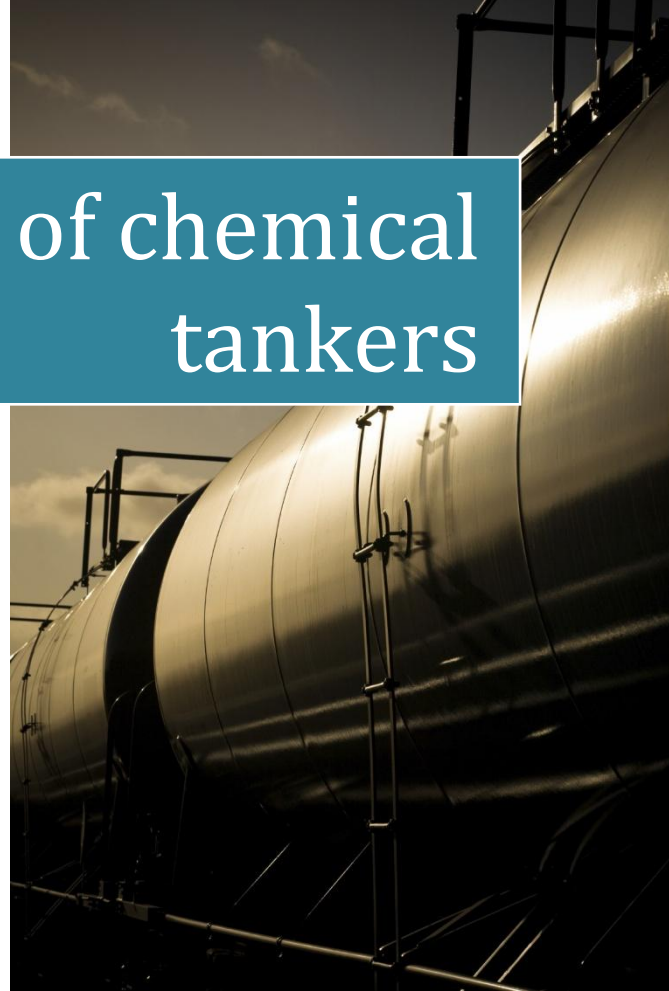


Working on top of chemical tankers



CHEMICAL INDUSTRIES
ASSOCIATION



Responsible Care

Working on top of chemical tankers

Responsible Care

Responsible Care is an international chemical industry voluntary initiative. It is designed not only to improve the performance of the chemical industry in the fields of health, safety, environment, product safety, distribution, emergency response and relations with the public, but also to enable companies to demonstrate that these improvements are in fact taking place. Responsible Care is a commitment to open communication on the activities and achievements of the chemical industry.



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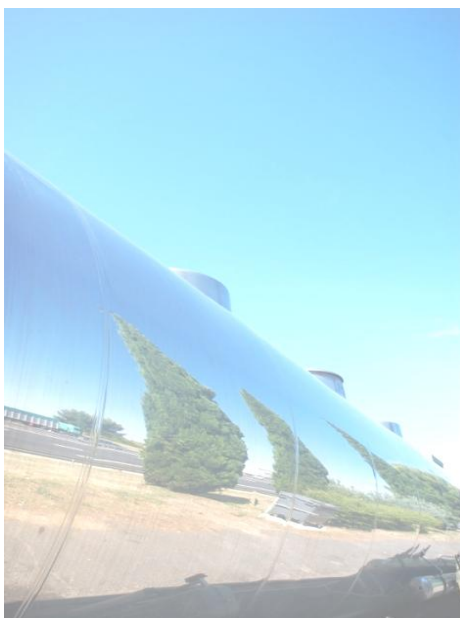
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1. Introduction

The Workplace (Health, Safety & Welfare) Regulations 1992, which applies to all workplaces since 1996, makes specific reference to the subject of accessing tops of tankers. Appropriate safety standards and procedures need to be in place in order to minimise the risk of a fall and cause serious and sometimes fatal injuries. Working at height is a key focus topic for the Health and Safety Executive (HSE) who over the past years have been working in a number of industry sectors to promote safe working standards whilst at height.

This guidance document aims to provide companies seeking support and advice on improving standards when accessing and working on top of chemical tankers. The content of this guidance is equally applicable to liquids and solids (powders) carried in tankers. The intention of the document is to help industry implement safe working procedures by taking into consideration legislative requirements, standards for equipment and conducting a step-by-step risk assessment before accessing the top of a tanker.



The regulatory background

Employers have a general duty under the *Health & Safety at Work Act 1974*¹ to ensure, as far as is reasonably practicable, the health, safety and welfare of their employees at work. ***The Workplace (Health, Safety & Welfare) Regulations 1992***² aim to ensure that workplaces meet the health, safety and welfare needs of each member of the workforce. Regulation 13 requires employers to take suitable and effective measures to prevent any person falling a distance likely to cause personal injury. Similarly, the ***Work at***

Height Regulations 2005 (as amended)³ places duties on the employer to do all that is reasonably practicable to prevent anyone falling along with Schedules covering detailed requirements on access procedures when working at height and information on collective fall preventions and fall arrests.

Under the ***Management of Health & Safety at Work Regulations 1999***⁴, the employer has an obligation to assess the risks to employee health and safety before performing any work activity,

record the assessment and make any necessary changes to adequately control those risks identified. Regulation 11 requires that where activities of different employers interact, individuals need to co-operate with each other and co-ordinate their preventative and protective measures to ensure that their respective obligations are met. This may be the case for tank drivers who work on various sites. In the case where a driver has to carry out duties on top of the tanker or tank container during (un)loading, both the employer of the driver and the respective site management have a duty. In general both parties (carrier and site manager) should have procedures and training in place for carrying out tasks on tanker tops which do not

convey conflicting messages and allow safe access. The carrier should also provide the driver with Personal Protective Equipment (PPE) (E.g. safety harnesses) as well as train employees in the use of PPE whereas the loading/unloading site should provide safe tank access.

Under the Corporate Manslaughter and Corporate Homicide Act 2007⁵ companies and organisations can be prosecuted for gross failures in the management of health and safety where a fatality has occurred. The Act does not impose new duties of care but the new offence does apply to the existing obligations on a company employing contractors and sub-contractors, for the safety of worksites, employees and other workers who they supervise.

2. The need for access to the top of tankers

Where possible, tanker top access should be eliminated altogether. Operations or tasks where access to the tanker top is existing practice should be challenged to justify and establish if there is a real need for top access.

However, personnel may need to gain access to the top of tankers for various reasons, e.g. for sampling purposes, checks on the safety of load before transit or in case of an emergency during transit. Access to the top of tankers may also be required for maintenance or when attending cleaning stations. An increasing number of companies are now only permitting top sampling where there is a safe fixed gantry in place because of the concerns associated with carrying samples down a ladder or lowering it on a line.

Tank containers (ISO tanks or portable tanks) pose a particular difficulty. Although the frame members provide a good means of support for a working platform, climbing to the top requires a difficult manoeuvre in moving from the vertical ladder to the horizontal top frame. It is possible to carry out tasks for ISO tanks at ground level.

Bottom loading can prevent the need for such access, but in some cases there are good technical cases for top loading (e.g. where valves need to be manually operated at height or the need to check liquid levels). The UN Model Regulations also includes special provisions requiring 'top only tanks' for over 300 substances. Whilst such provisions require tank shell openings above the liquid, this task can be safely carried out at ground level with no need to access the tanker top.

A complete assessment of the whole filling operation should be carried out prior to any decision being taken to change from top to bottom loading. This includes consideration of lines remaining full at the end of the filling operation. In this case, arrangements need to be made either to empty the lines (e.g. by reverse pumping), to blow through the lines or to install reliable dry-break couplings. In addition, a system also needs to be in place to avoid over pressurisation especially in cases where vent connections have not been opened before starting the filling operation.

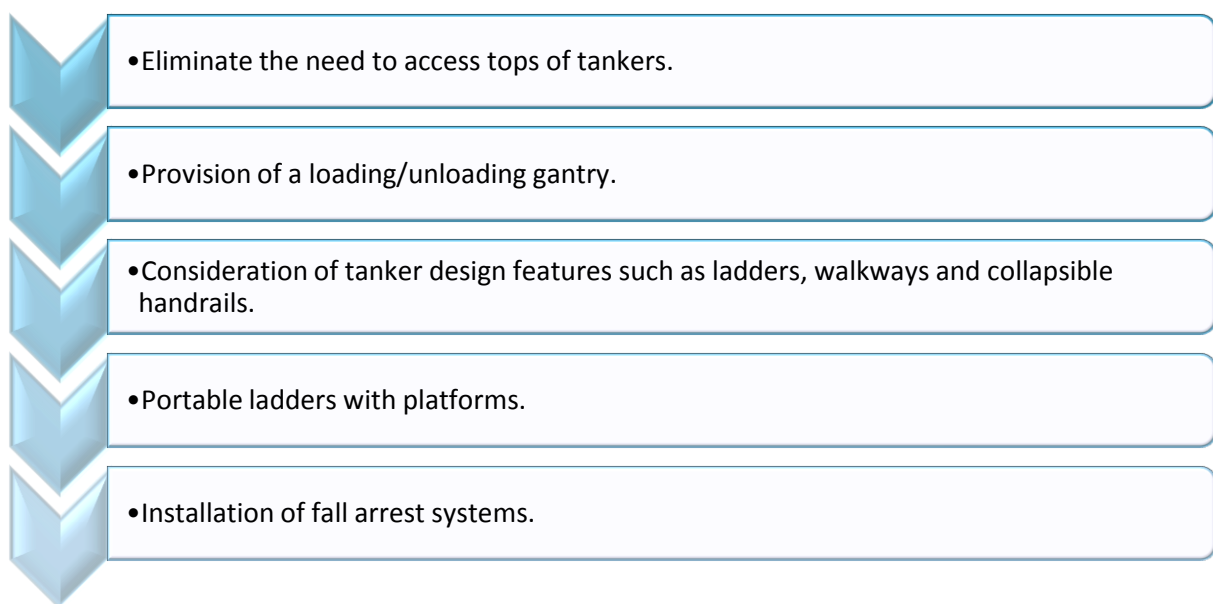
Both the HSE Approved Code of Practice (ACoP) for workplace, health, safety and welfare⁶ and subsequent HSE guidance document *Workplace transport safety; guidance for employer*⁷ specifically states that the need for people to climb on top of vehicles should be avoided as far as possible. Where top access is unavoidable, effective measures should be taken to prevent falls. The guidance requires employers of drivers and operators of premises to carry out risk

assessments before allowing access to the top of tankers. Furthermore, the ACoP states that, where a tanker is loaded from a fixed gantry and access to the top of the tanker is necessary, fencing should be provided where possible. The need to operate a safe system of work, which may include the use of safety lines and harnesses, as well as emphasising the importance of adequate instruction, training and supervision, is also highlighted in the ACoP and guidance document.

3. Accident prevention

Where working on top of tankers or tank containers is deemed necessary, the risks to consider will include falls from a height, access and egress, contact with product and exposure to fumes.

To prevent falls from tankers, the following hierarchy of control measures need to be considered:



Note that, whatever control measures are put in place, they have to be accompanied by the necessary training, instruction and supervision to ensure compliance. Repeated training of staff and compliance checks should be maintained when procedures are used to manage tanker top access.

Case study 1:

In order to open the manhole and sample the product prior to unloading, the driver climbed on top of the tank container using the affixed ladder. When descending down the ladder, the driver missed a step and fell to the ground. He required medical surgery due to a shift vertebra and was out of work for two months. Following the root cause investigation, it was found that the incident was due to several failures prior to and during the unloading operation. These included:

- *Adequate infrastructure to enable safe and direct access to the top was not available.*
- *Although the driver had a safety harness there was no safety line available to attach it to.*
- *Sampling is the responsibility of the consignee and should, in principle, be carried out by consignee personnel.*

Solution

The company worked with the relevant customers to ensure the responsibility of all sampling activities are clearly defined within site operation procedures. In addition customer safety instructions were reviewed and communicated with all operating personnel - including drivers.

Key learning

If adequate infrastructure enabling safe and secure access to the top is not available, site procedures should be reviewed as a priority. Companies should work with their customer sites to improve unloading procedures and ensure all risks related to working on top of tankers are managed appropriately.

3.1. Risk assessment

Adequate risk assessment should be carried out to include an evaluation of the hazards when working from heights and the necessary measures to control these. The assessment should be conducted for each individual set of circumstances, in order to determine the most suitable control measures. Some gantries may only be suitable for a limited range of tanks, e.g. road tankers but not tank containers, or tankers with different walkway arrangements – a key element which needs to be considered whilst conducting a risk assessment. It is also reasonable to conclude that a safe system of working should allow the driver to have both hands free when working above ground level.

A flowchart to assist the risk assessment process is shown in Appendix 1. The assessment process should take into account the following factors:

- **Height of the working position**
- **Frequency of access**
- **Nature of the task**
- **Equipment to be handled**
- **Personal Protective Equipment to be worn**
- **Location and exposure to weather conditions**
- **Level of supervision**
- **Operating procedures**
- **Maintenance procedures**
- **Experience and training of individuals**

3.2. Loading/unloading gantry

If access to the top of tankers is necessary several times a week, risk assessment and the use of the hierarchy controls mentioned

earlier would normally lead to the provision of a safe access permanent gantry or a platform. A means of access must be provided using

steps at a safe angle with a non-slip surface and handrails. The gantry platform should be fitted with handrails and should have adequate headroom to prevent overhead obstruction. Various designs of hand railed enclosures can be used on gantries, such as:

- Access via mechanically adjustable steps from a fixed platform on to a suitable catwalk, with fall protection provided by fixed overhead handrails designed to suit the height/length of the tanker.
- Enclosures, which can move up and down hydraulically, sometimes also with a capability for lateral movement (these have the advantage of being able to accommodate a wider range of transport vehicles);

The enclosure should have the following features:

- ✓ The area available should be large enough to give adequate access for the task to be carried out;
- ✓ All equipment that is expected to be used by personnel should be readily accessible;

- ✓ Personnel should not be required to go outside the cage for any part of the operation;
- ✓ Site filling connections should be capable of being easily moved to the tanker connections inside the cage. This means that arms/hoses should either be stored inside the enclosure (with appropriate draining facilities) or they should be capable of manoeuvre without any manual handling issues.

Where a fixed gantry is not reasonably practical, mobile gantries should be considered as an alternative. This may be the case for sites where the top of tankers is accessed for limited, specific purposes only and therefore no permanent fall prevention measures exist. Mobile gantries should be surrounded by secure fencing and remain stable despite any forces exerted during any tanker top activities. Adequate room to move such a device and level grounding are prerequisites for such an arrangement.

Case study 2:

A tanker loading bay was installed with a gantry to provide safe tanker-top access. However, upon review it was found that the gap between the gantry and some tanker tops was too large, increasing the risk of falls. This was due to the bay being used by road tankers as well as demountable tank containers, as well as the haulage being arranged on a supplier delivery and customer-collect basis. This resulted in a wide range of tanker heights accessing the bay. The gantry had a fixed height pivot, so when the platform was lowered onto the tanker top, this resulted in an unacceptable gap when the tanker height was outside the design range – either too low or too high.

Solution

A quick fix was to install a fall-arrest system on a scaffold structure. This was a substantial scaffold structure entailing significant cost. The operations team worked with the supply chain organisation to insist on tankers being provided which met the height constraints of the gantry. There was significant resistance, especially from the customers arranging their own haulage on a customer-collect basis, but this was achieved.

Key learning

Involve the whole supply chain to prevent the need for tanker-top access, or to ensure that it can be done safely. Although imposing height restrictions on tankers may present difficulties and costs for the supply chain, this will often be outweighed by the benefits gained at the loading bay with reduced costs and risks.

3.3.Tanker design

Where appropriate gantry access is not available, suitable equipment should be provided on the tanker. Road tankers are capable of providing their own means of safe access. However the wide variety of tank designs may result in the need to consider alternative tank top working standards and procedures to those mentioned in this section. Where appropriate and where risk assessments can clearly demonstrate that

equivalent or better level of protection is offered, these alternative standards and procedures should be employed.

Ladders

The access ladder should be placed on the end or on the rear side of the tank and situated to provide the most convenient access to relevant parts of the tank top whilst minimising the use of walkways.

Ladders – design features

- ✓ *Rungs should be equally spaced, not more than 300 mm apart, with the bottom foothold not more than 550 mm from the ground and placed so as to provide easy and safe access from the ground.*
- ✓ *Circular rungs should be at least 20 mm in diameter.*
- ✓ *Ladders should be fixed so that there is at least 130 mm clearance between the rungs and the tank casing, thus providing adequate toe space. Ladders should be vertical, or where possible, slope inwards towards the top.*
- ✓ *Where practicable the lowest few rungs should be on a fold down interconnected so that it raises the top handrails when the rungs are folded down to gain access to the top of the tanker.*
- ✓ *The handholds at the top of the tanker ladder should allow safe use when getting on to and off the truck-top platform. If there are no adequate hand-holds above the walkway, the stiles of the ladder should be extended at least 250 mm above the top rung of the level of the walkway.*
- ✓ *The design of the ladder, handrails and supports should be such as to prevent a person's hand being caught.*

Walkways

All walkways should be of a non-slip surface providing the best possible grip in all conditions.

Tankers fitted with a walkway or a fitted platform at or near the top of the tank should be in a single plane with no preventable tripping hazards. They should be at least 900 mm wide if all round access is required, or at least 600 mm wide if one side working is specified.

Tankers fitted with walkways on the side of the tank below top level (normally at half-height or just above) should allow fittings on

the top of the tanker to be reached with ease and without the need to go on top of the tanker. Such walkways should be at least 350 mm wide with a grab rail fitted to the tank barrel. The overall width of the tanker must however stay within legal limits.

Collapsible handrails

Where the tanker is fitted with a walkway there should be fencing on all sides and ends of the platform except at the access ladder.

For tankers fitted with a walkway on the side of the tank below top level (normally at half-height or just above), there should be handrails along the outer side edge. A gap is

allowed at the access ladder location, however if this is along the side of the tanker, this too should have fall protection, such as a gate. The top of the fencing should be at least 1100 mm above the walkway and should consist of a suitable top rail and intermediate rail. Single guard rails are not acceptable.

Consideration should be given to the compatibility of handrails with the overhead structures, which may prevent raising the rails to the appropriate height or may result in damage if the rails are not lowered before the tanker is moved.

Case study 3:

A driver climbed the ladder to raise the handrail. However as the handrail cable was snagged under one of the retaining bolts, the driver was unable to raise the handrail. The driver continued to climb on top of the tank to pull the handrail free. The handrail did not rise, instead sprung back and pulled the driver over from the top of the tank. The driver landed on his back next to the road tanker. He sustained a fractured vertebra and chipped shoulder bone.

Solution

The company engaged with hauliers and drivers to reinforce the importance of safety measures when working on top of tankers. Key messages included:

- *Drivers do not continue with operation until appropriate safety measures are in place.*
- *Report any safety measures which have failed to the site operator so these can be addressed without delay.*
- *If normal safety measures fail, they should be compensated instead of being ignored.*

Key learning

Ensure safety measures are adhered to by all employees, including contractors. This could include refresher training or issuing revised safety instructions for site operations. If normal safety measures fail, they need to be addressed and rectified as a priority.

3.4. Additional considerations for tank containers

The hierarchy considerations shown in the flow diagram of Appendix 1 applies when accessing the top of a tank container. However, due to design variations and the difficulties around installing permanent gantries, ladders and handrails, the activity of accessing the top of a tank container can present a higher risk of serious injury. The most common top access arrangement is a ladder running up one end of the tank leading to an F-shaped walkway. BS ISO 1496 specifies requirements and dimensions of walkways and ladders for tank containers. The International Tank Container Organisation (ITCO) revised their protocol in 2010⁸ on preventing falls from tank containers. The protocol agreed with the HSE sets out design criteria and specifications for ISO tank equipment, which is in line with ISO 1496-3. In addition ITCO have agreed with the HSE a three stage implementation plan to minimise the risks when access to the top of a tank container is necessary.

The plan includes:

- All new tank containers requiring access platforms or walkways will be fitted according to the ITCO tank equipment specification⁸ for orders from 2006.
- Tank container operators will ensure that 60% of their fleet operating within Europe that require access platforms or walkways will be retrofitted according to the ITCO tank equipment specification⁸, or the need for top tank access eliminated, by December 2010.
- All tank containers requiring access platforms or walkways will be 100% retrofitted to the ITCO tank equipment specification⁸ by December 2013.

3.5. Fall arrest systems

These systems include the use of a body harness attached to a rail, track or cable via an inertia arresting block and should be securely attached to the overhead structure. Harnesses should be a good fit and checked regularly to ensure they remain in acceptable condition. In particular, nylon webbing is readily attacked by acids with no obvious signs of deterioration. As a consequence any acid contamination should be included as part of normal reporting procedures. In general, harnesses should be provided by the carrier to drivers to ensure they are of a good fit. Nevertheless loading and unloading sites should also have harnesses available as a back-up. Users should be trained in using or wearing a harness.

For operations requiring horizontal movements (e.g. along the catwalk of a

tanker), the harness cable must be clipped to a runway beam, a suspended cable or other appropriate systems covering the length to be protected. The support system should be properly designed and tested. Connecting a harness to an untested anchor can significantly increase the risk when working from height.

Sites should have a rescue plan for situations where the driver or operator falls from the vehicle and is suspended in a safety harness. The plan should include a quick response plan to avoid any potentially hazardous improvised rescue operations. Self lowering fall arrest systems can significantly reduce the risk of suspension trauma as well as support site rescue plan.

Total Restraint Access Module (TRAM)

The TRAM safety system is designed so that the user is firmly attached to the vehicle unit at all times providing a safe means of accessing and working on the top of tankers. The safety system includes a mechanical component that slides along a fixed rail and specially designed safety harness attached by two lanyards. The TRAM system provides a handhold that moves with the operator (both

vertically and horizontally). TRAM can be employed at loading or unloading gantries as well as on road tankers and tank containers.

In 2005 the Health and Safety Laboratory (HSL) on behalf of the HSE published a report on the *Safety of workers when accessing the top of tank containers*⁹. The TRAM is acknowledged in this report as a means to

prevent or protect a worker from the consequences of a fall off a ladder or from the

top of a tanker.

4. Control measures

Whichever method is chosen for the provision of safe access to the top of road tankers and tank containers, control measures in place should include the following:

- ✓ Good housekeeping standards should be maintained and reinforced by auditing.
- ✓ An adequate maintenance programme for all equipment.
- ✓ Tanker loading and unloading areas are capable of being well lit.
- ✓ Adequate headroom provided.
- ✓ Sound driver training programmes incorporating a high degree of hazard awareness.
- ✓ Site rules that ensure control methods are fully operated and procedures are complied with by visiting drivers.
- ✓ Safety footwear is worn; procedures should be in place to ensure that this is non-slip, and long laces should be avoided.

Case study 4:

An operator mounted on top of a road tank container to open the man lid. Due to the speed in which the operation was carried out no alternative methods were used to depressurise the tank. As a consequence the man lid suddenly opened resulting in the operator being thrown off the container. The operator died of his injuries.

Solution

Often the forces present on a man lid from a tank which has not been depressurised are underestimated. Standard operation instructions for pressurised tanks were revised to highlight the forces present on a man lid from the range of tanks visiting the site. These were also communicated with others involved in the supply chain (customer site, hauliers and distributors).

Key learning

Extra precautions should be considered when working on top of pressurised tanks. Forces are often underestimated and the work should not be carried out based on previous experience or advice from other operators. In general, operators should not kneel or stand on man lids. In addition they should not stand in front or behind but try to stand beside it. Opening man lid bolts in a circular sequence should be avoided as this can result in the man lid being opened suddenly. Bolts should be opened across but left in their upright position so they can continue to hold their securing function. The final bolt should be loosened with extra precaution so any remaining pressure can be detected. Always use a (torque) wrench for (un)tightening bolts. Ensure instructions are prepared and delivered to operators even for standard operations

5. Reporting procedure

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)¹⁰ requires the employer to report any deaths or injuries caused whilst working from height. Regulation 7 of RIDDOR requires employers to maintain records of reported deaths and injuries. Employers should collect data on all incidents and near misses whilst

accessing or working on top of tankers. The information obtained will help identify areas, which require attention and consequently develop strategies to prevent further incidents occurring. The CIA has developed a standardised template¹¹ on site entry instructions, providing a means of communicating basic instructions to drivers

whilst working on site. The template also allows for contractors accessing and working on top of tankers to report basic information on near misses or hazardous occurrences which may have occurred during the (un)loading operation. The reporting of near misses and hazardous occurrences should be encouraged with a view to improve safety

standards of the overall operations. Cefic have also developed a site (un) loading information document (SULID)¹² for bulk liquids and solids. Part of this document allows consigners, consignees and logistic service providers to exchange technical safety information on accessing and working on top of chemical tankers prior to the operation taking place.

Case study 5:

On occasions drivers were climbing outside the gantry to access other areas of the tanker top. This was due to drivers leaving additional man lids open in order to cool and vent the tanker after leaving a cleaning station. Once on the loading bay, these man lids could not be accessed from within the gantry, so drivers were climbing outside the safe area.

Solution

The hauliers were instructed that they must arrive on site ready to load, with all man lids closed. It was found that the drivers arriving with man lids open were just doing this as a short-cut to save time at the cleaning station – rather than wait for the tanker to be cooled on the cleaning station, they opened the man lids and drove to the loading bay. Initially, some drivers continued to leave the man lids open and stopped off-site to close them, so it was necessary to work with the hauliers to prevent this.

Key learning

Do not impose site rules without working with drivers and hauliers – the problem may just move off-site.

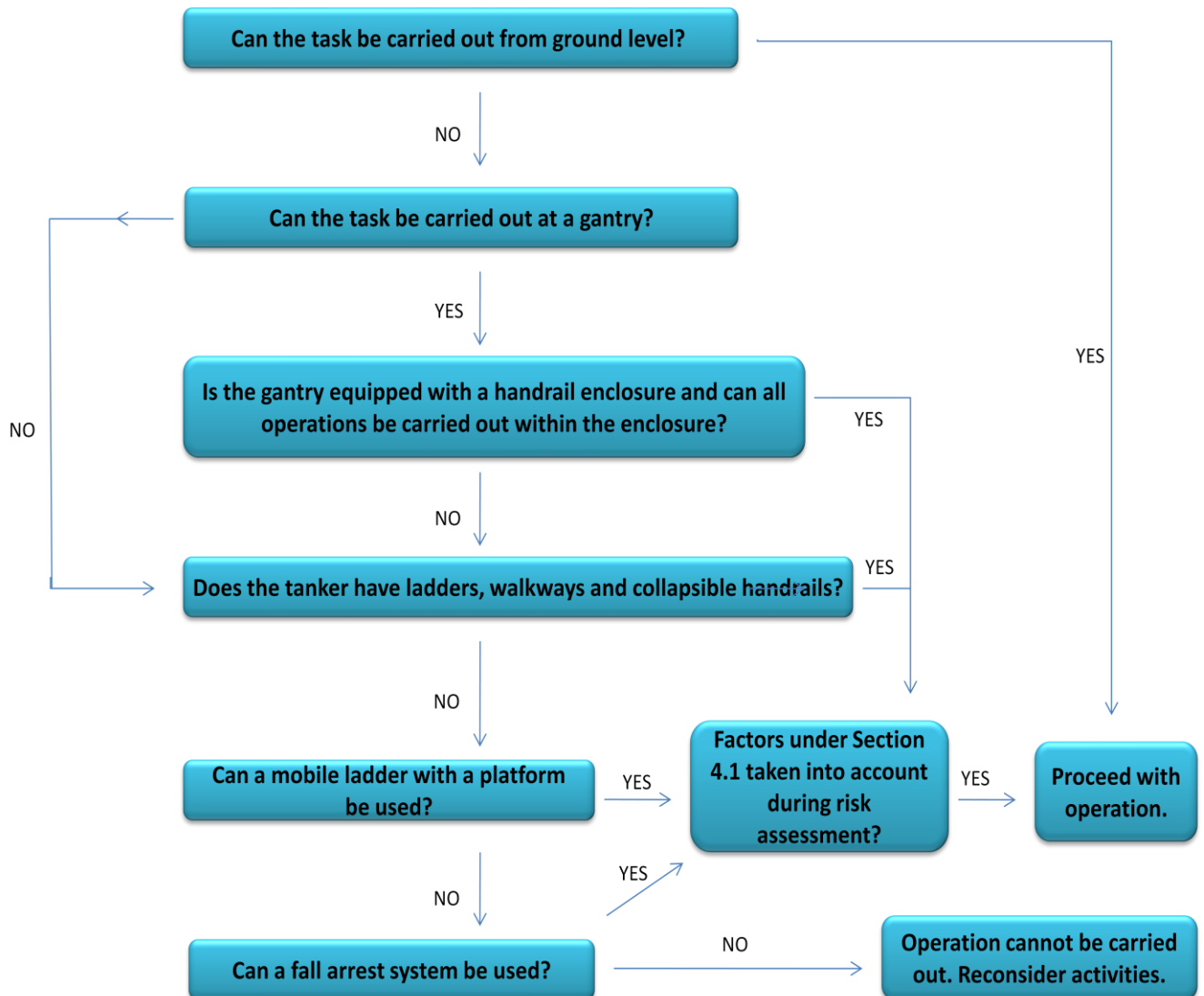
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- CBA/CIA Guidance for the sampling of road tankers, UN portable tanks and containers 2005
Available from CBA/CIA offices

Appendix 1 – Risk assessment flow diagram – Preventing falls from tankers





CHEMICAL INDUSTRIES
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Chemical Industries Association
Kings Buildings, Smith Square,
London SW1P 3JJ
www.cia.org.uk