Crane Hire

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Key Points

- Roles & Responsibilities
- Crane Selection
- Crane Operation;
  - Ground Conditions
  - What to Look For
- Summary
Legislation & Standards

* NSAI Code of Practice for the Safe Use of Cranes in the Construction Industry: S.I. 360:2004,
* BS 7121:Parts 1 to 3, 2006 (UK),
  - SHWW Act 2005,
  - SHWW (Construction) Regulations 2006,
  - SHWW (General Applications) Regulations 2007,
  - SHWW Act 1974 (UK),
  - Construction(Design & Management) Regulations 2007,
  - Lifting Operations & Lifting Equipment Regulations, 1998 (UK),
Contractual Considerations

• **Standard Hire**
  - The Hirer (Employing Organisation) Must:
    - Comply with the NSAI CoP.
    - Appoint the Appointed Person.
    - Plan the Lift and operate the Safe System of Work.
    - Ensure that the crane hired is of a suitable type and capacity.
    - Check the Credentials & the Certification Supplied by the Owner (CHL).
  - The Owner (CHL) Must:
    - Supply the Appointed Person.
    - Plan the Lift and operate the Safe System of Work.
    - Manage & Control the Lifting Operation.

• **Contract Lift**
  - The Hirer (Employing Organisation) Must specify:
    - The works are to be completed to the NSAI Code of Practice.
    - That the Employer (CHL) appoints the Appointed Person.
    - Provide all information on services in writing.
  - The Owner (CHL) Must:
    - Supply the Appointed Person.
    - Plan the Lift and operate the Safe System of Work.
    - Manage & Control the Lifting Operation.
Insurance Considerations

Standard Hire
Hirer (Employing Organisation) Responsibility:
• Loss/Damage to Plant
• Loss/Damage to Goods
• Hire Charges arising from Plant damage
• Public Liability
• Add-ons Required?

Owner CHL Responsibility
• Employers Liability

Contract Hire
Owner (CHL) Responsibility:
• Loss/Damage to Plant (except Hirer’s Negligence)
• Loss/Damage to Property (except Hirer’s Negligence)
• Public Liability (except Hirer’s Negligence)
• Employers Liability

Hirer (Employing Organisation) Responsibility:
• Public Liability
• Providing Accurate Information

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The Lifting Team – Appointed Person

**Duties of the AP**

- To provide such Planning, Selection (Cranes & Equipment), Instruction & Supervision to undertake the Task safely
- Ensuring all Checks, Inspections & Maintenance of Equipment has been carried out.
- Organisation & Control of Crane Operations
- Ensuring All Others involved are Competent
- Can Stop the Works if Deemed Necessary
If you are undertaking Lifting Operations you **MUST** have an Appointed Person and That Person needs Time to Collect Information, Prepare, Review & Distribute Documentation
The Lift Team

• The Appointed Person
• Crane Coordinator
• Crane Operator / Driver
• Slinger / Signaller
• Crane Erector / Rigger
• Maintenance Staff
Safety Documents: Standard Hire

• For Standard Hire the Owner (CHL) Should Provide the Following Information for the Safe System of Work:
  • Rigging Method Statement,
  • Rigging Risk Assessment,
  • Loading Data Sheet,
  • Staff & Equipment Certification.

• The Hirer (Employing Organisation) must provide the rest of the documents for the Safe System of Work!
Safety Documents: Standard Hire

• The Hirer must provide the Following Information for the Safe System of Work:
  • The Lift Plan (incl. Ground Capacity),
  • The Method Statement,
  • The Risk Assessment,
  • The Site Plan Drawing,
  • The Slinging Drawings (as required)
Safety Documents: Contract Lift

• For Contract Lift the Owner (CHL) must provide the Following Information for the Safe System of Work:
  • The Lift Plan (incl. Ground Capacity – but CHL will request Information),
  • The Method Statement,
  • The Risk Assessment,
  • The Loading Data Sheet,
  • The Site Plan Drawing (as required),
  • The Slinging Drawings (as required),
  • Staff & Equipment Certification,
  • Insurance Cover (as required – Special Loads).

• The Hirer (Employing Organisation) must provide requested information (details of the load, ground conditions, services, etc.) in writing.
Safety Documents – Staff & Equipment

• **Staff:**
  • Safepass Card,
  • Construction Skill Certification Card (CSCS), or,
  • Construction Plant Competence Card (CPCS).

• **Plant (Lifting Equipment):**
  • GA 1 Four Yearly Test Certificate,
  • GA 1 Annual (12 Month) Report of Thorough Examination,
  • GA 2 Weekly Inspection Report.

• **Chains, Slings, Etc. (Lifting Accessories):**
  • GA 1 Six Monthly Examination Certificate.
Safety on Site

• Communication: Use of Radios or Signals.
• PPE: Hi-Vis Orange for Lifting Team.
• Safety Zones: Keep people & plant out of the Lift Area.
• Obstructions: Power lines, structures, etc.
• Working at Heights: Fall protection.
• Access: Safe access & egress.

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Safety on Site

• Communications:
  • Two-Way Radios are the first choice.
  • But always know the standard hand signals as a back up
Lifting Equipment – Crane Selection

• The Radius: The horizontal distance from the centre of the slew ring to the hook block.
• The Boom (Jib) Length: The distance that the boom is telescoped out – its angle is also relevant
• The Counter Weight (Ballast) has a major impact on capacity at increased radii.
• See the Crane Capacity Charts.
• Greater the Radius the Lower the Capacity.
• A 200 ton crane will lift 200 tons at 3m and just 5.9 tons at 50m.
Lifting Equipment – Crane Selection

• The Appointed Person is responsible for the selecting the correct Lifting Equipment (Crane) that will be required to complete the Task safely.

• Take the advice of the Owner (CHL).

• CHL will complete a free Site Survey & Offer Advice.

• CHL will provide you with a crane configuration & outrigger loading data sheet.
Lifting Equipment – Crane Operation

- The Key Points:
  - Ground Conditions.
  - Site Layout.
  - The Load.
  - The Radius.
  - Proximity Hazards.
  - Weather Conditions.
Lifting Equipment – Crane Operation

- Ground Conditions:
  - Greenfield Sites,
  - Brownfield (filled) Sites,
  - Services & Utilities,
  - Paved Areas.
- Suspended Slabs
- Information:
  - Site Investigation,
  - Services Records

- electricity cables;
- gas/water/drainage pipes;
- culverts;
- uncompacted material;
- covered shafts and manholes;
- recently backfilled excavations and trenches;
- voids under old concrete foundations;
- cellars and basements.
Lifting Equipment – Crane Operation

• Ground Conditions:
  • Soil Bearing Pressure,
  • Loading Data Sheets,
  • Timber Grillage,
  • Larger Crane Mats,
  • Temporary Works, etc.

• It is the AP's responsibility to ensure that the ground conditions are suitable to carry out the job safety.

TYPICAL LOAD COMPONENTS
* weight of the crane
* weight of the lifting gear
* weight and position of the load
* wind loading on crane and load impact loading (e.g. caused by an incorrectly slung load slipping)
* displacement of vertical load, and introduction of lateral loading, if the crane is not level (due to incorrect set-up or differential settlement of supports)
* centrifugal load (caused by slewing or a swinging lifted load).
Factors:

- Wt. of Load - kg./t
- Max. Projected Surface Area - Ap Sq.m.
- Coeff. Of Resistance – Cw
- Max. Wind Speed – m/s or km/h
- Surface Area Exposed to Wind – Aw Sq.m.
- Dynamic Pressure - p
The Effect of Wind

- Watch for gusts 3 sec. duration
- Wind direction impacts on the boom & the indicator in different ways (front-light: rear-heavy: side doesn’t register)
- Wind loads- what affects them ?
- Wt., Max. surface area, Coeff. Res. Cw, Permissible Wind Speed (from charts)

If the surface area of the load exposed to wind is greater than 1.0 m² per tonne of load and/or the Cw value is greater than 1.2 then the Max. Permissible Wind Speeds as per the Load Table are no longer Valid

<table>
<thead>
<tr>
<th>Object Shape</th>
<th>Coefficient of Resistance Cw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate/Cube</td>
<td>1.1 to 2.0</td>
</tr>
<tr>
<td>Cylinder</td>
<td>0.6 to 1.0</td>
</tr>
<tr>
<td>Ball</td>
<td>0.3 to 0.4</td>
</tr>
<tr>
<td>Wind Power Rotor Blade</td>
<td>Approx. 1.6</td>
</tr>
</tbody>
</table>
Influence of Wind on Crane Operations

3 Methods of Calculation:
• Wind Force Diagrams
• Formula
• Per Load Chart Book

Remember:
• Double the Wind Speed means 4 Times the Wind Loading on the Boom & the Load
Load Cases
Location

Crane access - height, width, swept path, weight restrictions
Room for crane rigging
Level approach and working areas
Ground bearing capacity
Voids, traps, underground services, adjacent excavations etc
Obstructions to lifting (overhead cables, existing buildings, other cranes etc.)
Exclusion zones
Road closure
Rail possession
Public interface
Wind (means of monitoring and action levels)
Lifting Equipment – Crane Operation

• Ground Conditions Adequate?
• Gillespies set up their new 350 ton crane on a suspended slab without adequate or correctly placed backpropping.
• Once the first outrigger punched through the slab it caused a progressive collapse...
Lifting Equipment – Crane Operation

• Site Layout:
  • Access & Egress for the crane & ballast trucks.
  • Access for transport Vehicles.
  • Alternative routes for pedestrians and plant around the exclusion zone.
  • Traffic Management on Public Roads?
Lifting Equipment – Crane Operation

• The Load:
  • Weight?
  • Shape?
  • Centre of Gravity?
  • Lifting Points, Eyes or Lugs?
  • Sharp Edges?
  • Collapsible or Unstable?
  • Demolition?
  • Tandem Lift?
Lifting Equipment – Crane Operation

- **Radius & Ballast:**
- This crane was lifting a tree (which was being cut down).
- It had the jib fully extended and a jib extension fitted due to a large radius.
- The weight of the load was under-estimated.
- Note they were not using any additional ballast!
Lifting Equipment – Crane Operation

• Proximity Hazards:
• Maintain a minimum of 600mm between the crane & any obstruction to prevent crush injuries.
• Remember the Counter Weight slewing radius will extend past the outriggers on larger cranes.
• Take advice from ESB when working near power lines.
• Set up an exclusion zone for other plant & pedestrians.
• Additional restrictions apply close to Aerodromes / Airports.

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Weather Conditions:

- Wind: Max Wind Speed Typically 9.0 m/s (32km/h) for Mobile Telescopic Cranes – Take the Crane Operators Advice!
- Fog, Heavy Rain, Snow & Darkness all impact on visibility.
- Lightning poses a serious risk to the safety of all working close to the crane.
- Ensure that site lighting for night works is not directed into the Crane Operator's line of sight.
Lifting Accessories – Chains, Webs, Etc.

- Lifting Accessories Include:
  - Chain Slings,
  - Wire Rope Slings,
  - Polyester Webbing Slings,
  - D & Bow Shackles,
  - Lifting Beams,
  - Spreader Bars.
Lifting Accessories – Safe Working Load.

- **Safe Working Load (SWL):**
- SWL refer to use in a vertical application.
- Applied Load is increased when used in an inclined position.
- The maximum included angle must never exceed 90 Degrees (alpha angle).
- Factors of Safety must be applied for inclined slings.

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Lifting Accessories – Slinging.

• **Do:**
  • Stand back & size up the job.
  • Determine that the lifting points are man enough.
  • Allow for deflection of the boom.
  • Use the correct gear (Length, strength, etc.).
  • Determine the weight of the load & the SWL of the accessories.
  • Check the Centre of Gravity.
  • Check the condition of the accessories.

• **Do:**
  • Check the load is slung under plumb.
  • Stand clear of the load being lifted.
  • Protect accessories against sharp edges by using packing.
  • Take the strain and test lift the load.
  • Check the slings & lifting point attachments.
  • Give clear signals/instructions to the Crane Operator.
  • Stand where you can be clearly seen by the Crane Operator.
Lifting Accessories – Slinging.

• Don't:
  • Drag accessories along the ground.
  • Use unauthorised accessories... ensure that they are all certified.
  • Guess the weight of the load.
  • Drag slings from under a load it could pull the load over... use skids.
  • Shorten any slings by knotting.

• Don't:
  • Ride on the load or in the slings.
  • Leave accessories lying around on the ground... pick them up.
  • Leave damaged or condemned accessories where they can be used by others.
  • Place hands or feet near the bite of any sling.

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Common Accidents in Lifting Operations

- Overturning of the crane
- Breaking the boom sling
- Touching overhead power lines
- Falling objects
- Collision with obstacles
Summary.

• Know the requirements of the Legislation & Standards.
• Standard Hire or Contract Lift???
• Use only Experienced & Competent Staff.
• Importance of having an Appointed Person.
• Lift Plan Documents.
• Lifting Equipment & Accessories.
• The Ground Conditions
• Weather Conditions
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- Mobile Cranes on both a Standard Hire basis and for Contract Lifts,
- Provision of Certified Appointed Persons (Contract Hire), Banksmen & Riggers,
- Heavy Transport (Lift'n'Shift) Solutions, including skating machinery,
- Preparation of Lift Plans, Method Statements & Safe Systems of Work for Lifting Operations,
- Provision of Traffic Management Solutions,
- 3D Crane Drawings for Presentations, etc.
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