all the crane operators, and between each of the crane operators, is essential to maintain a safe operation.

Multiple lifting must not be carried out using tower cranes.
4. SPECIALIST LIFTING

4.1 RAISING OR LOWERING PERSONNEL (MAN RIDING)

Raising or lowering of personnel by crane is not encouraged and is to be used as a last resort only.

Approval for man riding should only be given by the Appointed Person after consideration of the following:

- Is there a viable and inherently safer alternative to man riding?
- Is it for limited man riding operations or for multiple usages?
- The crane and equipment to be used
- The operation being carried out
- The risk assessment for the operation and its resultant Method Statement

Man riding must NOT be carried out utilising excavators under any circumstances.

Man riding can only be carried out on cranes:

- That preferably have a hydraulic or electrical/electronic control system rather than a mechanical/pneumatic one.
- Fitted with “deadman” controls (Crane will come to rest if controls released)
- Fitted with power load lowering (with any free fall system locked out)
- That have been thoroughly examined by a competent person within the last six months and a satisfactory report issued
- Been tested within the last four years and certificate issued
- With all hydraulic cylinders fitted with devices to prevent movement in the event of a hydraulic system failure
- With control systems that will ensure smooth movements of the persons being carried, limiting their speed to 0.5m/s
- Fitted with limit switches to prevent movement beyond the machines physical limits, including an over hoist (anti two-block) limit
- With a SWL at the required radius of at least twice that of the weight of the personnel carrier and its contents
- Fitted with a hook that has a safety latch fitted
- Whose hoist rope is at least 8mm in diameter
- Fitted with an anemometer to check on operational wind speeds

Man riding baskets can only be used to carry Personnel if they have:

- Been properly designed for the purpose, stable in operation and approved
- Been thoroughly examined within six months and a satisfactory report issued
- Been tested within the last four years and a certificate issued
- Been clearly marked with its safe working load (which will not be exceeded) and also marked to indicate the number of people it can lift safely
- Been inspected before each use and this inspection recorded
- A safe means of access and egress
- A storage system for tools, etc. to contain them in case of the carrier tipping
- Sufficient designated fall arrest harness anchor points for the carrier’s rated number of persons
- The capacity to accommodate a stretcher, if required

Before the operation, check and record the following:

- Daily inspection of crane and carrier
- If lowering down a hole, the carrier must be sent down empty to ensure that the hoist rope is long enough
- A means of communication must be provided between the crane operator and the personnel in the carrier
• A system must be in place to rescue the personnel from the carrier in the event of a crane or power failure, or the operation of any of the crane’s safety systems cutting out the crane’s motions

• The crane, carrier and lifting gear must be inspected

• The crane’s motion cut outs must be tested

**During the operation** (i.e. with personnel in the carrier suspended from the crane):

• Measures should be taken to prevent the carrier from spinning

• The wind speed should not exceed 7m/s

• The crane operator and signaller must concentrate solely on this operation

• The crane operator must remain at the crane’s controls at all times

• No lifts may be made with any other hoist line on the crane

• The crane may not travel

• Personnel must wear suitable fall arrest harnesses and have them securely attached to the designated anchor point in the carrier

• Personnel should ensure that all parts of their bodies are contained within the carrier to prevent a trapping hazard against external objects

• Personnel must not work whilst standing on any part of the carrier except its floor

• Care should be taken with electrical cables required for power tools and weld sets to guard against entanglement or stretching (also applies to air hoses for pneumatic tools)

• Care should be taken if welding from the carrier not to cause any stray electrical currents to pass through the crane

On any site or contract, the company Safety Adviser must be notified in advance of the intention to carry out man riding. They will advise on the use of suitable fall arrest harnesses.

4.2 **VACUUM LIFTING DEVICES**

Lifting with a vacuum device requires even more care than with a hook, as there is no positive engagement between the lifting appliance and the load. It can be extremely useful, however, as no special lifting points are required, but the load does need to be suitable to be lifted by this method. Items that can be lifted include glass, glazed units, marble panels, pre-cast concrete panels, and sheet materials including metal, timber and plasterboard.

The vacuum lifter must be selected to give adequate support to the load; generally for glass, for example, vacuum cups must be no more than 500mm apart.

The type of pump must be rated to suit the porosity and surface finish of the load, especially if experience shows that the pump will run continuously due to air leaking into the system.

The vacuum lifter shall have:

• A rated capacity based on lower limit of the working range of the vacuum level

• A factor of safety of at least two on the rated capacity

• A vacuum indicator, showing both the working range and the actual vacuum levels, visible to the operator at all times

• An audible and visual alarm to indicate that the vacuum level has fallen below the minimum working level, or that the vacuum generating equipment has failed. The alarm shall be powered by a separate power source to that which powers the vacuum device

• A vacuum reservoir to give at least five minutes of working vacuum in the event of failure of the vacuum generating equipment, or longer if this is necessary to enable the load to be placed in a safe place. A check valve shall be provided to ensure that the reservoir does not lose vacuum through the pump in case of any failure

• Any flexible hoses shall be of the armoured type and shall be protected as far as possible from accidental damage
Vacuum lifters will be:

- Thoroughly examined and dynamically tested on the material surface for which they are designed, and with the load in the orientation for which the lifter has been designed, within the previous six months

- Inspected (especially hoses and vacuum pads) prior to each use and the warning device tested at least weekly

Consideration should be given to the provision of a mechanical back up device to “catch” the load in the event of a failure of the vacuum lifter where the loads are being lifted to a height of 10m or more.

Loads should never be lifted over personnel or outside the site boundaries. The load should be routed to avoid lifting the load unnecessarily high, or over areas that would be especially vulnerable to impact from the falling load.

Appendix 8 contains specific guidance on the use of vacuum lifters, and is reproduced by kind permission of GGR Glass Services Limited (Tel: 0161 683 2580).

4.3 MAGNETIC LIFTING DEVICES

Magnetic lifting requires more care than with a hook, as there is no positive engagement between the lifting appliance and the load. It can be extremely useful, however, as no special lifting points are required, but the load does need to be suitable for lifting by this method. Items that can be lifted include the majority of iron and steel materials, although it should be noted that some stainless steels are not magnetic and are therefore not suitable for magnetic lifting.

When carrying out lifting with magnetic lifting devices the following points should be observed:

- The safe working load of the magnet should be established by testing it with weights having the same characteristics as the loads to be lifted

- The power to the magnet should not be turned on until the magnet is resting on the load. The power should not be turned on when the magnet is not in use to ensure that the magnet does not get too hot

- When not in use, the magnet should be kept suspended from the crane, or rested on a clean wooden platform if detached from the crane. It should not be placed on the ground

- Consideration should be given to the provision of a mechanical back up device to “catch” the load in the event of a failure of the magnetic lifter where the loads are being lifted to a height of 10m or more

Loads should never be lifted over personnel or outside the site boundaries. The load should be routed to avoid lifting the load unnecessarily high, or over areas that would be especially vulnerable to impact from the falling load.

4.4 DEEP SHAFT WORKING

When using a crane to lower loads down deep holes, the weight of the long hoist rope required becomes significant and must be added to the load being lifted. If the weight of the hoist rope is not taken into account, there is a risk that the combined weight of the rope, hook block and load will exceed the SWL of the crane. The effect of this will be to either cause the hoist up motion to be cut by the load limiting system, preventing the combined load from being reduced to a safe level, or cause the crane to fail.

These problems can be prevented by correctly sizing the crane for the application and by the operator watching the rated capacity indicator for warning of the approaching problem.
5. CRANES (Other than Tower Cranes)

5.1 SITE BASED MOBILE AND CRAWLER CRANES

A site based crane is often selected initially for its ability to perform the most difficult of a number of planned tasks, such as skipping concrete to a particular position, handling an expected weight of pre-cast panel or placing steel to the roof of a structure. Once on site, it is frequently used for tasks that are more general; such as unloading lorries, handling air conditioning plant or portable office units. In these circumstances, due to the lack of specific planning, the risk of an accident is often high.

Frequent causes of such accidents are:

- The use of unsuitable lifting accessories
- The Rated Capacity Indicator being incorrectly set
- Overloading the crane in an effort to “get the job done”
- Inadequate spreading of outrigger load or high crawler ground bearing pressure
- Operating or travelling on slopes

The Appointed Person should always be consulted about any lift in advance, and by following the procedures set out in Section 3, establish a safe method of carrying out the lift.

The following highlights some of the specific risks associated with site based mobile and crawler cranes, together with measures to be taken to mitigate those risks.

5.1.1 Unsuitable Lifting Accessories

Part of the planning for every lift is the selection of lifting accessories that are both adequately rated for the load to be lifted and in a suitable condition. Detailed advice on the selection, use and examination of lifting accessories is given in Appendix 7 of this document and in the Laing O’Rourke “Guide to Safe Slinging & Signalling”.

5.1.2 Rated Capacity Indicator Setting

An incorrectly set Rated Capacity Indicator can occur when the operator of an all-terrain or rough-terrain crane is asked to carry out a “quick lift” which is attempted without outriggers and without selecting the appropriate duty on the Rated Capacity Indicator. It is good practice to forbid lifting free on wheels on a site unless it is carried out to a written Method Statement approved by the Appointed Person.

5.1.3 Overloading

Overloading in an effort to “get the job done” may occur in the situation where the weight of the load and/or the radius of the “landed” position are not accurately known.

Traditional crawler cranes (based on rope operated excavators) tend to be tough, heavy and stable, and many people have believed that they could overload them with impunity. The latest generation of crawler cranes, incorporating hydraulic operation, generally carries longer, lighter booms and have lower base weights. They are therefore less tolerant of abuse, especially if made to lift when sited on soft or sloping ground and in high winds.

They are also more prone to structural collapse of the boom due to damage or overloading, or due to side loading from out of plumb loads or side slopes.

5.1.4 Outrigger, Axle and Crawler Loads

Outrigger loads, axle loads and ground bearing pressures need to be considered carefully in all cases. They should be available from the crane supplier or manufacturer. Further advice on this is given in Section 3.6.

Outrigger loads vary with the magnitude of the load being lifted, its radius and the slew angle of the crane. If, for example, an outrigger has to be placed over a vault, it may be possible to limit the load on that corner by not slewing the crane with the load at maximum radius over that corner. However, it should be noted that slewing the crane counterweight over that corner with no load on the crane might be a worse condition. This requires a high level of planning and site control. Specific outrigger loads should be obtained from the crane supplier.

Axle loads quoted for mobile cranes are normally only applicable when the machine is ready for the road, with the jib stowed and additional counterweights...
removed. If the crane is to be moved with the jib in any other position, with the counterweights in place, with a fly jib fitted, or especially if carrying a load, consult the supplier for an indication of the axle loads to be expected.

The ground bearing pressures for crawler cranes, as quoted in specification leaflets, generally assume a minimum configuration, and that the weight is evenly spread along and across the tracks, which is a rare situation. The real maximum pressure can be considerably higher (possibly several times), and will change with such factors as slew angle, boom length, radius, the weight of the load, and the ground conditions. Consult CPES if more accurate ground bearing pressures are required.

The Temporary Works Co-ordinator must be consulted on adequacy of ground conditions or floor capacities, requirements for spreader beams under outriggers to cranes or large devices with outriggers such as concrete pumps or MEWPS.

For more guidance on outrigger load design refer to LOR TIN 42 and TIN 42S

5.1.5 Thorough Examination Reports and Test Certificates
Relevant examination reports and test certificates must be available for inspection on site.

5.2 VISITING MOBILES
The same provisions apply to visiting mobile cranes as for site-based cranes (see previous section).

A particular problem with hiring cranes for the day is ensuring that they comply with legal requirements. Use of the Lifting Operations Assessment Forms (Appendix 2) should record how the site’s responsibilities are properly discharged. It is the duty of the Appointed Person to ensure that the items listed on the form are actively considered and satisfactory answers obtained.

See also Section 5.9 for further information regarding the Project Manager’s responsibility for the operator.

5.3 EXCAVATORS
All types of excavators and loaders are required by LOLER to be inspected weekly and thoroughly examined at twelve monthly intervals.

Should an excavator or loader be used to lift materials, other than excavated material or fill, then by definition it becomes a crane. In this case, the following points must be observed:

- A test & thorough examination is required as necessary (previously 4 yearly)
- The load must be lifted from a properly designed lifting point, NOT the bucket teeth or bucket link
- If the properly designed lifting point is mounted on a bucket which is attached to the boom using a Quick Release Bucket Attachment (QRBA) it is important to check that the bucket and QRBA are fully compatible
- If the excavator has a maximum rated lift capacity of more than 1,000kg (or an overturning moment in excess of 40,000Nm) it must be fitted both with lowering control device(s) to ISO 8643 on the lifting boom hydraulic cylinders and an audible or visual rated capacity indicator
- The safe working load of the excavator must be marked on the machine or displayed in the operators cab, together with a load radius diagram showing ‘rated object handling capacities’
- If the excavator configuration can be altered, the operator must be provided with clear instructions on which configurations are intended for lifting duties
- Where the stability of the excavator is dependent upon the use of outriggers, blades or the locking of oscillating axles; suitable safety devices should be fitted so that in the event of a hydraulic failure during lifting they remain in position
- The use of excavators to lift delicate loads or loads requiring accurate placement, should be discouraged as the controls lack the precision required
• Excavators must be restricted to very basic lifting at or near ground level and should not travel except over short distances. The use of a crane is usually a better option.

• If some limited travel with suspended load is unavoidable, the Appointed Person (Lifting) should agree the limitations and agree appropriate safe system of work for inclusion in the schedule of common lifts.

• Excavator operators must hold CPCS card for size of machine being used.

• Only CPCS card Slinger/Signalers can attach or detach suspended loads unless the HS&E Director has previously approved an alternative qualification.

• The use of excavators for man riding is prohibited.

• If an excavator could be used in lifting operations, this must be clearly stated when placing an order to ensure that the machine delivered complies and has a RCI fitted if required.

### 5.4 FORKLIFTS AND TELESCOPIC HANDLERS

All types of forklifts, including telescopic handlers, are required by LOLER to be inspected weekly and thoroughly examined at twelve monthly intervals.

Should a forklift be used to lift materials, other than on its forks, then by definition it becomes a crane. In this case, the following points must be observed:

• The load must be lifted from a properly designed lifting point, NOT by hooking a chain onto the forks.
- Specially designed, certificated lifting adaptors must be used to centre the load
- If a forklift has a maximum rated lift capacity of more than 1,000kg (or overturning moment in excess of 40,000Nm) it must be fitted with check valves on mast/boom hydraulic cylinders and audible or visual rated capacity indicator
- The safe working load of the forklift must be marked on the machine or displayed in the operators cab along with a load reach/radius diagram
- If the forklift configuration can be altered, the operator must be provided with clear instructions on which configurations are intended for lifting duties
- Where the stability of the forklift is dependent upon the use of outriggers or the locking of oscillating axles, suitable interlocking devices should be fitted so that in the event of a hydraulic failure during lifting they remain in position
- Some forklifts or telehandlers can be used for lifting people when fitted with purpose built carriers. These should only be used where other more suitable platforms cannot be provided as they do not provide the same standard of safety or control as a Mobile Elevating Work Platform. The use of forklifts for this purpose is covered by HSE Guidance Note PM28. Forklifts used for lifting people require a thorough examination at intervals not exceeding six months
- Forklifts and telehandlers should avoid traveling with suspended loads due to the high risk of dynamic instability. The use of a crane is a better option
- If some limited travel with a suspended load is unavoidable, the Appointed Person (Lifting) should agree the limitations and agree appropriate safe systems of work for inclusion in the schedule of common lifts
- Forklift operators must hold a CPCS card and use CPCS carded Slinger/Signalers to attach or detach loads

5.5 LORRY LOADERS

Lorry loaders (often known as HIABs) are common on construction sites. The primary function of these units is to unload materials from the delivery vehicle on which they are mounted. If used for this purpose to unload standard materials such as bricks or pipes, where ground conditions are good and no other hazards exist, a LOAF form does not need to be filled in.

If however a lorry loader is to be used for general site lifting or particularly large, complex or potentially high risk lifts, then the same principles for planning, testing, supervising and executing the lift are required as for a conventional crane lift. In both cases the following points must be observed:

- Lorry loaders must be operated on firm level ground with the outriggers properly deployed and the vehicles tyres correctly inflated
- Spreader plates may be required under the outrigger feet
- Machines may only be used with outriggers partially retracted if this duty is permitted by the manufacturer
- Lorry loaders should always be positioned so that there is no risk of the operator being trapped between the lorry and the load or loader arm
- Operating controls should be clearly marked. Where more than one operating position is provided the operator should ensure that no person is in a position to interfere with the second set of controls. Operators should have a clear view of the whole lifting operation
- Lorry loaders with a SWL in excess of 1,000kg (or an overturning moment in excess of 40,000Nm) must be fitted with suitable overload cut out devices. These must enable the boom to return to a safe position in the event of an overload
- Where the SWL is dependent upon the operating radius or boom configuration, a load radius diagram must be provided at each operating position

On all our sites, operators of site based lorry loaders are required to hold a CPCS or ALLMI card (Association Lorry Loader Manufactures and Importers) covering the operation of lorry loaders. The crane plan
assessment of common lifts will determine further requirements for a separate CPCS Slinger/signaller card. However, this is not a standard that can be imposed upon suppliers delivering materials to site.

5.6 BEAM AND TRESTLE HOISTS

These types of crane both have a lifting unit travelling under a fixed beam. This unit will lift a load using a hook that travels through a vertical path by means of either a steel wire rope or a steel chain. The unit may or may not have an overload cut out, depending on its age and lifting capacity.

The standard runway beam consists of a universal beam section (UB) or rolled steel joist (RSJ) fixed to the structure of a building, special steelwork, or scaffolding.

The trestle type has a portable frame supporting a short runway beam, which has a cantilever at one end allowing it to pick loads up from outside a building or scaffold. The other end of the frame will have a counterweight to stabilise it. These often take the form of bins, which are filled with sand or ballast. Care should be taken with these as, over time, ballast material can be lost and the stability of the unit adversely affected. A more reliable alternative is the use of steel or concrete weights.

These units are all classified as cranes, and are thus subject to the same inspection regime and rules as all other lifting appliances.

5.7 “TAG” JIB CRANES & MINI TOWER CRANES

The jib crane essentially consists of a slewing runway beam attached at one of its ends to a fixed vertical column. A runway beam hoist travels along the beam. TAG or KONE is the name of the manufacturer of the versions held within the Select Group.

Mini tower cranes are small cranes that can be mounted on small masts, generally masts originally intended for construction hoists. They can slew, and are generally limited to a safe working load of one tonne. Both these types of crane are to be treated as tower cranes (see Section 6).

5.7.1 Floor Cranes / Mini Cranes / Element Setters

- Floor cranes or mini cranes are potentially dangerous in the hands of untrained and inexperienced users. Operators must hold a CPCS card (Under 10 tonne Crane)
- The use of these lifting devices must be assessed by the Appointed Person (Lifting) and their use approved by the Safety Department
- Refer to LOR Common Standards No 15 for full Guidance

5.8 OTHER TYPES OF CRANES

5.8.1 Scaffold Hoists – Scaffold Cranes – Bracket Hoists

These are small cranes attached to scaffolding or the sides of buildings. They generally lift up to 200kg, and utilise a wire rope and hook onto which loads are connected.

5.8.2 Hoist Erection Cranes

These small cranes lift mast sections from the cage onto the mast for extending the mast of a construction hoist.

5.8.3 Side Booms

Mounted on the side of crawler tractors, these are used to lower pipes into trenches.

5.8.4 Drilling Derricks

The equipment used to lift drill pipes and attach them onto the drill stem of a drilling rig is a lifting appliance.

5.8.5 Piling Rigs

There are many types of piling rig but any rope or device used for lifting the pile, its driving device, casing or reinforcement cage is classed as lifting equipment and must meet the requirements of LOLER.
5.8.6 In Summary

Any equipment that lifts a load out of its initial horizontal plane by means of a rope and hook, or chain and hook is a crane, and is thus subject to the same inspection regime and rules as all other lifting appliances. Operators of these items of equipment must meet the training and other requirements laid down elsewhere in this standard.

5.9 OPERATORS OF HIRED CRANES

Operators are normally supplied with a hired crane by the Owner, but under the usual Contractors’ Plant-hire Association (CPA) Hire Conditions, the Project Manager bears full responsibility for the operator’s actions. The Project Manager should ensure that the operator has an appropriate current CITB Certificate of Training Achievement CPCS (formally CTA card) and is familiar with the controls of the crane they are required to drive.

The operator is normally responsible for carrying out the weekly inspection and reporting any defects. They are also responsible for recording the inspection and any findings in a “Records of Inspection” book such as that published by the Construction Confederation or an approved equivalent. Guidance on operator selection is given in Section 2.5.
6.1 INTRODUCTION

Tower cranes are often the most important items of plant on a site and to ensure that site operations proceed in a safe and efficient manner, great care must be taken in the choice of equipment, its installation and use.

Tower cranes must be selected in consultation with Select Plant and, if a company owned crane is not used, the hire order for any externally hired tower crane must be placed by Select Plant on behalf of the operating division. The only exception to this is the provision of tower cranes as part of a package by a Trade Contractor under Management forms of contract, however Select Plant must still be consulted at the planning stage and all other requirements of this document apply.

This section of the document covers the design, erection, operation, inspection and dismantling of tower crane installations. It must be followed for every tower crane installed on our sites, irrespective of who is supplying and operating the crane. It must also be followed when installing a Select owned crane on a non-company site, with the requirements of that site taking precedence only if they are more onerous.

The on/off costs of tower cranes are often substantial, and can be affected by the size of mobile crane and need for road closures. These costs can be minimised by the selection of a correctly sized crane at the planning stage using the resources of Select Plant Technical Services.

No tower crane must ever be erected unless a layout drawing has been produced and project manager is satisfied with:

- The Location
- Coverage
- Capacity
- Clearance for the construction activity
- Clearance over other buildings
- Oversailing of other properties
- The means of dismantling

Oversailing a property with the jib of a tower crane is a civil trespass, and unless an agreement has been reached, the affected owner may obtain an injunction requiring the trespass to cease. There are also special requirements where tower cranes are sited close to public railways.

6.2 APPOINTMENTS

Every site with a tower crane must have company staff members appointed to carry out the duties of Temporary Works Co-ordinator and Appointed Person (see Section 2.3).

The Temporary Works Co-ordinator and Appointed Person will maintain effective communications throughout the installation and operational phases.

On sites with a high density of cranes, serious consideration should be given to the appointment of a full time Crane Supervisor to co-ordinate and control the movement of the cranes, thereby ensuring that they work with maximum efficiency and without the danger of jib clashes.

In most cases, it is envisaged that the Temporary Works Co-ordinator will deal with matters relating to the design and installation (i.e. Sections 6.3, 6.4, 6.5, 6.6, 6.7 and 6.8 of this document) while the Appointed Person will deal with matters relating to operation and regular inspection (i.e. Sections 6.9, 6.10 and 6.11 of this document).

6.3 TOWER CRANE PLANNING PROCEDURE

The procedure below should be followed whenever a tower crane is considered for a project.

6.3.1 Tender Stage

The tender planner should contact Select Plant as early as possible (with or without ideas of their requirements) and supply them with:

- Site Plan
- Building Foundation Plan
- Typical Floor Plans
- Sections
• Elevations showing height of neighbouring buildings

• Some idea of the loads to be lifted, the pickup points and location of any particularly heavy items

Note: Every effort must be made to ensure that pickup points are located within the site boundary to minimise the interface with the public.

Select Plant will then produce a layout drawing, indicating the size and position of suggested cranes. This will be sent to the person making the request, together with a hire quotation.

The tender team should discuss the proposal with their nominated engineer who may contact Select Plant Technical Services or the Engineering and Temporary Works Department to discuss the implications of the tower crane base on other construction work, and to review the options available to them in designing the base. They may also need to refer to the Consulting Engineer for the project if loads from the crane could be imposed on the permanent structure.

The tender team also need to take into special consideration:

• The availability of an adequate mains electrical supply

• The high cost of a generator and fuel

• Potential problems with the mobile crane to be used for erecting or dismantling the tower crane i.e. provision of space and work to prepare or consolidate the ground for axles or outriggers

• Any costs or problems associated with the oversailing of other properties by the tower crane jib

• Lighting, if being used outside daylight hours

There are occasions when there is not enough time to ask Select Plant Technical Services to prepare a formal scheme. In such cases, for single crane schemes, a quotation may be obtained for a suitable crane with a small risk of error. For multiple crane schemes, experience has shown that there is an escalating risk of the cost exceeding budget due to unforeseen complications, and a real risk that the scheme will prove impossible.

6.3.2 Contract Stage

Tower cranes, whilst a major expense, are key elements in the efficiency of the site. The Project Manager must ensure that all selection, installation and operational aspects of the crane are delegated to responsible people and that proper consideration be given to their recommendations.

One person must be designated Appointed Person, and act as a channel for information for all interested parties.

Step 1 is to examine the tender scheme in detail, paying particular attention to programme timings, access, required lifting capacities, foundation requirements and heights. Information used, or assumptions made at tender stage must be checked in order to ensure that the tower crane proposed at tender stage will meet the project’s requirements.

Step 2 is to contact Select Plant. Since the tender, a more suitable crane may now be on the hire market, or a crane selected at tender stage may not now be available. This is particularly critical for multi-crane projects, and for any project for which a complete scheme was not prepared at tender stage by Select Plant. As soon as the site is satisfied with the scheme, the crane should be ordered.

The site should then be visited by a representative of Select Plant, or an outside supplier if appropriate. They will be principally concerned with the access to install and later remove the crane. The site should make a careful note of any advice or requirements given, since failure to comply can have major financial and programme repercussions. It cannot be over emphasised that attempts to save small sums on preparation can easily lead to subsequent large costs. The most common problems are the failure to make or keep an area clear for cranage, transport and initial assembly, and inadequate ground preparation for mobile crane wheels and outriggers.

In parallel with the final selection of the cranes, the nominated engineer, the Engineering and Temporary Works Department or Select Plant Technical Services should design the tower crane foundations. This will depend on:

• Size and type of tower crane

• Type of tower crane base
• Ground conditions
• Space available
• Type of permanent foundations being constructed
• Permissible loading of permanent works

It is usual to present the details to the Project Consulting Engineer for his information.

In cases where the design of the base is carried out by an organisation external to Laing O’Rourke, steps must be taken to ensure that the designer has the necessary expertise and that the design check and design review detailed in Section 6.5 and 6.6 are carried out.

6.3.2.1 Checks before Final Choice of Tower Crane

The following items must be considered before finalising the type, size and location of the crane:

• Maximum load, radius and hook height requirements
• Proximity hazards (overhead cables, structures, railways, other cranage, etc.)
• Environmental hazards (fumes from existing chimneys, wind funnel effects from neighbouring tall buildings, risk of foundations flooding, etc.)
• The feasibility of installing an adequate foundation
• Access for erection and dismantling
• Adjacent properties (i.e. oversailing rights, special requirements in respect of public roads, railways, etc.)
• Any alterations required during construction
• Availability of adequate electrical supply
• Interface with completed building

Zoning systems are available for modern tower cranes. These allow the crane to be programmed to prevent them from carrying loads into prohibited areas.

With multi-crane schemes, the use of anti-collision devices must be considered; however these are no substitute for vigilance by, and good communication between, the tower crane drivers. Use of such devices may reduce the productivity of cranes in some circumstances.

6.3.2.2 Information from the Tower Crane Supplier

Once the crane has been chosen, the supplier will be required to submit the following information, as a minimum, relating to the chosen tower crane configuration:

• Lifting capacities
• Imposed foundation and tie-in forces for in-service, out-of-service and erection/dismantling conditions

Note: Erection/dismantling loads may not be given by some manufacturers if they do not give rise to maximum forces.

• Method Statements for installation and dismantling of the crane superstructure (Appendix 3 lists items that should be addressed in the Method Statements submitted)
• Any restrictions on the type, size or tolerances of foundations including any limitations on settlement or deflections

See also section 6.8.2 with regard to a pre-delivery inspection of the tower crane.

6.4 FOUNDATION DESIGN

6.4.1 Designer Qualifications

The foundation design must be carried out by a suitably qualified and experienced engineer as defined in Laing O’Rourke procedures on temporary works.

In cases where the design of the base is carried out by an organisation external to Laing O’Rourke, steps must be taken to ensure that the designer has the necessary expertise and that the design check and design review detailed in Section 6.5 and 6.6 are carried out.

6.4.2 Information for the Designer

The foundation designer must be supplied with all relevant information, which will include:

• Details of the site showing the tower crane location
• Soils data (i.e. site investigation results, details of previous ground use etc.)
• Loading data and restrictions such as the 2nd and 4th items of Section 6.3.2.2
• Details and construction stages of adjacent permanent or temporary works
• Details of future construction works to take place whilst the crane is erected which may impose additional loads, undermine or otherwise affect the stability of the foundation

6.4.3 Standards
The foundation designer must carry out the design of the foundation in accordance with relevant British Standards.

For steelwork and bolted connection the fatigue criteria of BS 2573: Part 1: 1983 “Rules for the Design of Cranes”, shall be applied. Appendix 1 lists other relevant documents.

6.4.4 Drawings & Calculations
The foundation designer must prepare and submit to site a general arrangement drawing detailing the foundation required. This drawing must be supplemented with further details, specification notes and a construction Method Statement where appropriate. Calculations must be submitted if requested.

6.4.5 Design Certificate
On satisfactory completion of the foundation design, the foundation designer must complete and sign a certificate of design clearly identifying any limitations or restrictions.

See Appendix 4 for an example of the type of certificate required.

6.4.6 Use of Permanent Works
Where the foundation design involves the use of the permanent works the imposed loading, both minimum and maximum, and the proposed connection details must be clearly shown. The foundation designer must clearly state whether the adequacy of the permanent works to support the imposed loading has been analysed and whether any deflection or differential settlement of the permanent works is liable to adversely affect the crane’s “out of plumb” limits.

6.4.7 Rail Mounted Cranes
Cranes mounted on travelling bases generally run on standard railway rails, but the local forces from tower cranes are high. While a locomotive may weigh around 120 tonnes, its weight is spread evenly over 10 to 12 wheels. A tower crane, on the other hand, can put this same force onto just two wheels only 600 mm to 800 mm apart! Foundations for tower crane track, therefore, may need to be far more substantial than the typical sleepers-on-ballast arrangement that a railway uses. A further limitation is that a tower crane is very sensitive to differential deflections of the bogies, e.g. a bogie with 100 tonnes on it may only be permitted to deflect 6 mm more than one with no load on it. It is therefore critical that the track is both designed and laid to acceptable standards. The requirements set out below apply to all tower cranes on company sites including externally hired, and subcontractors’ cranes.

Where a tower crane is to be rail mounted, the nominated engineer should check that the standard track detail issued by Select Plant Technical Services is adequate for both the crane bogie loads (also supplied by Select Plant Technical Services) and the ground conditions on site. If necessary, the nominated engineer may specify additional ground preparation or an alternative track design.

The track drawing specifies the acceptable tolerances to which the track must be laid. These must be checked at regular intervals and any rectification work carried out immediately. The nominated engineer must issue a Tower Crane Foundation Pre-erection Inspection Certificate (see Appendix 4) to Select Plant before erection of the crane commences.

The Inspection and Testing Service of Select Plant must be provided with a copy of this certificate stating that the track has been correctly laid to the drawing, is complete and is to required tolerances, before the crane is tested.

The following points should also be observed:

• A further Tower Crane Foundation Pre-erection Inspection Certificate must be issued whenever the track is extended
• Rails must not be heated by burning or welding, as there is a high risk of embrittlement and premature failure of the rail under load
• It is essential that track be properly earthed. This means that both rails must be connected to earth spikes driven sufficiently deep to achieve a safe earth. Where there are rails connected together by fishplates, a continuity lead must be bolted to each rail. Select Plant Technical Services can provide full details.

• Tower cranes rail bogies must be clamped to the rail when the crane is out of service. These clamps are normally part of the crane.

6.4.8 Expendable Anchors

A standard drawing No. 3716-A-01/02 is available from Select Plant Technical Services showing basic dimensions and construction of the concrete base with embedded expendable anchors. This is not sufficient for construction, as the base must be designed to suit the imposed loads (supplied by Select Plant Technical Services) and the ground conditions. This design must be by Engineering and Temporary Works or the nominated engineer.

The anchors must be inspected before delivery to site by Select Plant Technical Services to make sure they comply with the crane manufacture’s drawing. Access to the base must be maintained at all times to allow for the inspection of the anchors and the top surface of the base.

The anchors will be delivered by the tower crane supplier. Where this is Select Plant, they will organise a crane and provide a supervisor to assist with placing the anchors, but the site must in any case provide an engineer to check for plumb and positional accuracy. The projection of the anchors above the concrete has a critical tolerance. Failure to comply with the specification can prove to be very expensive, both in rectification work, and in lost time.

When the base has achieved its minimum required strength, as proven by test cubes, the Appointed Person must ensure that a Tower Crane Foundation Pre-erection Inspection Certificate (see Appendix 4.) is issued to Select Plant.

The foundations must be constructed strictly in accordance with the design; if problems arise, they should be taken up at once with Select Plant Technical Services or the nominated engineer responsible for the base design.

Mistakes occasionally happen, but rectification must not be attempted by site personnel unaided. The designer of the base and Select Plant Technical Services must be consulted.

6.5 FOUNDATION DESIGN CHECK

6.5.1 Design Checker

The design of the foundation must be subjected to an independent check by a suitably qualified engineer who has not been directly involved with development of the concept or details of the foundation design.

The independent design check is carried out to ensure that the concept, overall design and details of the foundation proposed are adequate and that the foundation designer’s intentions have been properly reflected in the drawings to be supplied to site. The check is not intended to take the place of any checking carried out by the foundation designer, who will retain full responsibility for the adequacy of the foundation design.

6.5.2 Information for the Check

The engineer carrying out the design check must be provided with the basic information supplied to the designer, as Section 6.4.2 above, together with the drawings, details, specification notes, Method Statement and design certificate prepared by the foundation designer.

The design checker should not be supplied with the original calculations, but should be encouraged to discuss the design concepts with the designer.

6.5.3 Design Check Certificate

On satisfactory completion of the design check, the design checker must complete and sign a design check certificate clearly identifying any limitations, restrictions or reservations. See Appendix 4 for an example of the type of certificate required.

If the foundation design involves the use of the permanent works, the design checker must clearly state whether or not the adequacy of the permanent works to support the imposed loading has been analysed and whether any deflection or differential
settlement of the permanent works is liable to adversely affect the crane’s “out of plumb” limits.

6.5.4 Permanent Works Check
Where the foundation design involves the use of the permanent works the details and forces must be submitted to the Project Consulting Engineer for approval.

Where the designer and/or design checker has not analysed the adequacy of the permanent works the Project Consulting Engineer must be requested to confirm in writing that the permanent works are adequate to support the imposed forces and supply details of the expected deflections and/or differential settlement that may occur during the operational period of the crane.

6.6 FOUNDATION DESIGN REVIEW
If neither the foundation design, nor the independent design check, have been carried out by experienced/trained staff within the company, then the details, as defined in Section 6.5.2 above, must be submitted to either Engineering and Temporary Works Office, Laing O’Rourke or Select Plant Technical Services, for review and comment prior to erection of the tower crane.

6.7 TIES
Ties between the crane mast and another structure may be required, either to enable the crane to stand to a greater height than the design of the unrestrained tower or foundation will allow, or to reduce the sway of the crane at certain heights. If so, then the design procedure must generally follow Sections 6.4, 6.5 and 6.6 for the foundation design. Certificates required will be a Design Certificate and a Design Check Certificate. Special attention must be given to Section 6.5.4, considering the state of the structure at the time of attachment (e.g. part built).

6.8 INSTALLATION

6.8.1 The Foundation
The foundation must be constructed in accordance with the checked details issued by the foundation designer. If anomalies arise, they must be referred back to the foundation designer for resolution.

The foundation must be inspected and a certificate of inspection issued before erection of the tower crane commences. See Appendix 4 for an example of the type of certificate required.

As well as ensuring compliance with the design details, the inspection must include checks on the following:
- Concrete foundations – minimum concrete strength
  - plumb and accuracy of cast-in anchors
- Steelwork grillages – grade and torque of connecting bolts
  - weld quality
  - levels within tolerance
- Track rails – levels within tolerance
  - rails at correct centres
  - end stops fitted

Further guidance on the inspection of foundations is given in Appendix 4.

6.8.1.1 Tower Crane Foundation/Grillage Verification Form
In all erection Method Statements, a tower crane foundation/grillage verification form is appended, this form must be returned to Select Plant before erection operation can commence.

6.8.2 The Crane Superstructure
In the case of a crane supplied from outside the company, an examination of the crane must be made by an Engineer Surveyor from the Select Plant Technical Services, prior to erection. This examination must be requested by the site; at least 72 hours notice must be given and the request for inspection must be accompanied by details of the make, model and configuration of the crane.
Erection of the crane superstructure must be carried out in accordance with the manufacturer’s instructions and to a Method Statement supplied in advance.

Erection must not commence until the following signed certificates are in place on site:

- Foundation Design Certificate (see Section 6.4.5)
- Foundation Design Check Certificate (see Section 6.5.3)
- Foundation Inspection Certificate (see Section 6.8.1)
- Confirmation of Inspection by Select Plant (externally supplied tower cranes only)

6.8.3 Tower Crane Erection/Alteration/Dismantling

6.8.3.1 General

Erection or dismantling of a tower crane is a potentially hazardous operation, and any site activities that could impinge on the operation must be suspended whilst it is being carried out. This includes other cranes and equipment operating in the area. As an additional precaution, an exclusion zone must be established around the operational area. The site Appointed Person & Project Manager must satisfy themselves that a thorough assessment of the effect of site activities on the erection/dismantling and vice versa, has been made and adequate precautions taken to control the risks involved.

It is vitally important there is adequate liaison between the project team and tower crane supplier and that both parties are aware of their relative responsibilities, some of which are listed in 6.8.3.2. Planning and execution of the erection/dismantling operations will be the responsibility of the tower crane supplier’s Appointed Person. However, they may not always be present on site during operations, having delegated the task of controlling erection/dismantling to the erection supervisor.

Procedures must conform to the manufacturer’s instructions and be to a Method Statement supplied in advance by the erection supervisor and approved by the Project Manager (see Section 6.3.2.2 and Appendix 3). Large mobile cranes are often used, and all the points made in other parts of this document must be scrupulously followed (see also Appendix 6 - TIS 0157).

Site access is likely to be more difficult when dismantling a tower crane and it is therefore necessary to plan the operation carefully and in good time, allowing up to eight weeks for normal road closure. Changes to the original proposal must be discussed in advance and any agreed measures such as removal of hoardings or materials, provision of hard-core roads etc. carried out well in advance of the crane arriving on site.

The tower crane must be satisfactorily tested by the Inspection and Testing department of Select Plant before being made available for use. If the crane is to be subsequently climbed and/or tied to the structure, a further test will be required each time before the crane is returned to service.

If the tower crane is from an external supplier, the Inspection and Testing department must be given due notification. An examination must be made before the tower crane is delivered to site, and the test of the installed crane must be witnessed.

6.8.3.2 Who does what

The project team will be responsible for:

- Managing any interface with the public
- Determining the ground conditions and any foundations required under the outriggers of the mobile crane in its operating position
- Determining the access restrictions for mobile cranes and transport onto the site
- Providing attendance on site for
  - Security
  - First aid
  - Welfare
  - Emergency services
- Obtaining any road closures required for the mobile crane and transport
- Providing traffic management either where road closures are required, or to enable the mobile crane and transport to enter site where there are restrictions
THE SAFE OPERATION OF CRANES
TOWER CRANES (cont)

- Maintaining the exclusion zone required to keep other site personnel out of the hazardous areas identified by the installation company
- Control of the tower crane driver once the crane has been commissioned

The installation company (usually Plant Division) will be responsible for the overall planning, process management and control of the lifting operations involved in the erection/alteration/dismantle, including the appointment of their own Appointed Person and Crane Supervisor.

6.8.4 Tower Crane Climbing

Tower crane climbing is a specialized technique used in the installation of tower cranes. Successful climbing depends on detailed planning and effective team work by suitably trained and experienced personnel. Which ever method is used, i.e. eternal or internal, the success depends on good planning with the development of risk assessments and a comprehensive and clear method statement. Before a climb commences, the frame must be inspected and signed off by both the Crane Supervisors and an Engineer Surveyor. After each climb the crane will require a thorough examination before it is put back into service.

6.8.4.1 External Climbing

When carrying out external climbing, the most common method of increasing height of a tower crane is by the use of a climbing frame. This consists of a lattice steel frame surrounding three sides of the crane tower, with an opening on the forth. A hydraulic cylinder(s) allows the frame to be raised or lowered and guide wheels or rollers are provided to keep the frame aligned on the tower. The open side of the frame incorporates means of holding a new section prior to raising the climbing frame, moving it into the tower after climbing and then lowering it on top of the previous section.

6.8.4.2 Internal Climbing

On a tall structure a tower crane outside the building with a tower extending foundation level to the top of the building can result in costly tower configuration. It might also require a high capacity crane to place loads in the centre of the building’s footprint. As an alternative, the crane and its tower can be located inside the building and climbed up inside the structure as construction progresses, using the completed part of the structure to take all the forces generated by the crane.

This will include:

- Assessing and selecting the mobile crane hire company
- Determining the programme of events
- Carrying out Risk Assessments and producing Method Statements for operations
- Vetting the Risk Assessment and Method Statement

Note: In the case of externally hired tower cranes, the supplier’s Risk Assessment and Method Statement will be vetted by Select Plant Technical Services.

- Selecting the mobile crane required
- Final approval of the location of the mobile crane
- Provision of outrigger loads
- Testing and thoroughly examining the tower crane
- Control of the erection operation, including the right to cancel on safety grounds
- Controlling the tower crane driver during the operation
- Controlling any other crane on site where its use has been agreed and written into the Method Statement for erection/dismantling
- Provision of competent people to supervise and carry out the erection
- Maintenance of the tower crane

6.9 OPERATION

6.9.1 Lifting Operation Assessment Form

Part 1 of the Lifting Operation Assessment Form must be filled in for each tower crane before use.

6.9.2 Tower Crane Operators

All tower cranes on company sites will only be operated by experienced operators in possession of the
Sites should try to minimise the number of different tower cranes on the site that one operator is required to operate. This will ensure that the operator is fully familiar with the crane, its operating environment and type of lifts being carried out.

6.9.3 Additional Operating Procedures for Travelling Tower Cranes

Wherever practicable, rail mounted cranes must be erected and tested out side the radius of any other cranes.

When put out-of-service, they must be parked out side the radius of other cranes. N.B. jibs may over/under sail but under-sailing jibs must always be clear of masts.

Prior to the first movement of the crane along any section of rail, the following conditions must be satisfied:

- The length of track, including limit switches, friction stops and ultimate stops must be fully inspected and certified
- An approved Method Statement or Work Instruction must be in place
- Part 1 of a LOAF must have been completed
- The crane operator and Slinger/signallers must be briefed
- Operators and Slinger/signallers of adjacent cranes must be briefed
- “No unauthorised access” warning signs must be positioned at intervals of no greater than 25m on personnel barriers bounding crane rail areas

The Crane Supervisor must inspect the travel route for obstructions and must supervise the removal and replacement of securing clamps and friction stops. He must ensure that personnel barriers are in place to prevent unauthorised access along the track. He must personally ensure that the necessary clearances are maintained. If necessary, he must instruct other cranes to remain stationary.

If cranes are to travel whilst carrying a load, the jib must, as far as is practicable face the direction of travel. The load must be suspended as low and close to the mast as is practical.

### 6.9.2.1 Tower Crane Operators Hours

To ensure that tower crane operators are not subjected to long periods of operating without a break, and the consequent risks of fatigue and loss of concentration, each site with a tower crane is required to provide a relief operator, where necessary, to ensure that the following criteria can be met:

| Maximum period of continuous operating: | 6 hours |
| Minimum break period between periods of operation: | ½ hour |
| Minimum break period between periods of operation exceeding 4 hours: | 1 hour |
| Maximum period of operation in any day: | 10 hours |
| Maximum period of duty in any day: | 14 hours |

The table below gives the number of operators required for a given number of tower cranes on a site where the crane is to be operated continuously for more than 6 hours.

<table>
<thead>
<tr>
<th>No. of Tower Cranes</th>
<th>No. of Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

Operators are only to access areas of the crane that are provided with adequate fall protection (guardrails, toe boards, ladder hoops and rest platforms). It is the policy of Select that operators do not walk the jib as part of the weekly inspection.

relevant current CPCS card. The operator must be familiar with the controls of the particular crane being operated. If not, he must be given familiarisation training and allowed time to ‘get a feel for’ the controls by carrying out some practice lifts. Guidance on the requirements for crane operators is given in Section 2.5.
Cranes must NOT perform slewing and traveling motions simultaneously.

At the end of every shift, the Crane Supervisor must ensure that cranes are parked in their designated safe position. If this is not possible, e.g. breakdown etc, the Appointed Person and the Project Manager are to be informed. The Appointed Person will assess the situation and determine what action is to be taken.

The rails must be visually inspected at the frequency indicated in the lift plan and the results recorded on the designated check sheets.

If the approaching crane is of a similar height to a stationery crane on the same or adjacent rail, the procedure outlined in 6.9.5 must be implemented.

6.9.4 Precautions to be used when travelling Tower Cranes are working in close proximity to other Tower Cranes

Should adjacent cranes have insufficient clearance to over sail, they may work back-to-back if there is a minimum of 3m clearance between counter jibs when the cranes are arranged with their counter jibs in line.

The Crane Supervisor must establish the closest distance of approach by positioning the stationary crane jib in line with the track, with the front jib facing away from the travelling crane. The travelling crane must approach “side on”, stop and then slowly slew away from the other crane until the counter jibs are aligned.

If the clearance is too little the crane must travel slowly away.

If the clearance is too great, the crane must NOT travel in reverse; it must slew until the counter-jibs are not aligned, reverse the appropriate distance and then slowly slew until the counter jibs are aligned.

At no time, must the travelling crane ever approach the stationary crane in reverse, i.e. with the counter jib leading.

When the Crane Supervisor is satisfied with the clearance, he must ensure that both cranes are incapable of inappropriate travel by fitting stops.

No one other than the Crane Supervisor can authorize removal of rail travel management equipment, e.g. clamps, friction stops, buffer stops and the like. The equipment must be removed or relocated, the crane travelled and then the equipment replaced or re-fixed in its’ new position under the CONTINUOUS supervision of the Crane Supervisor.

At the end of the shift or during a break when the crane is unmanned, the cranes must be parked in the designated safe out-of-service position.

During the whole period when the cranes could make contact, both crane operators must be kept fully aware of all events and must have communication with each other via the “clash/crash “ radios that will always be provided prior to any operation.

6.9.5 Precautions to be used when visiting Mobile Cranes are working in close proximity to Tower Cranes

The nominated Mobile Crane Supervisor has responsibility for the safe movement of cranes. This does not remove or reduce the crane operator’s responsibility but is intended to be an additional safety measure.

When it is intended that one crane will move to a location where there is the potential to clash with another, e.g. a mobile or crawler crane with adjustable jib heights working below a tower crane, a designated person (normally a Crane Supervisor) should be in full time attendance to supervise the movements of both cranes.

Priority of movement should be with the crawler or mobile crane and the tower crane should remain stationary until the crawler/mobile has moved away from the clash position.

If the potential clash positions are maintained for an extended period, both cranes may work only on the direction of the Crane Supervisor.

If the possibility of a clash is of a short duration (does not justify a Crane Supervisor) the Slinger/signaller of the crane intending to move into the clash position should approach the Slinger/signaller of the tower crane and agree a time when the tower crane will remain stationary. If a suitable time cannot be agreed, slingers must refer to the Crane Supervisor.
6.9.6 Provision and use of Rescue Boxes

Rescue Boxes must be provided for use wherever site conditions are:

- Unsuitable for easy access for walking wounded to seek first aid
- Unsuitable for the Medical Team to reach injured parties
- Or unsuitable for stretcher bearers

The boxes must be:

- Suitable for transporting a stretcher and attendants
- Kept ready for immediate use
- In a clean condition
- Positioned beneath a working crane
- Easily accessible for Slinger/signallers

If there are two or more cranes in one area sharing a rescue box, it must be positioned so as to provide quick availability to all the cranes. Ideally the box should be located in the area where the cranes inter-arc, although it may be necessary to pass the box from one crane to another.

Rescue Boxes must not be used as general working platforms, works access or storage for tools, materials and rubbish.

On EVERY occasion when the use of the Box is requested the Crane Supervisor must be informed at the earliest opportunity but this should in no way delay the preparation/positioning of the Box.

If an ambulance is called, the Medical Team will be informed that the Box is to be used.

Whilst the Box is being prepared, the Crane Supervisor will assess “the plan of action” e.g. remove the injured party immediately (danger of falling materials, risk of fire etc) or await the arrival of the Medical team.

If there is no immediate danger to life, the Box will await the Medical team. Slinger/signallers are not qualified to administer treatment or to move an injured party, except in life threatening situations.

Slinger/signallers will respond to calls for the Box as soon as is reasonably practicable.

If the crane to be used has a suspended load, the hook will be made available A.S.A.P. It is essential that any load on the crane is properly secured. The security of the load is very important, there is no point rushing to attend an accident and causing another on the way.

The use of Safety harnesses for rescue work is optional. However, if they are readily available and putting them on does not cause unnecessary delay or unreasonably impede movement they should be worn. Personnel in the Box should not lean out or stretch up etc, they should remain secure within the Box until it is landed and the door is opened.

One Slinger/signaller will accompany two members of the Medical Team, (with or without a stretcher) and if possible another Slinger/signaller will be with/near the casualty. Under NO circumstances should the Box be lifted if the Medical Team are not accompanied by a Slinger/signaller.

A nominated person from the crane back-up team, (plant dept or Crane Supervisor) should be informed as soon as possible, this to ensure that fitters/electricians are available in case of crane failure. (The Appointed Person should ensure that nominations are made for this task)

Whilst a rescue is in progress, neighbouring cranes must not impede the crane carrying out the rescue. They must move away if necessary or stand by to receive the Box if requested.

After the rescue has been completed, the Box should be prepared for immediate re-use and returned to it’s designated position on site.

6.10 INSPECTION AND TESTING

6.10.1 On Completion of Erection and Prior to Use

Before being taken into use the tower crane will be subjected to a visual examination, overload test by the Erection Supervisor and a thorough examination by an Engineer Surveyor prior to starting work. In the case of a Select owned crane, this will be an Engineer Surveyor from Select Plant. Where the crane is supplied by an external supplier, the test may be carried out by a competent person employed by the owner of the crane. The test must however be witnessed by an Engineer Surveyor from Select Plant who will conduct their own thorough examination after the test.
All overload testing and thorough examinations will be carried out in accordance with BS 7121: Part 2: 1991 “Safe Use of Cranes; Inspection, Testing and Examination.

The results of all tests and examinations will be recorded by the person carrying them out. A report of these results will be made on the appropriate form and issued by the organisation responsible for carrying out the test and examinations. This will include the results of tests on any Automatic Safe Load Indicator. Copies of all such reports should be given to the Appointed Person in order that he may allow the crane to operate.

6.10.2 General Safety Inspection
The tower crane needs to be subjected to general workplace inspection to ensure that it is a safe place.

6.10.3 Daily Checks
At the beginning of each shift or working day, the crane should be checked by the operator to ensure that it is in a fit condition to start work.

6.10.4 Weekly Inspection
All tower cranes will be inspected by a competent person (normally the crane operator) at least weekly. The scope of the inspection must be agreed between the Appointed Person and the crane owner, and should include:

- The functioning of the crane
- The condition of wire ropes
- The security of fasteners
- Evidence of structural damage
- The crane foundation and its attachment to any structure as far as its construction permits

The results of this inspection must be recorded in a “Tower Crane Register” issued by Select or an approved equivalent, held on site. The purpose of this inspection is to check, as far as the operator is able, that the condition of the crane and its foundation has not changed since the last thorough examination. It should not be regarded as a substitute for the thorough examination, which is carried out by a person with more specialised knowledge and skills.

6.10.5 Six Monthly Thorough Examination
(see also Section 7.5)
The tower crane will be thoroughly examined by a competent person at six monthly intervals, following the initial examination and test (in the case of a Select owned crane this will be an Engineer Surveyor from the Inspection and Testing Service of Select Plant). The examination will be carried out in accordance with BS 7121: Part 2: 1991, “Safe Use of Cranes; Inspection, Testing and Examination”.

The examiner will record the results of all examinations and tests. A report of these results, including the results of tests on any Automatic Safe Load Indicators, will be made on the appropriate form and issued by the organisation responsible for carrying out the examination and test. This report will be forwarded to the project and the crane’s owner as notification of any defects requiring rectification, and must give the date by which rectification must occur. The Appointed Person must monitor the situation to ensure that defects are rectified by the due date.

In the case of a non-Select owned crane a copy of any examination report must be forwarded to the Inspection and Testing Service of Select Plant for review and advice on any necessary action.

This requirement for a six monthly examination is a Select requirement, and is mandatory for all tower cranes on company projects, irrespective of the supplier.

6.10.6 Supplementary Inspections of Foundations
The tower crane foundation (concrete base, rail track, steel grillages etc.) must be included in the post erection examination, and subsequent weekly inspections and three monthly thorough examinations. Certain types of foundations may require supplementary inspection, particularly in the period immediately after erection. In the case of rail tracks, these are often subject to settlement and levels should
be monitored with a reducing frequency, taking into account the degree of settlement.

Guidance on the inspection of foundations is given in Appendix 4.

6.10.7 Test and Examination Following Alterations

Any alterations to the tower crane such as change in height or jib length, adding a tie, or structural repairs, will require the crane to be re-tested using the procedure detailed in Section 6.10.1. A reassessment of the foundation design will also be required prior to any alterations taking place.

6.11 OPERATOR ACCESS / EGRESS

Consideration must be given to access for the crane operator to reach his place of work safely. While there is a ladder and rest platform system in the tower of the crane, the operator must be able to reach this from the ground or from the new building structure. It is the site’s responsibility to provide this access, and to secure it from unauthorised access to the crane mast.

Consideration must also be given to the possibility of an emergency where the operator needs to be rescued from the crane cab or other part of the crane structure. Consult with the crane supplier, the local emergency services and/or Select Plant Technical Services for guidance.

6.12 GOTCHA RESCUE KIT

The operation of erecting and dismantling tower cranes is very high risk and so requires very tight safety precautions during both operations. During this operation there is a risk of operatives falling, so all supervisors will be issued the Gotcha Rescue Kit to provide a means of recovery.

6.12.1 Recovery Procedure

The following procedures will be followed to prevent any delays if an operative was to fall and to ensure continued competence.
**7. INSPECTION, TESTING AND MAINTENANCE**

### 7.1 INTRODUCTION

The inspection, thorough examination, testing and maintenance of cranes and lifting accessories must be carried out in accordance with the requirements of the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) and specific Company standards (Section 7.5 and Appendix 7 for lifting accessories).

If any thorough examination or test shows that a crane cannot be used safely, the crane must not be used.

### 7.2 DAILY CHECKS

At the beginning of each shift or working day, the crane should be checked by the operator to ensure that it is in a fit condition to start work.

### 7.3 WEEKLY INSPECTIONS

Once a week, the crane should be inspected to ensure that no damage or wear has occurred and that all safety systems are functioning correctly. This inspection is normally carried out by the operator or other individuals assessed as competent to carry out this task.

The results of the weekly inspection should be recorded in a “Tower Crane Register” issued by Select or an approved equivalent.

### 7.4 MAINTENANCE

Cranes must be maintained in accordance with the manufacturer’s instructions at intervals which take into account the intensity of use, operating environment, variety of operations and the consequence of malfunction or failure. Maintenance should only be carried out by personnel who are both familiar with the equipment and competent to carry out the work. Sufficient time should be allowed in the site programme for maintenance to be carried out effectively.

All maintenance activities should be recorded in a permanent maintenance log.

### 7.5 THOROUGH EXAMINATIONS

All cranes must be thoroughly examined by a competent person before being taken into use for the first time, after any substantial alteration or repair, or in the case of a tower crane, after each erection on site. Cranes should also be thoroughly examined at intervals not exceeding twelve months if the crane is NOT used to lift persons.

Where a crane IS used to lift persons then the interval between thorough examinations must not exceed six months. It is company practice that all company owned crawler and mobile cranes are thoroughly examined at intervals not exceeding six months and that all tower cranes, trestle and beam hoists on company sites are thoroughly examined at intervals not exceeding six months (see Section 6.10.5).

Climbing frames must be thoroughly examined every 12 months and 4 years as per BS 7121.

The results of the examination, including the results of tests on any Automatic Safe Load Indicators, should be reported and recorded in a suitable form, which contains at least the information required by Schedule 1 of LOLER.

### 7.6 TESTING

All cranes should be overload tested (as described in BS 7121: Part 2) by a competent person before being taken into use for the first time, after any substantial alteration or repair, or in the case of a tower crane, after each erection on site. Cranes should also be overload tested at intervals not exceeding four years.

The results of the test and subsequent thorough examination should be reported and recorded in a suitable form that contains at least the information required by Schedule 1 of LOLER.

In the case of a strut jib crane with removable sections, the crane is tested in accordance with BS7121 Part 2 which requires the shortest, middle and longest boom lengths to be tested and is then deemed to cover all available combinations in between. On each assembly of a strut jib crane the assembled crane must be inspected by the supervising fitter and an
entry, stating that the crane is in good order and fit to start work, made in a “Records of Inspection” book such as that published by the Construction Confederation or an approved equivalent.

7.7 EXAMINATION SCHEMES

As well as the traditional method of carrying out thorough examinations at specified periodic intervals outlined above, LOLER also permits the use of an “examination scheme”. This must be drawn up by a competent person and is based on the condition, working environment and usage of the crane, and may specify different examination intervals.

This approach is not considered to be appropriate for the construction industry with its wide variations in working environment and usage. All cranes used on company sites, with the exception of some mobile cranes over 500 tonnes, will be examined using the “specified period” approach.

7.8 HIRED MOBILE CRANES

All mobile cranes used on company sites must have, as a minimum, a twelve monthly thorough examination report and a four yearly test certificate, so that site personnel are checking documents with which they are familiar. A six monthly thorough examination report is required for cranes used for lifting persons. These requirements must be included on all hire orders for mobile cranes up to 500 tonnes. Larger cranes may be examined in accordance with a scheme of examination but any such scheme and the resulting reports must be submitted to Select Plant Technical Services for approval, well before the crane arrives on site.

A suitable clause for inclusion in hire orders for all mobile and crawler cranes, and all relevant sub contracts involving cranage, is:

“Any crane supplied under this order must be accompanied by a report of thorough examination made within the previous twelve months (six months if the crane is to be used for lifting persons) and a certificate of test made within the previous four years (or after major repair or alteration)”

7.9 COMPETENT PERSON

The competent person carrying out any of the above activities will be, in the case of Select owned cranes, an Engineer Surveyor from the Inspection and Testing Service of Select Plant. In all other cases, the competent person should be from a BSI accredited in-service inspection body.

Note: Select Plant’s Inspection and Testing Service is accredited by UKAS.
8.1 USE OF RADIOS

Generally, signals will be given to crane operators either by radio or by hand signals. This will be decided by the Appointed Person taking into account the site conditions.

If radios are chosen, then all instructions must be repeated continuously, for example “LOWER, LOWER, LOWER...” until the movement is complete. Should the instructions stop getting through to the crane operator, they should immediately bring the load safely to rest. This will guard against failure of the radio system.

If there is more than one crane on site, and more than one slinger/signaller/crane operator team using radios, the Appointed Person must devise a safe system of work to ensure that there are no problems such as one operator following instructions intended for another.

It is recommended that where more than one crane is in use on a site, and there is a possibility that there could be a clash between them, a second radio on a separate “open” frequency should be provided in the cab of all the cranes. Transmission by any one operator will be heard by all the other operators, allowing operator-to-operator emergency contact. This “open” channel must only be used for emergency purposes.

The type of radio to be used by the operator in the crane cab should be chosen to allow easy use of the radio and crane controls simultaneously. With this in mind, most crane radios will require foot-operated switches for the receive/transmit control. In addition, the radio licensing authorities do not allow the use of hand portable radios in the cabs of tower cranes, as their altitude may cause interference with other sites in the area or enable them to receive spurious signals leading to confusing instructions.

Mobile radios in tower crane cabs must be used with special aerials, such as leaky feeder aerials, which effectively limit the range of the signals. Advice on this is available from Select Plant.

8.2 RADIO LICENCES AND FREQUENCIES

Any radio used on any company premises or sites must be properly licensed. It is illegal to use an unlicensed radio. New radio networks can be applied for through Select Plant, who will arrange for sites to be allocated a frequency or frequencies (subject to availability) by the Radio communications Agency. Applications normally take three weeks to be processed after all relevant details have been given.

Laing O’Rourke holds a UK General Licence that enables the Company to use certain radio frequencies anywhere in the UK. However, the Radio communications Agency must be informed fourteen days prior to use of radios on any site, via Select Plant.

UK General frequencies allocated are on the VHF high band, and are available with control tones that limit the interference from other sites on similar frequencies.

Other frequencies are also currently obtainable on both VHF and UHF bands. The use of the radios and the site conditions will determine which band is more suitable.
9. ELECTRICAL MATTERS

The majority of tower cranes, runway beam hoists and some other types of crane are powered by electric motors supplied from either the mains or generators. It is important that any electrical installation is designed, installed and tested by competent people to ensure that it is both safe and adequately sized to ensure that the crane can lift its rated load.

All electrical installations on company sites must comply with the requirements of BS 7671:1992 Requirements for electrical installations (IEE Wiring Regulations) and HSE publication HS (G) 141 Electrical Safety on Construction Sites, with the additional requirement that all portable electrical equipment is supplied from a reduced low voltage supply (110V centre tapped earth). The exceptions to this being items located in tower crane cabs and site accommodation where 230V supplies are permitted only if they are protected by a suitable Residual Current Device (RCD).
10. ADVICE AND ASSISTANCE

Advice on the contents of this document and all aspects of the selection, installation and use of cranes may be obtained from:

a) Select Plant Technical Services
   Barford Road
   Little Barford
   St. Neots PE19 6WB
   Telephone: 01480 407080
   Fax: 01480 405710

   Choice, installation, operation, inspection and testing of all types of cranes; Steel foundation and tie design and checking; Interpretation of Regulations; Checking of Method Statements.

b) Engineering & Temporary Works Office (E&TWO)
   Foundation design and checking.

c) Select Plant
   Barford Road
   Little Barford
   St. Neots PE19 6WB
   Telephone: 01480 407080
   Fax: 01480 407899

   Hire and installation of Tower Cranes, Crawler Cranes, Mobile Cranes; Hire of Fire Extinguishers and Surveying Instruments.
APPENDIX 1 – BIBLIOGRAPHY

Before using any document, check that it is the latest issue and includes any current amendments. This list was reviewed in August 2007.

**Regulations**
- The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)
- The Construction (Design and Management) Regulations 2007
- The Provision and Use of Work Equipment Regulations 1998 (PUWER)

**Standards**
- BS 7121: Part 2: 2003 Inspection, Testing and Examination
- BS 7121: Part 3: 2000 Mobile Cranes
- BS 7121: Part 4: 1997 Lorry Loaders
- BS 7121: Part 5: 2006 Tower Cranes
- CP 3010: 1972 Code of Practice for the Safe Use of Cranes. (This code is being gradually superseded by the issue of BS 7121 and will be withdrawn once all parts of BS 7121 have been issued).
- BS 1757:1986 Specification for Power-Driven Mobile Cranes
- BS 5744: 1979 Safe Use of Dockside and Container Cranes
- BS 7262: 1990 Automatic Safe Load Indicators
- BS 8004: 1986 Code of Practice for Foundations
- BS 8110:
  - Various parts Structural Use of Concrete
- BS 5950:
  - Various parts Structural Use of Steel in Building
- BS 6399: Part 2: 1997 Code of Practice on Wind Loads
- BS 7671:1992 Requirements for Electrical Installations (IEE Wiring Regs)

**HSE and HSC Publications**
- GS6 Avoidance of Danger From Overhead Electrical Lines
- HS (G) 150 (Rev 1) Health and Safety in Construction
- L113 ACOP and Guidance to the LOLER 1998
- PM28 Working Platforms on Fork Lift Trucks
- HS (G) 141 Electrical Safety on Construction Sites

**CIRIA Guides**
- Special Publication 131 Crane Stability on Site
- Special Publication 146 Managing Materials and Components on Site

**Laing O’Rourke Documents**
- Design Guide for Tower Crane Bases
- Laing ORourke Safe Slinging & Signalling Safety Guide
- TIN 42 & 42S - Outrigger Foundations for Mobile Cranes
- Safety Management System (available via LOR iGate)
- Management of Temporary Works (available via LOR iGate)
- CPA Technical Information Notes
APPENDIX 2 – LIFTING OPERATIONS ASSESSMENT FORM

The form consists of two parts. Part 1 covers the documentation and details of the equipment being used, and must be completed when the equipment arrives on site. Part 2 details the use of the crane. There must be a valid Part 2 form for every lift (if used, see below).

However, a Part 2 form may cover more than one lift if all the circumstances are the same. See the Safety Management System for further guidance. These forms may also be useful in planning the use of plant such as concrete pumps, aerial platforms and lorry loaders.

Part 1

Part 1 must be filled in by a person familiar with equipment certification. This person will be nominated by the Appointed Person.

The equipment supplier will provide information relating to the equipment, but the certification must be checked to ensure that it relates to the equipment and lifting accessories, and that it is current.

The ‘valid until’ date will be the earliest of:

• The earliest expiry date of any of thorough examination reports/test certificates
• When any anticipated re-rigging of the crane will take place
• When the equipment will leave site

The nominated person will then sign the form, and give a copy to the equipment operator. This must remain in the equipment at all times, as it will be inspected each time Part 2 is filled out. A copy must also go the Appointed Person.

Note: Part 1 forms may need to be periodically updated whilst the equipment is on site, for example, after a change in rig configuration, after a re-test, after each thorough examination.

Part 2

Part 1 will be checked when Part 2 is filled in to ensure that it is valid.

Part 2 forms relate to the use of the crane and are intended to provide a convenient way of recording the planned method of lifting, i.e. the Method Statement. They can be completed to cover a range of typical lifts (provided conditions are similar) or for individually identified lifts.

The repeated use of Part 2 forms is not required for identified common lifts where the method of lifting has already been specified, where the weight of the load is known to be well within the capabilities of the equipment and where there are no hazards or obstructions within the area of operation. However, at least one Part 2 form should be completed to record the above findings.

There may be occasions when the Part 2 form is not considered to provide an adequate Method Statement e.g. for complex or high risk lifts. In such cases, more detailed lifting studies and more comprehensive Method Statements will be required.

Whilst it is the responsibility of the Appointed Person to ensure that Part 2 forms are produced and are to a satisfactory standard, it is also the responsibility of every manager who puts a crane to work, including all Crane Supervisors, to ensure that lifts are not carried out unless there is a pre-determined safe method of work.
Lifting Operations Assessment Form
Part 1 - Documentation

Project: Date:

THE CRANE/ LIFTING DEVICE

Owners Name, Address, Phone No.:
Technical Representative:
Crane / Equipment Make & Model:
Registration and/or Plant No.:
Rig Configuration(s):
Special Ballast Required? *YES / NO - Details:
Site Testing Required? *YES / NO - Details:
Crane Driver Name [1]:
CITB CPCS card details: Reg. No: Expiry date:
Crane Driver Name [2]:
CITB CPCS card details: Reg. No: Expiry date:
4 yr test & thorough examination Reg. No: Certificate expiry date:
12 monthly thorough examination (6 mth if crane lifting persons) Reg. No: Examination report expiry date:
Weekly crane inspection YES/NO* *Details

LIFTING ACCESSORIES CARRIED

<table>
<thead>
<tr>
<th>Item</th>
<th>Identification No</th>
<th>S.W.L.</th>
<th>6 monthly thorough examination - Expiry date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ACCEPTANCE SIGNATURE
I have checked the above items as indicated and confirm that to the best of my knowledge, they are in good order and that this form is therefore valid until the prescribed date.

Sign: Date: Form valid until:

Print Name:

☐ Copy to Appointed Person ☐ Copy to Crane Operator (to be kept in crane cab at all times)
### APPENDIX 2 (cont) – Part 2 – USE

#### Lifting Operations Assessment Form

**Part 2 – Use**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Date:</th>
</tr>
</thead>
</table>

#### THE JOB

<table>
<thead>
<tr>
<th>Brief Description of Work:</th>
<th>Crane Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Wt.:</td>
<td>Max. Height of Lift:</td>
</tr>
<tr>
<td>Max. Radius Lift:</td>
<td></td>
</tr>
</tbody>
</table>

#### Lifting Accessories:

<table>
<thead>
<tr>
<th>Obstructions (O/Head Cables, Existing Buildings, etc.):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Conditions:</td>
</tr>
<tr>
<td>Underground Services:</td>
</tr>
<tr>
<td>Road Closure: Y / N * Access:</td>
</tr>
</tbody>
</table>

#### THE SPECIFYING TEAM (Named Individuals)

<table>
<thead>
<tr>
<th>Appointed Person:</th>
<th>Crane Specifier:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Specifier:</td>
<td>Lifting Accessory Specifier:</td>
</tr>
</tbody>
</table>

Will Crane be HIRED AND MANAGED on site YES / NO* or FULLY SUBCONTRACTED? YES / NO*  

#### THE CRANE

<table>
<thead>
<tr>
<th>Make &amp; Model:</th>
<th>Registration/Plant No.:</th>
</tr>
</thead>
</table>

Part 1 Form checked YES/NO* and valid until: YES/NO*

Weekly crane inspection - rechecked and up to date YES/NO*

#### RADIO COMMUNICATIONS

<table>
<thead>
<tr>
<th>Crane to Crane Radios Required? YES / NO</th>
<th>Crane to S/S Radios? YES / NO</th>
</tr>
</thead>
</table>

#### THE TEMPORARY WORKS (Cranes Base & Outrigger Supports)

<table>
<thead>
<tr>
<th>Standard Solution (TIN42) i.e. Outrigger Pad Size:</th>
</tr>
</thead>
</table>

Special Design? Yes / No  Checked to Comply? By Whom? |

#### THE LIFTING ACCESSORIES (If not as per Part 1 form)

<table>
<thead>
<tr>
<th>Item</th>
<th>Identification No</th>
<th>S.W.L.</th>
<th>6 monthly thorough exam’n - Expiry date</th>
</tr>
</thead>
</table>

#### THE CRANE TEAM

<table>
<thead>
<tr>
<th>Appointed Person:</th>
<th>Crane Supervisor:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Crane Driver:</th>
<th>Slingers/Signaller(s):</th>
</tr>
</thead>
</table>

#### ACCEPTANCE SIGNATURES (Distribution of copies to these persons, plus Slingers/Signallers)

<table>
<thead>
<tr>
<th>Appointed Person</th>
<th>Sign</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane Supervisor</td>
<td>Sign</td>
<td>Date</td>
</tr>
<tr>
<td>Crane Driver(s)</td>
<td>Sign</td>
<td>Date</td>
</tr>
</tbody>
</table>

I have checked all of the above items, and confirm that to the best of my knowledge the crane is capable of carrying out the lifts described within the limits specified.  
I am aware of the lifts for which the use of this crane is authorized & any limitations imposed & will ensure that to the best of my ability the crane is not used outside these limits.  
I have informed crane operator & Slinger/Signaller(s) accordingly.
APPENDIX 3 – TOWER CRANES - METHOD STATEMENTS

Tower Crane Method Statements should address the following issues:

What is to be done? – Precise scope of the job, including crane characteristics.

Where is it to be done? – Precise location.

Where is it to be done? – Details of site features, layout and access, with notes on how these may affect proposed arrangements and methods of working.

When is it to be done? – A detailed programme giving each stage of the operation and the dates on which they will be carried out.

Who is to do it? – Number and type of personnel, including any specific skills, training or qualifications required. See Section 6.8.3.2 for respective site and crane supplier responsibilities.

How is it to be done? – Arrangements for management of the erection/dismantling, including co-ordination with site and the responsibilities and authority of supervisory personnel at all levels.

How is it to be done? – The detailed method of erecting/dismantling the crane (the erection scheme should be devised to ensure that activities such as slinging, lifting, unslinging, initial connection, alignment and final connecting can be carried out safely). The scheme may be detailed by reference to the appropriate sections of the manufacturer’s manual.

How is it to be done? – The provision of suitable cranage to assist in the operations including arrangements for access, adequate siting and outrigger foundations.

How is it to be done? – Arrangements for delivery, stocking, storing and movement of components on site.

How is it to be done? – Arrangements for examination and testing following erection.

What are the risks and control measures – List the identified hazards, who might be harmed and the precautions to be taken including:

Measures to avoid interface problems with other site operations (see Section 6.8.3).

Provisions to aid the prevention of falls from height including safe means of access and safe places of work.

Protection from falls of materials, tools and debris.

Contingency arrangements should there be, for instance, high winds, a breakdown of plant or components delivered out of sequence.

Site specific risk assessment – In order to highlight the hazards identified and draw together all of the control measures specified within the Method Statement, a Site-specific Risk Assessment must be completed.

References – The Method Statements should include a site layout showing the position of the tower crane and mobile crane. It should also include any cross-references to specific drawings, standard procedures, generic risk assessments, and manufacturer’s manuals etc.
<table>
<thead>
<tr>
<th><strong>Date and originator</strong></th>
<th>The Method Statement must be dated, signed by the originator, and each page numbered as “page x of y”.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communications</strong></td>
<td>The Method Statement must contain a distribution list of all parties to whom the contents of the Method Statement must be communicated and must also detail the arrangements for briefing those carrying out the work on site.</td>
</tr>
<tr>
<td><strong>Supervision and monitoring</strong></td>
<td>Arrangements for ensuring that work proceeds according to the Method Statement.</td>
</tr>
<tr>
<td><strong>Approval</strong></td>
<td>All tower crane Method Statements must be approved by CPES before the commencement of work on site. At least five working days must be allowed for this approval process. Additional time may be needed to allow site to carry out their own approval process.</td>
</tr>
<tr>
<td><strong>Amendments</strong></td>
<td>Any modifications to the Method Statement must be detailed in an amended document, which must be re submitted for approval.</td>
</tr>
</tbody>
</table>
APPENDIX 4 – THE INSPECTION OF TOWER CRANE FOUNDATIONS

A4.1 SCOPE OF INSPECTION

Foundations of whatever type must be thoroughly inspected before the tower crane superstructure is erected, and then monitored at intervals to ensure that no undue settlement or distress is occurring during the operation of the tower crane.

The exact details and frequency of the inspections required will depend on the type of foundation involved. It is recommended that both the foundation designer and the crane supplier be consulted when determining the details, especially where a non-standard foundation solution has been adopted.

The Appointed Person must ensure that a regime is specified and followed.

A4.2 RESPONSIBILITY

Having determined the scope of the inspections required, arrangements must be made to clearly define the personnel who will carry out the inspections required. Any demarcations between the main contractor, subcontractor, tower crane supplier, etc., must be clearly defined and agreed.

A4.3 PRE-ERECTION INSPECTION

The following inspections must be carried out before a tower crane may be erected on the foundation. An example of a suitable certificate is shown at the end of this section.

<table>
<thead>
<tr>
<th>All foundations</th>
<th>Details in accordance with foundation designer’s drawings and details.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-in Items</td>
<td>Level, plumb and to tolerance.</td>
</tr>
<tr>
<td>(foundation</td>
<td></td>
</tr>
<tr>
<td>anchors etc.)</td>
<td></td>
</tr>
<tr>
<td>Reinforced</td>
<td>Concrete of correct grade and sufficient maturity.</td>
</tr>
<tr>
<td>Concrete</td>
<td></td>
</tr>
<tr>
<td>Piles</td>
<td>Results of pile tests; Sufficient reinforcement bond length into pile cap and pile to take tension where applicable.</td>
</tr>
<tr>
<td>Steelwork</td>
<td>Steel correct grade; Bolts tight (check if particular torque required); Weld quality.</td>
</tr>
<tr>
<td>Rails</td>
<td>Bedding properly compacted; Rail centres and levels to correct tolerance; Limit ramps and end stops correctly positioned and firmly fixed; Rails earthed.</td>
</tr>
</tbody>
</table>

The Appointed Person must produce a standard form in line with the agreed monitoring regime.

<table>
<thead>
<tr>
<th>All Foundations</th>
<th>Level checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforced</td>
<td>Inspection for cracking, especially around cast-in items.</td>
</tr>
<tr>
<td>Concrete</td>
<td>Bolts tight; Inspection for cracks in welds.</td>
</tr>
<tr>
<td>Steelwork</td>
<td>Rail centres and level; Limit ramps and end stops correctly positioned and firmly fixed.</td>
</tr>
<tr>
<td>Rails</td>
<td></td>
</tr>
</tbody>
</table>
A4.5 FREQUENCY

During the first week of crane operation, it is recommended that level checks and condition inspections be carried out daily. Thereafter, visual inspection must be carried out weekly, with a more thorough examination of critical items such as bolts and welds at three monthly intervals.

Level checks for rail/track mounted tower cranes should continue at weekly intervals. For cranes mounted on RC foundations the frequency of level checks may be reduced to monthly for the first three months and then three monthly thereafter, assuming that the projected settlement is with limits.

Rail-mounted static cranes founded directly on RC foundations may be classified as mounted on RC foundations.

The frequency of inspections and/or level checks should be increased if any adverse tendencies are noted, or if adjacent works are liable to compromise the stability of foundations.

A4.6 RECORDS

The following records should be kept on site:

- Pre-erection inspection
- Monitoring records (condition inspection and level checks)
- Records of any remedial actions taken following review of the inspection records

A4.7 CERTIFICATION

The following are examples of certificates that may be used in connection with the design and inspection of tower crane foundations.

The exact format will be dependent on the type of foundation involved and other specific site requirements such as Quality Assurance Procedures, client requirements, contractual arrangements, etc.
### APPENDIX 4 (cont) – DESIGN CHECK CERTIFICATE

**LAING O’ROURKE**

**Certificate No:**

**TOWER CRANE FOUNDATION**

**DESIGN CERTIFICATE**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Tower Crane No/Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tower Crane Type:</td>
</tr>
</tbody>
</table>

**Design criteria and references:**

(Loading data, specifications, contract drawings, British Standards, standard data etc.)

**Drawings and documents issued to site:**

**Limitations or Restrictions:**

(If the foundation design relies on the use of the permanent works, the designer should state whether the permanent works have been analysed).

I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.

<table>
<thead>
<tr>
<th>Signed:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**cc**

Site Appointed Person:

Crane Supplier:

Select Plant:

File:
APPENDIX 4 (cont) – DESIGN CHECK CERTIFICATE

**TOWER CRANE FOUNDATION DESIGN CHECK CERTIFICATE**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Tower Crane No/Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tower Crane Type:</td>
</tr>
</tbody>
</table>

**Information checked:** (Drawing numbers – Document references)

**Design criteria:** (Loading data, British Standard Specifications, etc.)

**Notes and Observations:**

I certify that reasonable professional skill and care has been used in the preparation of this design, that the details have been checked for compliance with the relevant standards listed above and that the design has been accurately translated into drawings and other documents issued to site.

<table>
<thead>
<tr>
<th>Signed:</th>
<th>Date:</th>
</tr>
</thead>
</table>

**Name:**

**Position:**

**Company:**

cc Site Appointed Person:
Crane Supplier:
Select Plant:
File:

Certificate No:
**APPENDIX 4 (cont) – PRE-ERECTION INSPECTION CERTIFICATE**

**LAING O’ROURKE**

**TOWER CRANE FOUNDATION**
**PRE-ERECTION INSPECTION CERTIFICATE**

<table>
<thead>
<tr>
<th>Item (delete where not applicable)</th>
<th>Checked by</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with design drawings/specification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-in items within tolerance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete quality/strength</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pile tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weld quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolts – grade, torque, tightness, quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track rails – levels, spacing, fixings, ramps, end stops, earthing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Documents against which foundation has been checked** (drawing nos./document references):

**Design Cert. No:**

**Design Check Cert. No:**

**Notes and Observations:**

The above inspections having been carried out satisfactorily, erection of the tower crane superstructure may proceed.

**Signed:**

**Date:**

**Name:**

**Position:**

**Company:**

**cc** Site Appointed Person:
Crane Supplier:
Select Plant:
File:
APPENDIX 5 - GLOSSARY

Accessories for Lifting
See ‘Lifting Accessories’.

Appointed Person
The person appointed by the Employing Organisation to have overall control of the lifting operations on a site. The Appointed Person should have adequate training (see Section 2.3) and experience to enable them to carry out their duties competently.

Note, this role is sometimes described as ‘Crane Appointed Person’ to distinguish them from the ‘First Aid Appointed Person’.

Oversail
To oversail an area is to operate a crane in such a manner as to cause part of the crane structure or load to pass over the vertical boundary of property owned or occupied by a third party. Note that some cranes, especially tower cranes, must be allowed to free slew whilst in an out-of-service condition. Consequently they may be blown round by the wind and oversail a neighbouring property, which would not be passed over during normal operations.

Owner
The Company, Firm or Person letting the plant on hire and includes their successors, assigns or personal representatives.

Rated Capacity Indicator
A device that automatically provides, within a specified tolerance, warning that the load is approaching rated capacity, and another warning when rated capacity is exceeded. Rated Capacity Indicators are also known as Automatic Safe Load Indicators.

Slinger/Signaller
The person responsible for attaching and detaching the load to or from the crane hook, and for the use of correct lifting gear. The Slinger/signaller is also responsible for initiating and directing the safe movement of the crane and load. (Previously known as the Banksman)
Temporary Works Co-ordinator

The Temporary Works co-ordinator is the person ensuring that temporary works on a site are provided and inspected as required, and that they conform to all relevant regulations.

UKAS/BSI

The United Kingdom Accreditation Service (UKAS) and British Standards Institute (BSI) are recognized by the British Government as the UK national bodies responsible for assessing and accrediting the competence of organisations in the fields of calibration, measurement, testing, inspection, and the certification of systems, personnel and products.

APPENDIX 6 – TIS 157

RESPONSIBILITY FOR HEALTH AND SAFETY MATTERS DURING THE RIGGING OF LARGE MOBILE CRANES

A common crane hire situation, particularly when erecting tower cranes, is the hiring of a large semi-mobile crane, which requires rigging on or adjacent to, the site. In constricted city centre sites, the crane is often rigged in an adjacent road that has been closed off to the public. The rigging, which may take several hours, often starts during the night to ensure that the crane is ready to start work the following morning.

This situation gives rise to a number of questions:

1. Is the closed off road in which the crane is standing and being rigged, an extension of the site and therefore the responsibility, under CDM, of the Principal Contractor?

2. Whilst the crane is being rigged by the Owner, and before it starts lifting for the Hirer, does the responsibility for a Safe System of Work rest solely with the Owner, providing the Principal Contractor has assessed the competence of the Owner?

3. Where a slave crane is provided by the Owner, and it is being used by him to rig the large crane, is this effectively a Contract Lift in that the Hirer is only hiring the large crane and that the use of the slave crane is under the control and direction of the Owner?

Following consultation with HSE and Group Safety our view is:

1. As the road has been closed off for the purposes of the operation, it must be considered a de facto extension of the site.

2. Providing that the Principal Contractor has adequately assessed the competence of the Owner then the responsibility for providing and implementing a safe system of work rests with the Owner. The Principal Contractor is however responsible for the safety of the General Public and must ensure that the Owner is aware of the requirement for him to take adequate measures to protect the public.

3. It is perfectly reasonable to leave the planning and execution of lifts carried out by the slave crane to the Owner, as these are part of his arrangements for providing the large mobile.

All our suppliers of large mobile cranes for tower crane erection/dismantle have been assessed for competence but, to ensure that they are fully aware of their responsibilities, the attached draft letter will be sent to the supplier prior to each crane hire.
**Draft Letter to a Crane Supplier - Rigging of Large Mobile Cranes before Starting Lifting**

We have recently placed an order with you for the provision of a (type) mobile crane at our (name) site on (date). As you are aware, before starting lifting the crane will require rigging in (name of road).

(Crane supplier’s name) are responsible for the safe execution of this work which includes responsibility for:

1. Provision of a safe system of work to protect both your employees and others not employed by you. This should include a risk assessment to identify all hazards associated with the work and the provision of appropriate measures to reduce any risks identified to an acceptable level.

2. Provision of suitably trained and briefed personnel, adequately supervised to ensure that the safe system of work is carried out effectively.

3. Arrangements for the protection of the public.

Yours, etc.

**APPENDIX 7 – LIFTING ACCESSORIES PROCEDURES**

**A7.1 PURPOSE**

To establish procedures for the selection, procurement, statutory thorough examination (including testing), record keeping and disposal of Lifting Accessories.

Advice on the use of Lifting Accessories, including pre-use checks, is contained in the “Guide to Safe Slinging and Signalling”.

**A7.2 SCOPE**

This procedure applies to every place of work controlled or used by Laing O’Rourke and is to be implemented wherever lifting operations are being, or are likely to be, undertaken.

**A7.3 LEGAL REQUIREMENTS**

The requirements for Lifting Accessories used at any place of work, including construction sites, are laid down in the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER). In these regulations, Lifting Tackle is referred to as “Accessories for lifting”.

Advice on the details of these regulations can be obtained from Select Plant Technical Services.

**A7.4 DEFINITIONS**

LOLER refers to Lifting Tackle as ‘accessories for lifting’ and defines them as ‘work equipment for attaching loads to machinery for lifting’. In practice, this means a chain or rope sling or similar gear, and a ring, link, hook, plate clamp, shackle, swivel, eyebolt and spreader beam;

Bale bars, attached to any kind of skip, are not specifically included in the requirements of the regulations, but it is Select policy that they are thoroughly examined at six monthly intervals in accordance with clause 5.2, but do not require testing before first use.

**A7.5 PROCEDURES**

**A7.5.1 Acquisition**

When a Project Manager requires an item of lifting accessories he should consult with either Select Plant Technical Services or the Engineering & Temporary Works Office (ETWO) or other specialist, to draw up a specification for the equipment.

All non-standard lifting accessories should be specified in consultation with either Select Plant or ETWO.

The item must then be sourced from existing stocks on site or within Laing O’Rourke, or purchased from a reputable supplier who is a member of the Lifting
Equipment Engineers Association and operates a quality system to BS EN ISO 9002.

In either case, the Project Manager should ensure that the item is accompanied by either:

- In the case of new equipment an EC declaration of conformity
- or
- In the case of existing equipment a current record of thorough examination; as required by LOLER

A7.5.2 Periodic Thorough Examination

All lifting accessories must be subjected to a thorough examination by a competent person at intervals that are at a maximum of six months apart, and a record of the results of the thorough examination made. The examination must be made by a competent person employed by an Inspection Body accredited by the British Standards Institute (BSI) to carry out in-service inspection of Lifting Equipment. The Inspection Service of Select Plant is one such approved body.

A7.5.3 Use on Site

The Project Manager will:

- Not accept delivery on any item of lifting accessories from any source unless it is accompanied by either a valid EC declaration of conformity or a current record of thorough examination
- Ensure that entries are made when appropriate in site registers
- Make arrangements for carrying out periodic thorough examinations in accordance with paragraph 5
- Make readily available all items requiring examination by the competent person on site
- Ensure that lifting accessories which may have been brought onto site by others, e.g.: subcontractors, also complies with the requirements of paragraph 5.2

If items are found to be defective at the time of thorough examination or otherwise, they must be withdrawn from service immediately. These items will be repaired, re-tested and re-examined prior to use, or be destroyed. If they are destroyed, the item must be properly written off with both the copy records and originals endorsed accordingly.

Slingers/signallers must carry out a visual inspection of lifting accessories every time they use it. If any damage is seen, then the item must not be used until examined by a competent person as in paragraph 5.2.

Crane Supervisors and Slinger/signallers must ensure that proper arrangements are made for the storage of lifting accessories. Further guidance is given in The Safe Slinging and Signalling.

A7.5.4 Transfer and Sale

A7.5.4.1 Within the Company

Whenever lifting accessories are transferred to another place of operation within the company, the appropriate EC declaration of conformity, records of test (if any), sketches and current records of thorough examination are to be transferred with it.

A7.5.4.2 Outside The Company

Whenever lifting accessories are sold outside the Group, it must be described on the document of sale as either:

- “Examined”; in which case the goods must be accompanied by the current record of thorough examination as appropriate
- or
- “Sold as Seen”; in which case no records of thorough examination are to be provided; instead they are to be endorsed with the details of the sale and retained by the seller
Appendix 8 – Vacuum Lifting Guidance

1. Ensure correct protective equipment is worn; standard dress is hard hat, safety footwear and high visibility jacket or vest. Where assessed it may also include gloves, wrist protectors, safety goggles, noise protection and fall arrest harnesses.

2. Ensure operator reads vacuum lifter manual before use.

3. Always obtain a risk assessment and Method Statement for the task.

4. Vacuum lifters shall only be applied to the load and operated by:
   a) trained and authorised personnel (minimum age of an operator is 18 years of age)
   b) maintenance personnel in direct performance of their duties
   c) authorised inspectors (with trained operator in attendance)

5. Where assistance is required from untrained personnel, a designated and trained person must be in direct supervision

6. Never use a lifting device that is tagged “out of service”

7. Never lift a damaged or faulty load

8. Never, for whatever reason, allow personnel to ride on loads

9. Never lift in the rain or when the load is wet

10. Operators must be aware of the current and expected weather conditions when planning the day’s lifts

11. Never lift from a rotated position. Never attempt to rotate off-centre loads as the frame could rotate too quickly

12. The lifter must not be used for side pulls or sliding of the load. Never lift a load from the flat position with the lift bar locked

13. Ensure a thorough examination of the lifter has been completed by a competent person within previous 6 months

14. Ensure that the lifter/lifting device combination and any other accessories used are capable of lifting the required load

15. Is the lifter suitable for the size of glass even though the load is within the SWL (refer to supplier for technical assistance)? Manufacturers recommend outer pad is no further than 500mm from edge of load

16. Always ensure the lifter is applied to the load within 40mm of the centre of gravity

17. Where possible plan the lift to avoid lifting over people. Cordon and divert where necessary. The lift may require provision of a crash deck

18. Ensure operator has enough space for transporting the load without endangering anyone

19. Operator must be able to give his full attention to the lifting operation

20. If you are unfit or unwell do not engage in any lifting activity. Your infirmity may affect your judgement. This also includes alcohol, drugs (including prescription drugs) and their side/after effects. Remember, the law will take this into consideration

21. A pre-use check must be carried out on each lifter to be used, prior to each shift’s lifting operations, and signed for. If the lifter fails its pre-use check it must be set aside for further investigation and have an “out of service” label displayed. Management must be informed

22. Ensure the load and the pads are cleaned correctly prior to applying the lifter. Failure to do so increases the chances of load slippage and rapidly degrades the vacuum system

23. Ensure the required vacuum is achieved and the pump turns off before attempting lift. Lift the load 50mm and wait for 30 seconds (observing vacuum gauge) before commencing lift to make sure vacuum is stable

24. Where the operation is carried out using a tower or mobile crane the lifting operation itself must be under the full control of a qualified Slinger/signaller. This may or may not be the supervisor of the vacuum lifter. If not, then the
Slinger/signaller is the only person authorised to give orders to the vacuum lifter supervisor.

25. The only exception is when a potentially dangerous situation is imminent, when anyone may give the stop order which must be obeyed immediately.

26. Observe the load at all times for warning signs from audible and visual alerts.

27. Ensure load is fully supported before vacuum is released.


This guidance on the use of vacuum lifters is reproduced by kind permission of GGR Glass Services Limited (Tel: 0161 683 2580).