

Irish Mobile Crane Hirers Association

GUIDE TO SAFE LIFTING



*Representing Mobile Crane Hire
Companies Nationwide*



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KEY POINTS

- Roles and Responsibilities
- Crane Selection
- Crane Operation:
 - Ground Conditions
 - What to look for
- Summary



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LEGISLATION & STANDARDS

- NSAI I.S. 360: 2019, Code of Practice: Safe Use of Cranes in the Construction Industry
- BS 7121: Parts 1 to 3, 2016 (UK)
- Irish Mobile Crane Hirers Association Conditions of Hire For Mobile Cranes
- SHWW Act 2005
- SHWW (General Applications) Regulations 2007
- SHWW (Construction) Regulations 2013
- SHWW Act 1974 (UK)
- Construction (Design & Management) Regulations 2015
- Lifting Operations & Lifting Equipment Regulations, 1998 (UK)
- Provision & Use of Work Equipment Regulations, 1998 (UK)



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TYPES OF HIRE

Standard Hire

***The Hirer (Employing Organisation)
Must:***

- Comply with I.S 360: 2019.
- Appoint the Appointed Person
- Plan the Lift and operate the safe system of work
- Ensure that the crane hired is a suitable type and capacity
- Check the credentials and the certification supplied by the owner

The Owner must:

- Provide a safely maintained, tested and certified crane
- Provide a Competent Operator

Contract Lift

***The Hirer (Employing Organisation)
Must specify:***

- The works are to be completed to I.S. 360: 2019
- That the Employer (Owner) appoints the Appointed Person
- Provide all information on services in writing.

The Owner must:

- Supply the Appointed Person
- Plan the lift and operate the safe system of Work
- Manage and Control the Lifting Operation



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HIRER'S INSURANCE GUIDANCE

The Hirer (Employing Organisation) Responsibility:

The Hirer shall take out and maintain insurance against any and all liabilities the hirer may incur under the contract

Cover shall include:

Loss / Damage to Plant (Hired in plant insurance)

Hire Charges due to loss of hire arising from plant damage

Loss / Damage to Goods

Public liability



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The Lifting Team – Appointed Persons

Duties

- ✓ To provide such planning, selection (Cranes & Equipment), instruction and supervision to undertake the task safely
- ✓ Ensure all checks, inspections & maintenance of equipment has been carried out
- ✓ Organisation & control of crane operations
- ✓ Ensure all others involved are competent
- ✓ Can stop the works if deemed necessary



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The Lifting Team – Appointed Person

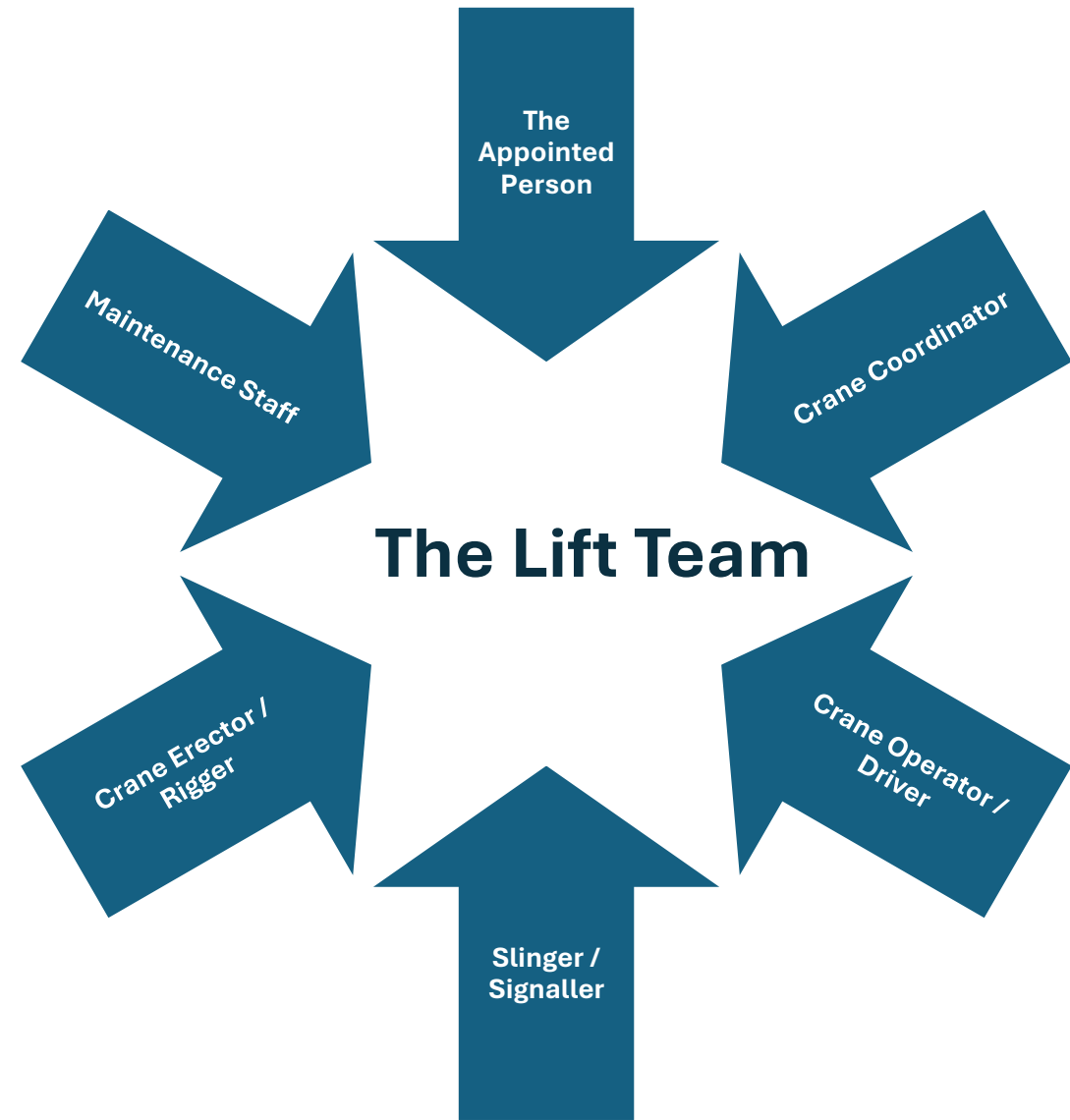
When you are undertaking lifting operations :

- **You must have an appointed person**
- **The Appointed person needs time to collect information, prepare, review and distribute documentation**



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SAFETY DOCUMENTS

STANDARD HIRE

For standard hire, the OWNER should provide the following information for the safe system of work:

- ✓ Rigging Method Statement
- ✓ Rigging Risk Assessment
- ✓ Loading Data Sheet
- ✓ Staff and Equipment Certification

For standard hire, the HIRER should 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 Slings Drawings (as required)



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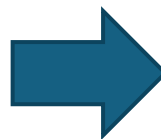
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SAFETY DOCUMENTS

CONTRACT LIFT

For Contract Lift, the OWNER should provide the following information for the safe system of work:

- ✓ The Lift Plan (incl. ground capacity – *The owner may request additional information*)
- ✓ The Method Statements
- ✓ 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 Re specialist loads)



The Hirer (Employing Organisation) must provide requested information (Details of the load, Ground conditions, Services, etc.) in writing



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SAFETY DOCUMENTS – STAFF & EQUIPMENT



STAFF:

- *Safepass card*
- *Construction skill certification card (CSCS), or*
- *Construction Plant Competence Card (CPCS)*
- *Manual Handling (where required)*



PLANT (LIFTING EQUIPMENT):

- *EC Declaration of Conformity*
- *GA1 Four Yearly Test Certificate*
- *GA1 Annual (12 Month) Report of Examination*
- *GA2 Weekly Inspection Report*



CHAINS, SLINGS, (LIFTING ACCESSORIES):

- *GA1 Six Monthly Examination Certificate*



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HYBRID LIFTING - GUIDANCE

Where a crane is hired by the Crane Owner to the Employing Organisation and the Crane Owner becomes involved with the planning of the lift.

A hybrid situation exists where it is unclear who is responsible for ensuring that the requirements as laid out in I.S. 360:2019 are complied with. This could result in incomplete planning and an ineffective safe system of work.

An example of Hybrid Lifting is the preparation of Lift Plans and other associated Contract Lift documentation by the Crane Owner for Standard Crane Hire.

In a hybrid lift scenario, the Employing Organisation still retains the responsibility for appointing the Appointed Person. If the Employing Organisation is reliant on paperwork from the Crane Owner, who is not carrying out the works as a Contract Lift, the Employing Organisation is still liable for any losses and damages that they did not necessarily anticipate.

This situation serves no benefit to the Employing Organisation as the ambiguity around responsibility is likely to create a safety gap and greatly the chances of an incident.



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SAFETY ON SITE

Communication :	Use of radios or signals.
PPE :	Typically, 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
- Standard hand Signals can be used as a backup





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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 Counterweight (Ballast) has a major impact on capacity at increased radii.
- See the crane capacity charts.
- The greater the radius the lower the capacity.
- A 200-ton crane will lift 200 tons at 3m and just 5.9 tons at 50m.



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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 crane owner.
- The crane owner can complete a site survey & offer guidance.*
- The crane owner will provide you with a crane configuration & outrigger loading data sheet.

** Notwithstanding the IMCHA Conditions of Hire and I.S. 360:2019, where the crane owner undertakes a site survey/offers guidance of any nature whatsoever, including but not limited to specifying the appropriate crane/equipment required, the Hirer remains responsible for appointing the Appointed Person For Lifting Operations/the implementation of I.S. 360:2019 and hereby indemnifies and holds harmless the crane owner from any claims/losses howsoever arising.*



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LIFTING EQUIPMENT – CRANE OPERATION

GROUND CONDITIONS

- Greenfield Sites
- Brownfield (filled) Sites
- Services & Utilities
- Paved Areas
- Suspended Slabs

INFORMATION

- Site Investigation
- Services Records
- Determine Soil Bearing Pressure
- Loading Data Sheets,
- Timber Grillage,
- Larger Crane Mats,
- Temporary Works, etc.



HAVE YOU CHECKED FOR THE FOLLOWING?

- 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.



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LIFTING EQUIPMENT – CRANE OPERATION

RESPONSIBILITY FOR GROUND CONDITIONS

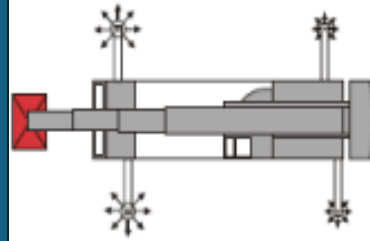
- Where a crane and/or Appointed Person is hired on Standard and/or Contract Hire/lift basis, it remains the sole responsibility of the hirer/user organisation to confirm to the crane hire owner in writing/by way of a detailed drawing clearly indicating the location and nature of any and all underground sewers, voids, services, drains, rivers and/or ground conditions that may make the areas over which the crane and/or equipment may travel over and/or set up upon hazardous /unstable /dangerous/unsuitable for the loads that may be exerted.
- Alternatively, the hirer/user organisation may request a geotechnical survey to establish the details of the ground conditions. In the absence of the aforementioned letter and/or drawing and/or Geotechnical survey, the crane owner will operate under the understanding that no underground hazards/sewers/voids/services/drains/rivers are present in the areas where the cranes/or equipment may travel over and/or set up upon.



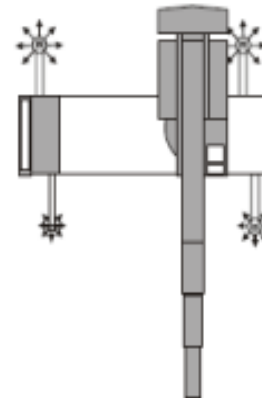
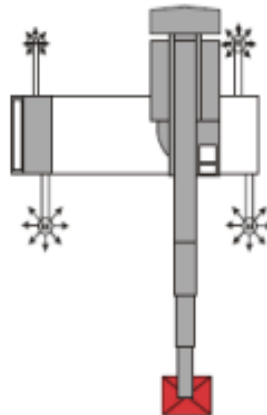
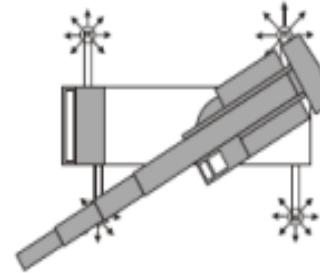
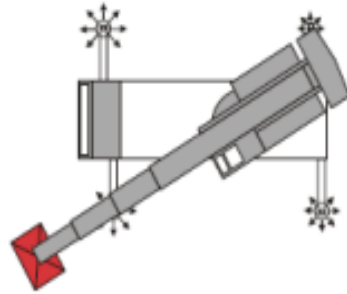
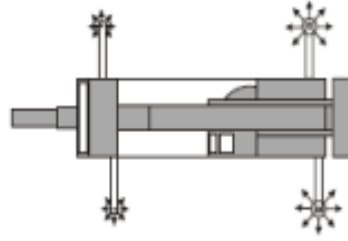
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LADEN



UNLADEN



LOAD CASES

- Cranes should only ever be used in accordance with the manufacturer's instructions.
- These are contained within the operator's handbook.
- They should not be used for operations that may result in the crane being subjected to forces for which it was not designed. i.e., side loadings, shock loadings, vibration.
- Mobile telescopic cranes should not be used for balling operations.



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INFLUENCE OF WIND ON CRANE OPERATIONS

FACTORS OF INFLUENCE:

- Mass of Load – m (kg or t)
- Max. Projected Surface Area - A_p (m^2)
- Drag coefficient – C_w
- Max. Wind Speed – V_{max} (m/s or km/h)
- Surface Area Exposed to Wind – A_w (m^2)
- Dynamic Pressure – P (Pa)

METHODS OF CALCULATION

- Wind Force Diagrams
- Formula

Important to Note:

**Double the Wind Speed means 4
Times the Wind Loading on the Boom
and the Load**



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THE EFFECT OF THE 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?
- Weight of Load, Surface Area exposed to wind, direction of the wind, drag co-efficient, Permissible Wind Speed (from load charts)

If the wind exposure surface (A_w) of the hoist load is greater than 1.2m²/ton than the maximum permissible wind speed must be recalculated for the load case. V_{max} must be re-calculated.



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CRANE SET UP CHECKLIST

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)

☐



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LIFTING EQUIPMENT – CRANE OPERATION

Are the Ground Conditions Adequate ?

- This 250-ton crane was set up on a suspended slab without adequate or correctly placed back propping.
- Once the first outrigger punched through the slab it caused a progressive collapse...





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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?



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LIFTING EQUIPMENT – CRANE OPERATION

THE LOAD

Weight?

Shape?

Centre of Gravity?

Lifting Points, Eyes or Lugs?

Sharp Edges?

Collapsible or Unstable?

Demolition?

Tandem Lift?



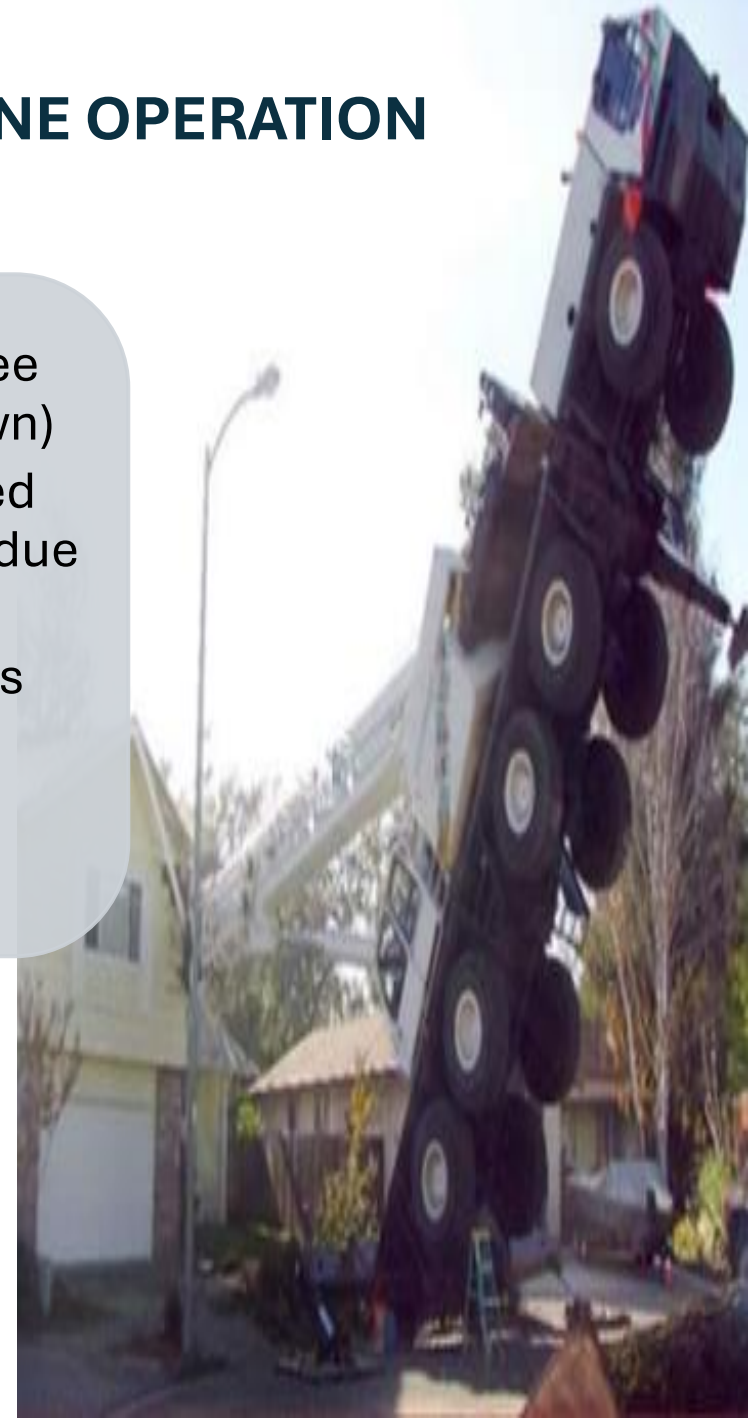
RADIUS & BALLAST

LIFTING EQUIPMENT – CRANE OPERATION

- 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!

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LIFTING EQUIPMENT – CRANE OPERATION

Maintain a minimum of 600mm between the crane & any obstruction to prevent crush injuries.

Remember the counterweight 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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LIFTING EQUIPMENT – CRANE OPERATION

Weather Conditions

- Wind: Max Wind Speed Typically 9.0 m/s (32km/h) for Mobile Telescopic Cranes – Take the Crane Operators guidance!
- **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.



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LIFTING ACCESSORIES – CHAINS, WEBS etc.

Lifting Accessories Include:

- Chain Slings,
- Wire Rope Slings,
- Polyester Webbing Slings,
- D & Bow Shackles,
- Lifting Beams,
- Spreader Bars.



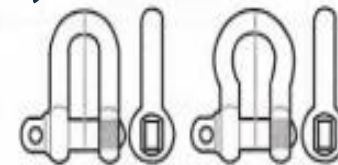
Chain Slings



Wire Rope Slings



Polyester Slings



D and Bow Shackles



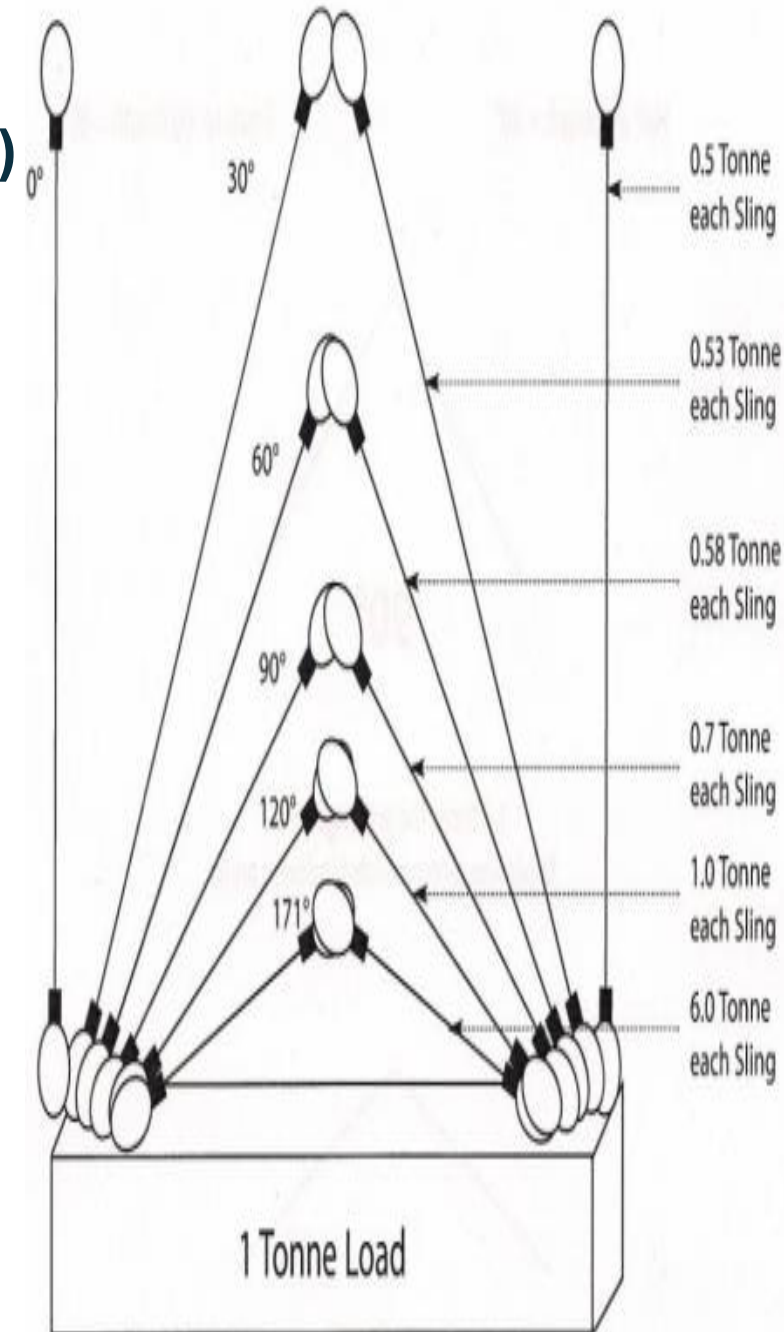
Lifting Beams



LIFTING ACCESSORIES

– 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



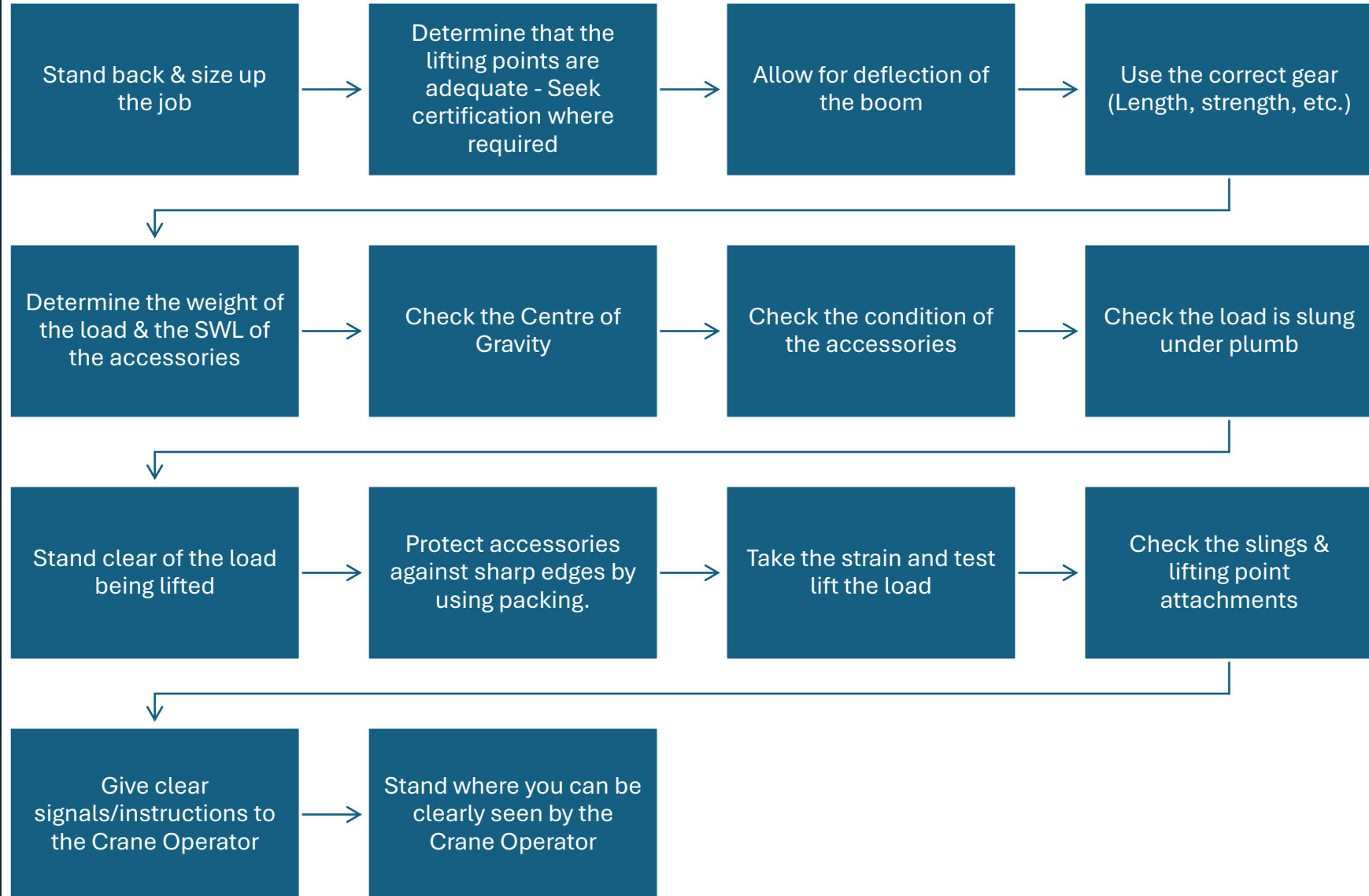
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LIFTING ACCESSORIES – SLINGING

DO



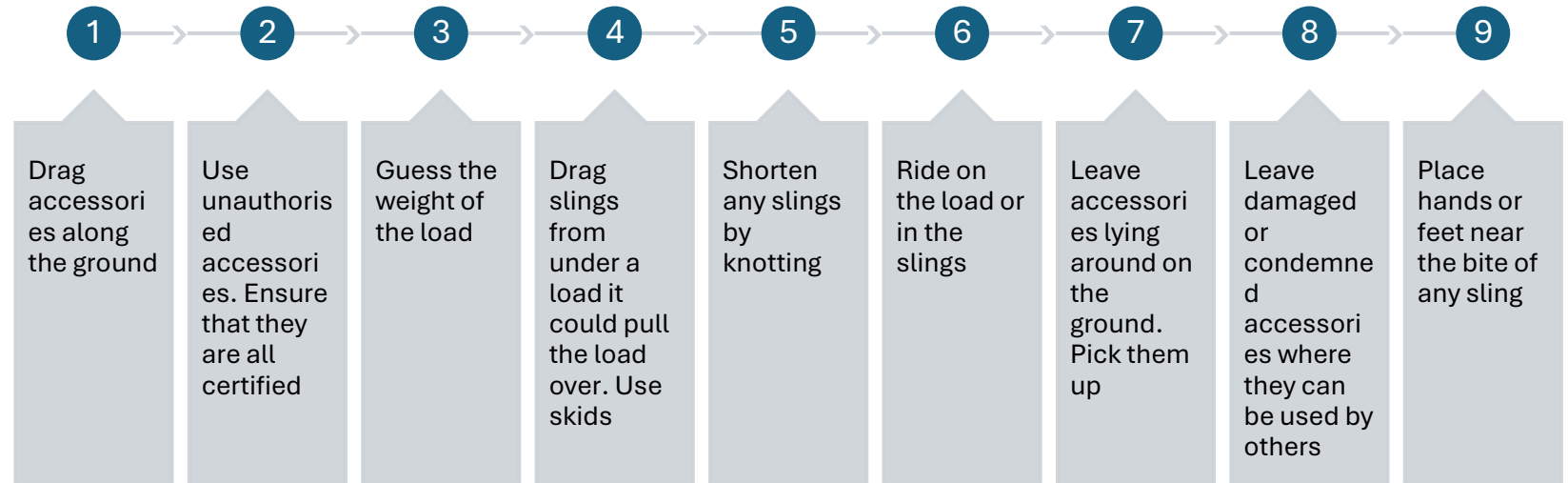
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LIFTING ACCESSORIES – SLINGING

DON'T



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COMMON ACCIDENTS IN LIFTING OPERATIONS



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- Overturning of the crane



- Breaking the boom sling



- Touching overhead power lines



- Falling objects



- Collision with obstacles





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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

Disclaimer

The Construction Industry Federation (which shall include their servants and agents, and any associations of the Construction Industry Federation (“CIF”)

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