

SAFETY INSIGHTS

BRINGING GOOD SENSE TO SAFETY



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INSIGHTS FOR SAFER CRANES & LIFTING OPERATIONS

Abstract:

A presentation of experiences of the author gained from investigations, review of incident data, audits and on-site safety interactions related to cranes and lifting operations across a number of heavy industry contexts from 2014-2018.

This information is designed to assist organisations that perform lifting operations by providing insights into what can go wrong and how to address this in terms of risk controls and lifting practices.

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1. Loads falling:

- The load detaches from the rigging or the rigging detaches from a crane apparatus and falls, most often because the load was not rigged correctly; the rigging was not fit for purpose; or hook did not / could not latch.
- Failure of the rigging equipment is also well represented. Failure of a crane component / lift apparatus is represented but less common amongst major manufacturers of cranes and rigorous inspection programs being applied.
- **Loads should never be suspended over people** (moral obligation of those performing lifts). Building construction workers, most at risk, with cranes often overhead and at times the occupy / work in areas that cannot be seen by the operator / spotter (Cameras are not used often enough).
- Loads suspended for longer periods of time, either by a crane or other method e.g. chain block, become less obvious overtime and people may normalise being under the load.

2. Load / Crane hits powerline:

- Lifting in proximity or traveling under / near powerlines most at risk when maintaining a safe distance if the only control. High voltage can arc, energising the crane without touching the wire. Persons in proximity e.g. rigger / dogman / spotter most at risk, as current flows through crane, rigging, load, to ground. Insulating hooks / links and proximity detectors that significantly reduce risk / prevent this are not often used in construction in Australia.
- Often powerlines are identified, but ongoing crane operations in their proximity becomes normalised e.g. laydown areas, where cranes pick-up and travel loads. The layout of loads in the area can change over time and operators are not alert to this fact, sometimes going too close or traveling with the boom up.

3. Loss of control of load (other than load falling):

- This includes: load hitting a person, snagging on an object, load coming apart, load flexing, bouncing, swinging etc.; load lands badly; or an object falls from the load.
- This can occur when: the rigging is incorrect; the load is flexible / awkward shape; and multiple items lifted / carried coming apart when not adequately secured together e.g. poly pipes secured only by tape.
- Riggers / dogman / spotters are most at risk, they should never handle a load without taglines, or for final positioning of the load in a planned and controlled way e.g. load is below waist height and fine positioning.
- It also commonly occurs when loads are picked up and travelled, sometimes over uneven terrain.

4. Uncontrolled movement of crane:

The crane topples, falls or moves significantly in any direction, not controlled by the operator. Typically ground conditions are not well understood or there is insufficient spreading of the weight under crane stabilisers

5. Interactions with cranes:

Person contacted by any part of the crane itself, e.g. boom, counterweight, body etc. hits a person / object. Mostly, there is not an effective and positive communication procedure between the operator and rigger / dogman / spotter. Most represented with mobile cranes e.g. truck mounted or franna cranes.

6. Rigging releases stored energy:

Any part of the rigging component fails under tension and becomes a projectile. This typically occurs when the rigging is incorrect, particularly when it is reeved at high angles or around sharp objects.

SOME EXAMPLES FROM INVESTIGATIONS



Forklift tipped, and control of load lost – The Jib used on the forklift was not fit for the weight vs length it was extended. The lift was not planned by people with an adequate level of competence to perform a heavy and complex lift.



Rigging equipment failed under tension – The rigging was reeved at a high angle). This was a periodic maintenance task, not often performed by mobile maintenance personnel who only had basic rigging competency. There was a jig / cradle available to lift the component, but this was not known to the maintenance personnel.



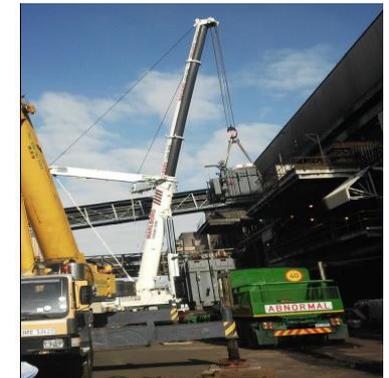
Crane rolled – Local hazard of terrain / slopes not identified because the lift, carry and placement of the load was not formally planned. The path of the crane travel was not inspected. Changes during the task introduced new hazards that were not identified and managed.



Lost control of load – Rigging method incorrect. Changes to the planned lifting / rigging method and equipment were not authorised and there was inadequate competent supervision of a complex lift.

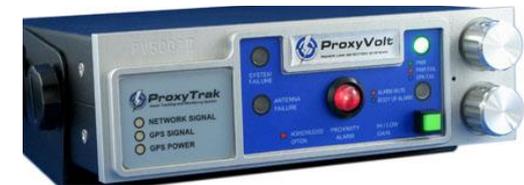


Mobile crane hits powerline – In laydown area whilst performing pick-up and carry lifts. The powerline was identified, but the layout of construction materials in the areas had changed over time. Operators were regularly reversing and traveling with boom up unloaded.



Person(s) in line of fire – Local hazard identification and control did not restrict traffic / pedestrians from entering the danger zone, which was not barricaded off.

1. **Blind spot and boom / load cameras** – Operator can view danger zones, the load and the dogman clearly at all times.
2. **Insulating links / hooks and tag lines** – Prevent electrocution when a crane hits power lines by insulating the load.
3. **Detection for power-lines** – Detects electro-magnetic force given off at a certain distance from power-lines and sounds alarm or interlocks controls.



[Click here for OSHA standards \(USA\) requirements for proximity detection and insulating links for use on lifting operations near powerlines in construction.](#)

Control

1. Lift planning

- Lifts should be planned in advance by a competent person in consultation with operators, riggers, dogmen and others involved in the lift to develop a documented lift plan. The level of planning and authorisation for the lift should be commensurate to the risk.
- The process of planning, authorisation and supervising high risk lifts should operate as a permit to work system and involve people with the requisite competence, authority and control for the high risk lifting operation e.g. lifting critical equipment, complex lifts, heavy lifts, multiple crane lifts, pick-up and travel lifts.
- The lift plan should consider: Lifting and rigging method; Crane and lifting equipment; Crane standing; Local / proximity hazards e.g. power-lines; Interface hazards e.g. other work areas, people in line of fire; Barricading of danger zones; Communication procedures; Load security, path and placement; Visibility; Terrain and clearance issues; and Required competencies. All lift plans should have a documented method of communication.
- Lift plans using a consistent format should be established for the different types of routine lifting operations normally performed on site. Task procedures for tasks involving lifts should include a lift plan, with simple instructions and pictures the correct rigging and lifting method so people with basic training can do the lift safely every time.
- Non-routine lifts should be identified in the upcoming work schedule and subject to a risk assessment; lift planning and an authorisation.

Monitoring

1. Regular field audits / inspections against defined criteria to verify:
 - The technical adequacy of the lift plan in terms of: lift method; local / proximity hazard control and barricading; communication procedure; equipment requirements; competency requirements; crane siting and load control.
 - Lifts performed on site have a lift plan approved by an authorised person that is communicated to persons doing the lift(s).
 - Non-routine lifts are identified in the upcoming schedule and the lifts are planned and authorised.
2. Planned task observations are carried out for routine and non-routine lifts to confirm compliance with the lift plan / task procedure or work method statement for the lifting operation.

Controls

2. Pre- start and local hazard control

- All persons involved with the lift are to be trained in the lift plan. A pre-start brief is performed by the crane operator and supervisor that steps through the lift method / process. The pre-start includes inspection of equipment, crane & rigging set-up, danger zones and travel paths of the crane and load.
- All lifting operations should have a communication procedure, included in the lift plan / task procedure. If a person involved in the lift is out of view or clear earshot of crane operator, radios should be used.
- The method should consider transmission black spots, sufficient battery power for radios, radio channel congestion and restrictions caused by design, noise, light, darkness, dust or anything blocking the signal path. When using radio communication in lifting operations a dedicated channel should be used. Back up communication methods should also be available and discussed.
- The work team needs to identify and manage any local hazards or changes in environment that are present at the time and location of the lift. Note: If there is any significant change to the approved lift plan in terms of people; equipment; environment, or lifting method; these changes should be approved by the person authorising the lift.
- If at any time the lifting job changes from plan or if any complication arises, the crane operation should be stopped, made safe and the plan reviewed. All personnel should remain in positions clear of the lift until replanning of the lift is complete, documented and communicated.

Suggested monitoring

As above for 1. Lift planning.

Control

3. Equipment approval, inspection and maintenance

- Compliance of cranes and lifting equipment with relevant legislation, standards and manufacturers instructions should be verified regularly. Inspection, test, maintenance data and manufacturers instructions and training material should accompany the equipment to site and be verified prior to entry. Contractors equipment should be inspected by an appointed person prior to site entry using a suitable checklist. A system should be developed to ensure contractor's equipment that comes on and off site remains compliant. Once authorised for use on site; equipment details are recorded in a register. The equipment should be tracked and its fitness for purpose verified at specified intervals.
- Maintenance plans should be in place prior to use and ensure inspection, testing and maintenance is performed by competent persons in accordance with the manufacturers recommendations. Dedicated equipment pre-operational checklists should be established for cranes and vehicle loading cranes. These should be based on a risk assessment and manufacturers instructions.
- Proposed modifications / changes to operation should undergo risk assessment and a formal change management process to manage risks; update procedures and communicate change to relevant personnel.
- Attachments (e.g. forklift jibs); jigs / tools should be designed by a competent person and undergo the same approval process as all other cranes and lifting equipment. Persons using this equipment should be trained and authorised to do so and have the appropriate lifting competency.

Monitoring

Regular systems and field audits / inspections against defined criteria to verify:

- Equipment maintenance, test, inspection, training material and manufacturers information is readily available.
- The equipment has been inspected, authorised and registered to enter the site and is tagged (as necessary) "in date".
- Equipment maintenance is carried out to a plan that is available and is in accordance with manufacture's recommendations.
- Pre-start inspections have been performed to a checklist based on a risk assessment and manufacturers recommendations.
- Operators, riggers and dogman can demonstrate relevant pre-start checks for cranes and lifting equipment.
- Persons inspecting and maintaining equipment are competent / certified / authorised to do so.

Controls

Suggested monitoring

4. Lifting Competency

- The system of training and verification of current competence (VOC) for operators, riggers and dogmen should ensure they are competent for the specific lifting tasks they perform.
- The quality and practical content of training, including training delivered by external training organisations should be verified. Minimum competency requirements and refresher training should be set for different lifting operations. This includes lifts using vehicle loading cranes, forklift / loader with jib or multifunction tool carrier lift attachment; hoists; lever hoist and chain blocks; or earthmoving equipment used as a crane
- To minimise the risk of inexperienced operators; the operator competency should expire unless a minimum frequency of operating time is met (may be tracked via database or log book).
- The limitations of basic lifting competencies should be understood when assigning lifting tasks. A core team of highly capable people should be available to develop / independently verify lift plans / procedures for routine lifts, high risk and critical lifts. If necessary experienced specialists should be identified and assigned to rig and direct loads or operate cranes. The size, qualification and number of lifting specialists will depend on the frequency and nature of the lifting operations performed.
- Training and competency for lifting operations should also extend to lift planning, site set-up, crane set-up and local hazard identification and control. The competency of persons authorising and supervising lifts or the availability of lifting specialists to advise them should also be considered.

Regular systems and field audits / inspections against defined criteria to verify:

- Qualifications and current competence are physically verified and recorded.
- Persons are currently competent (in date) and authorised as operators, riggers and dogmen for the lifting tasks they perform (visually sight qualification and VOC).
- Operators log their frequency of operation and satisfy requirements.
- Letter/notices of authorisation to perform lifting tasks.
- Persons who plan, verify or authorise lifts have the requisite competency and authority to do so (visually site qualification and letter / notices of authorisation).