

# Cranes

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Cranes, whether static or mobile, present a number of risk related concerns, including toppling, collapse, and fire.

This Loss Prevention Standard examines these risk exposures in more detail and offers useful guidance to reduce the potential for such incidents.



## Introduction

Cranes, both mobile or static units, are a common sight on construction sites. Losses involving cranes are infrequent however when incidents occur, they are often significant. [A crane fire on the M6 in Cumbria](#) in October 2017 led to travel delays and a substantial loss including the value of the crane, and damages to the road surface. In January 2024 the [jib of a luffing tower crane collapsed](#) overnight at a construction site in London, and in a similar incident in Edinburgh in November 2023, a [crane jib collapsed](#) at a construction site leaving two persons injured and extensive damage to the crane.

The risk of loss or damage can be significantly reduced by following the following guidance.

Note: This document relates to static and mobile cranes and is focussed on Property loss prevention and related risk management guidance. It is not intended to address Liability exposures.



## Understanding the Risks

Cranes are exposed to numerous risks in normal operation, during journeys to sites, erection/dismantling, and storage. The following are some of the more common risk exposures:

- Wind. Operating cranes during high wind conditions or failing to leave cranes in free slew/weathervane mode whilst not in use can lead to unusual forces being exerted and collapse incidents.
- Terrain. Cranes can collapse when poor, uneven landing surfaces are used, or ground with underlying services. The use of incorrect outrigger pads/mats, which are not capable of transmitting the loads safely across the underlying strata can also destabilise cranes and lead to collapse or damage.
- Collision/Impact. Cranes operating in close proximity to other cranes, as per an [incident in Austin, Texas](#) in 2020, buildings, plant or other construction activities may present an increased risk of collision/impact.
- Overloading. Damage during the lifting of excessively heavy or unusual loads, ice and snow build up, and/or where the centre of gravity is not centralised are known causes of crane damage.
- Road. Besides road collisions, cranes can fall into roadside ditches in narrow lanes, or overturn either after being forced on to uneven verges to allow passing, or through driver error/distraction.
- People. Whether due to poor decision making, lack of training or unfit condition to work, operators, managers, banksmen, or others can be a significant contributing cause of crane failure and damage.
- Mechanical failure. Lack of, or incorrect maintenance/road worthiness can lead to failure of key components, with potentially catastrophic consequences.
- Erection/dismantling. Poorly managed crane erection and dismantling related activities can lead to collapse or damage to the crane.
- Fire. Ignition hazards include electrical fault; flammable agents such as oil and diesel coming into contact with hot surfaces e.g. exhausts and motors; friction from moving components under pressure; faulty or damaged lubrication systems, and arson attack. Fires can occur whilst the crane is in operation or during journeys between sites.
- Electrical. Cranes can operate in proximity to overhead power lines. Once damaged, flailing power lines can injure operatives and cause damage to the crane and other property.
- Deliberate. Unauthorised persons can access sites and accidentally damage, vandalise, steal, or remove key components whilst scaling or attempting to access cranes. They can also be a target for urban explorers.

## Management and Supervision

Appropriate management planning and supervision applies to all elements of the crane work from leaving the compound until return following the period of use.

Appointed Person. Lifting operations should be planned and managed by a competent ‘**appointed person**’, who has appropriate practical and technical knowledge, qualifications, and experience of the type of crane lifts being undertaken. Large sites may utilise a Temporary Works Co-ordinator to oversee and manage temporary structures, systems, and processes, which can include crane operations.

More information is provided in - CPCS Appointed Persons: Lifting Operations A61

Travel Plan. Ensure transportation and travel planning is undertaken for every journey.

- Plan the route checking for road hazards such as bridges, narrow roads, congestion/rush hour etc.
- Driver credential checks should be routinely undertaken, including road competency, and driving licences.

Lifting Plan. All lifting operations should be adequately planned with all likely/foreseeable risks considered. The plan should include:

- A risk assessment and method statements.
- Key accountabilities/responsibilities.
- Pre lifting checks.
  - ✓ Ground conditions, hazards, other planned events in the area etc.
- Required resources and the lifting and general procedures.
- Communication arrangements ensuring the crane operator and slinger/signallers will be in visual and radio contact at all times and between crane operators where more than one crane is in operation.

Important: Load capacities and crane technical documentation is often missed in Lifting Plans and is needed for a suitable crane mat and outrigger assessment to be made.

Safe System of Work. The findings of the risk assessment, along with the planned work activities and process should be detailed in a safe system of work/method statement. Key components include:

- Safe processes for site preparation, erection, and dismantling, slinging, and signalling.
- Selection of the correct crane for the work.
  - ✓ Price and availability/supply issues are factors which dictate a crane selection, and this should be constantly reviewed to ensure the crane used is suitable for the site and activities.
- Maintenance, general examination, and ‘**thorough**’ statutory examinations.
- Training of all relevant personnel and security of persons in proximity to the lifting work.
  - ✓ Management reviews of training records can help ensure this is being undertaken adequately.
- Supervision of the works.

Supervision. Lifts should be adequately supervised to ensure they are carried out safely and in accordance with the lifting plan and safe systems of work.

- The crane supervisor should be competent and appropriately trained and experienced.
- Supervisors should possess the authority to stop lifting operations if necessary.

Safety Devices. Ensure all installed safety devices are in good working condition and interlocks and alarms cannot be overridden by operators. Appropriate response actions to the operation of safety devices should be formalised and shared with operators. Recommended safety devices include:

- Safe load indicators.
- Anemometer.
- Obstacle lights.
- Height limiter.
- Slew limiter.
  - ✓ If the slew brake is left on in high winds the crane cannot freely move, placing stresses on the equipment. This is a key safety feature that can be overlooked and requires close supervision and site checks.
  - ✓ Where there is more than one crane in operation, and there is potential for clash/impact, consideration should be given to installing anti-collision systems in all cranes, with systems alarming to the crane operator cabs, and also interlocked to isolate safely as necessary.
  - ✓ Safety interlocking should not be capable of manual override unless adequately risk assessed.
- Fail safe 'enabling' controls.

Operator. Ensure operator rules/standard operating procedures and disciplinary procedures are in place, and relevant operator documentation has been collected and checked. In the United Kingdom this includes:

- Evidence of competence and experience.
- Copies of any NVQ and/or National Plant Operators Registration Scheme (NPORS) certificates.
- Current Construction Plant Competence Scheme (CPCS) card.
- Current driving licence in respect of cranes driven on public roads.
- Signed substance abuse policy.
  - ✓ routine drug and alcohol checks should be undertaken with operators and other persons involved in the lifting work. Any persons testing positive for signs of substance use should be removed from site however ensure worker welfare has been considered and the person(s) are in a fit state or taken home.
- Ensure any on-site training provided is signed by the operator.

Note: Management and supervision responsibilities may be inadvertently overlooked on smaller sites that do not utilise a Temporary Works Coordinator. As such other persons assuming responsibility for management and supervision, such as Project Managers etc., may need to be adequately trained on their duties under any regulatory or statutory requirements.

## Equipment

### The Weight to be Lifted

Choose a crane with an appropriate lifting capacity to move the load. Too high a capacity will require added worker involvement, cost, and delays. Too low can lead to failures and accidents.

Note: Cost changes, delivery, or supply problems etc., can result in an inappropriate crane being supplied for the planned works, and not the type and size specified in the original lifting plan. Any crane changes of this nature should be notified to relevant stakeholders including Appointed Persons, Temporary Works Co-ordinator, crane operator etc. and the lifting plan reviewed immediately. Lifting works should be suspended until a suitable crane is supplied if necessary.

- Understand the dimensions, weight, and nature of the goods to be lifted.
  - ✓ Solid, evenly shaped goods require different lifting management than irregular shaped, or liquid filled loads.
- Understand the type of lifts being undertaken.
  - ✓ Simple or complex lifts or tandem lifting can reduce the crane percentage capacities.
- Undertake a crane load test to verify the design of the crane structure and to ensure all components function as intended at the safe working load.
- The frequency of lifting may also have an impact of the most appropriate crane to be used.
  - ✓ Crane changes can impact the number of lifts required to complete the works and delay other works.

### Lift Height

- Choose an appropriate crane for the height the goods are to be moved.
- Longer boom lengths are required for higher lifts.
- Fixed tower cranes provide the highest lift capacity but are unable to move once sited.

### Ground Conditions and Access

- Poor ground conditions may require more robust mobile cranes or delivery vehicles whilst vehicle-mounted cranes may be suitable for flat/even terrain.
- Correct Temporary Works designs for the crane mats, crane bases, tower crane bases and outrigger pads are critical vital to ensure stability of cranes during transit and more importantly during use. These should always be provided by suitably qualified persons.
- Ensure any haul roads are suitably designed for the movement of heavy machinery.
- Access, including any provided turning circles etc., will need to accommodate the crane and any delivery vehicles.
- Ensure sufficient available space for erection and dismantling is provided.
- Are other site buildings or installations likely to impede safe access and operation, and if so, can these be temporarily relocated?
- Are power cables present, scaffolding, tall trees etc., that might hinder safe operations?

### Equipment Hire

- Companies should not hire cranes without sufficient experience and expertise in managing lifting safely.
  - ✓ This can be inadvertently overlooked on smaller sites where a Temporary Works Coordinator is not utilised, and arrangements are overseen by persons who may not be fully aware of the regulatory/statutory duties.
  - ✓ The use of contract lifts is recommended in these instances.
- Check national agreements on any national duties of care or safety requirements. In the United Kingdom the Construction Plant Hire Association's crane hire agreement specifies the crane and crane operator are the responsibility of the customer when on site.

- Consult your Property Insurer or Broker to ensure appropriate insurance is in place, where lifting contractors/cranes are utilised on site.

## Travel to and from Sites

- Planning the journey to sites, including the roads to be used, and access to the crane siting location is imperative.
  - ✓ **Undertaking a 'dry run' of the journey in a standard vehicle can help identify potential hazards that might arise when transporting the crane such as narrow roads, road works, uneven or soft surfaces.**
  - ✓ Transporting large vehicles, such as cranes, is recommended in quieter travel periods outside of high commuter or holiday traffic etc.
  - ✓ Checking weather conditions prior to finalising arrival dates may help avoid weather related incidents.
  - ✓ Checking whether any prior weather related ground conditions, such as ice, snow, waterlogging etc., could impact safe crane operations.
- Ensure adequate crane standing surfaces have been installed, tested, and inspected prior to the crane arrival.
  - ✓ A suitably qualified and competent person should ensure suitable Temporary Works designs for the crane mats, crane bases, tower crane bases and outrigger pads have been provided.
- Appropriately trained persons, such as banksmen, slingers and signallers should be present on site to assure safe site movements once the crane has arrived.
  - ✓ Clear instructions and responsibilities should be provided and confirmed.
- Appropriate equipment should be present for helping assembly.

## Siting of Cranes

The siting of a crane needs to be carefully considered within the lifting plan, risk assessments and safe system of work.

### General

- Attention should be given to the proximate hazards and ensure there is sufficient room to operate the crane. These can include:
  - ✓ Overhead electrical cables.
  - ✓ Other buildings, cranes, or equipment.
  - ✓ Slopes, existing retaining walls, new and existing drainage beneath the crane position.
    - Oversailing over adjacent sites may need to be prohibited or restricted to certain times depending on the activities and hazards present.
    - Rights of oversailing and rights of light need to be considered, and where necessary agreed for out of hours skewing / weathervaning.
  - ✓ Aircraft from nearby airports or flight paths.
- The presence of underground services such as train lines, bunkers, basements, drainage, and infrastructure etc., should be considered.

## Tower Cranes

- Correct Temporary Works designs for tower crane bases are vital to ensure stability of the crane during use and also for out of service loads when the crane is subject to wind. These should always be provided by suitably qualified Temporary Works Engineers and a Category 3 independent assessment carried out as often as possible.
  - ✓ The risk assessment should also use load data supplied by the crane manufacturer, along with the weight of any ballast, loads and other features to determine the correct base for the crane.
  - ✓ Any dynamic forces on the crane due to wind should also be factored into the assessment.
    - Ensure tower cranes are placed in free slew state when not in use, this reduces the impact of wind and the potential for collapse or damage.
    - Jibs should also be lowered when not in use with no load.
- Where possible **'tying' the crane to an adjacent structure can improve stability.** This needs to be carried out in conjunction with other site stakeholders and be subject to inspection and certification by a competent person.
  - ✓ Any tying requires a full assessment by a suitably qualified Structural Engineer in line with formal quality assurance practices.
- Where there is more than one crane in operation, and there is potential for clash/impact, consideration should be given to installing anti-collision systems in all cranes, with systems alarming to the crane operator cabs and also interlocked to isolate safely as necessary.
  - ✓ Safety interlocking should not be capable of manual override unless adequately risk assessed.

## Mobile Cranes

- Mobile cranes should only be used on even and supportive ground. Inappropriate crane standing conditions can create stability and lifting stresses.
  - ✓ A suitably qualified and competent person should ensure appropriate Temporary Works designs for the crane mats, crane bases and outrigger pads have been provided.

## Erection and Dismantling

- Erection and dismantling should be undertaken in accordance with the Lifting Plan, safe system of work, and any relevant national regulations or guidance.
  - ✓ A competent crane erector/company should be utilised. Review their method statements and ensure alignment with own systems and procedures.
  - ✓ Provide appropriate instruction, information and guidance to relevant persons involved with the erection/dismantling work.
  - ✓ Ensure the crane is subject to an inspection and certificated after assembly as safe to use.
  - ✓ Ensure sufficient and appropriately trained/experienced banksmen, slingers and signallers are used.
  - ✓ Undertake such work when the site is otherwise closed, such as weekends, wherever possible.
  - ✓ Ensure weather conditions are appropriate for the work.
  - ✓ Close any relevant roads or access routes or walkways in proximity.
  - ✓ Ensure adequate clearance is provided around the crane to avoid property damage from falling objects.
  - ✓ Ensure the crane is left in safe condition overnight should the erection/dismantling extend to more than one day. Any assembled jibs should be lowered.
  - ✓ If a secondary mobile crane is used for erection and dismantling, ensure the ground is able to withstand the loads for such works. Any mats or bases should be designed by a suitably qualified and competent person.
  - ✓ Check appropriate PPE is being used for height work and ensure it is in safe condition.

## Maintenance

Crane maintenance is a critical factor in reducing the risks of property damage.

### General Inspections and Maintenance

- All cranes should be in a satisfactory and safe working condition. Undertake:
  - ✓ Daily Inspections. Check for signs of damage and fatigue along with checks on ties/fastenings, lights and indicators, brakes and brake hoses, fluid levels including hydraulic equipment, welds, cables, outriggers (where present), safety devices are working correctly.
  - ✓ Weekly, Monthly, Quarterly and Annual Maintenance. Undertake more thorough inspections, servicing and maintenance as specified in national standards, codes etc., and manufacturer or supplier guidance/manuals.
  - ✓ Crane Contractors. Where hired in crane contractors are used, ask to view maintenance records and daily/weekly/monthly etc., inspection checklists. Ensure these are thorough and appropriate.
  - ✓ Thermographic Cameras. Use these to check for hot spots caused by leaking hoses, overheating, electrical faults etc.

Ensure all:

- Inspections and maintenance is recorded.
- Certificates are stored appropriately.
- Recommended actions are completed.

Important: Cranes should not be in use with outstanding repairs and the safe system of work should adequately address this rule.

- Regular audits of maintenance records by responsible persons should be undertaken to ensure appropriate thoroughness and recommended corrective actions are being completed.
- Regular inspections of the crane mat should be completed.
  - ✓ Poor weather and traffic movements can damage mats over time.

Note: In the United Kingdom, inspection, servicing, and maintenance requirements are addressed in Multi-part Document BS 7121 - Code of practice for the safe use of cranes, the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) and the Provision and Use of Work Equipment Regulations 1998 (PUWER).

### Thorough Examination

The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) require a systematic and detailed examination of the equipment and safety-critical parts is carried out at specified intervals by a competent person and detailed within a written report. This report should include:

- The examination date.
- The date of the last inspection and when the next thorough examination is due.
- Any defects found which are (or could potentially become) a danger to people.

Serious defects must be reported to the duty holder by the competent person carrying out the examination, before leaving site by way of a handwritten notice and signed for by a competent member of staff with the authority to stop works, and followed by the written report. A copy of the report must also be sent to the relevant enforcing authority.



Thorough examinations should be completed:

- Before use for the first time. Unless the equipment has a Declaration of Conformity less than one year old (six months for people carrying equipment) and the equipment was not assembled on site.
- After assembly and before use at each location. For equipment that requires assembly or installation before use, e.g. tower cranes.
- Routinely. Unless there is an 'examination scheme' specifying other intervals, thorough examinations should be conducted every:
  - ✓ 6 months, for lifting equipment and any associated accessories used to lift people.
  - ✓ 6 months, for all lifting accessories.
  - ✓ 12 months, for all other lifting equipment.
  - ✓ After periods of poor weather or named storm.

In addition to inspection and maintenance of cranes and associated equipment, the crane standing, or foundations should be routinely inspected for signs of damage, failure, or other concerns.

## Cranes – Material Damage

### Fire

- Ensure smoking is prohibited within crane cabs and cabs are maintained clear of combustible items such as paper, waste etc.
- Ensure the areas around cranes, whether in situ or in storage, are maintained sterile and free from combustible goods.
  - ✓ Any foliage should be maintained and cut back.
- Regular inspection and servicing of motors, fuel lines, hoses, cooling fans etc., can help prevent faults and fires from overheating components and/or friction fires.
- Regular checks of engines compartments on mobile cranes can help identify oil or fuel leaks which may ignite upon contact with hot surfaces.
- Carefully consider the location of any Battery Energy Storage Systems (BESS) and ensure at least 10 metres separation from the crane, or where not achievable, fire barriers are introduced.
- Any fuel tanks/supplies e.g. diesel, should be located a safe distance from cranes.
- Ensure heating and/or air conditioning systems are turned off outside of operational hours.
- Provide appropriate fire extinguishers in cabs.
  - ✓ Refer Aviva Loss Prevention Standard – Fire Extinguisher Selection, Location and Servicing.
  - ✓ Provide appropriate fire extinguisher training to crane operators.
- Installation of automatic, local fire suppression to engine compartments can help prevent the growth and spread of fire.
  - ✓ Such protection should be designed, installed, and maintained by an experienced and competent company in alignment with appropriate national/international standards. The Fire Industry Association (FIA) Guidance Note - Guidance Note for an Introduction to Vehicle Fire Suppression – Part 1: Industrial Vehicle and Equipment Firefighting Systems is a useful guidance document. Refer [here](#) for more information.
  - ✓ In the United Kingdom such systems should be designed, installed, and maintained in accordance with FM 5970, Heavy Duty Mobile Equipment Fire Protection Systems.
  - ✓ Any such protection should be interlocked to isolate the engine power and fuel supplies safely upon activation.
- Ensure adequate Fire and Rescue Service access routes are provided and maintained clear.

## Other Perils

- Ensure the area around the crane location is adequately segregated from the risk of impact from other site vehicles.
  - ✓ Adverse site conditions, such as uneven and wet or icy tracks etc., may warrant the use of heavy duty, temporary concrete barriers around lifting operations.
  - ✓ Adequately lighting crane operations during darker conditions.
  - ✓ Obstacle lights to booms and jibs are essential in areas where low flying aircraft may be present.
- Maintain the body of the crane free from tools, accessories etc.
  - ✓ This can prevent the risk of unintended items being blown or vibrated into machinery compartments and in some cases increase the risk of weathervaning.
- The site should be risk assessed for adverse flooding or inundation exposures where located near coastal or tidal waterways.
  - ✓ High waters can damage crane standings or foundations, along with damage to any cranes present.
  - ✓ Check weather reports daily where the risks of such incidents is of concern and suspend/delay lifting operations until the weather conditions are appropriate.

## Security

- Secure cabs and use secured anti-climb panels to access ladders.
  - ✓ **Thieves may try to target cabs, however other unauthorised persons such as ‘crane-climbers’ may also try to scale the crane.**
  - ✓ Remove keys from the crane and store in a secure location.
  - ✓ Close and secure cab doors and windows to prevent unauthorized use.
  - ✓ Lock control panels that will not be in use.
  - ✓ Remove any mobile control panels and store in a secured location.
  - ✓ Ensure operators do not leave valuables in cab.
  - ✓ Intruder alarm systems are available for plant and machinery and should be considered along with response arrangements.
- Ensure the site security arrangements are adequate to prevent unauthorised entry.
  - ✓ Good quality hoardings should be installed around construction sites and hoardings of at least 3.5 metres installed around the crane base.
  - ✓ Any site gates for vehicles and persons should be locked outside of operational hours.
  - ✓ Where present, Video Surveillance Systems (VSS) should be reviewed to ensure the crane(s) is fully covered by camera equipment.
    - If not already configured to do so, the system should be monitored via an accredited Remote Video Response Centre (RVRC) and achieve level 1 police response.
  - ✓ Where not present, the use of temporary, detector activated Video Surveillance Systems should be considered.
    - Monitoring of such systems should be provided by the leasing company.
  - ✓ Response arrangements should be in place for any VSS related security concerns. The use of audio challenge, which would allow the RVRC to issue warnings to any unauthorised persons attempting to access the site or behaving suspiciously, should be considered.

## Specialist Partner Solutions

Aviva Risk Management Solutions can offer access to a wide range of risk management products and services at preferential rates via our network of Specialist Partners.

- Drug and alcohol screening - [D.tec International Ltd](#)
- Vehicle telematics, vehicle safety technology, fleet analytics - [VUE Group](#)
- Thermographic imaging and PAT testing: [PASS](#)
- Thorough Examinations - [Bureau Veritas](#)

For more information please visit: [Aviva Risk Management Solutions – Specialist Partners](#)

## Sources and Useful Links

- [BS 7121 - Code of practice for the safe use of cranes](#)
- [Lifting Operations and Lifting Equipment Regulations 1998 Amended \(LOLER\)](#)
- [Provision and Use of Work Equipment Regulations 1998 \(PUWER\)](#)
- [Construction Plant Competence Scheme \(CPCS\)](#)
- [Construction Plant-hire Association](#)
- [The National Plant Operators Registration Scheme](#)
- [CIRIA Guide to tower crane foundation and tie design \(C761\)](#)
- [Crane stability on site - second edition \(C703\)](#)
- [Loss Prevention Standard LPS 1197: Issue 4.2 Requirements for the LPCB approval and listing of companies inspecting, repairing, and maintaining fire and security doors, door sets, shutters, and active smoke/fire barriers.](#)
- [LPS 1531: Issue 1.2 Requirements for the LPCB approval and listing of companies installing or applying passive fire protection products.](#)

Note: Whilst UK standards and legislation are referenced in this document, other international standards and legislation should be referenced where applicable.

## Additional Information

Relevant Loss Prevention Standards include:

- Managing Contractors
- Engine Powered Mobile Plant
- Mobile Plant Theft from Construction Sites
- Temporary Buildings and Structures

To find out more, please visit [Aviva Risk Management Solutions](#) or speak to one of our advisors.

Email us at [riskadvice@aviva.com](mailto:riskadvice@aviva.com) or call 0345 366 6666.\*

\*The cost of calls to 03 prefixed numbers are charged at national call rates (charges may vary dependent on your network provider) and are usually included in inclusive minute plans from landlines and mobiles. For our joint protection telephone calls may be recorded and/or monitored.

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