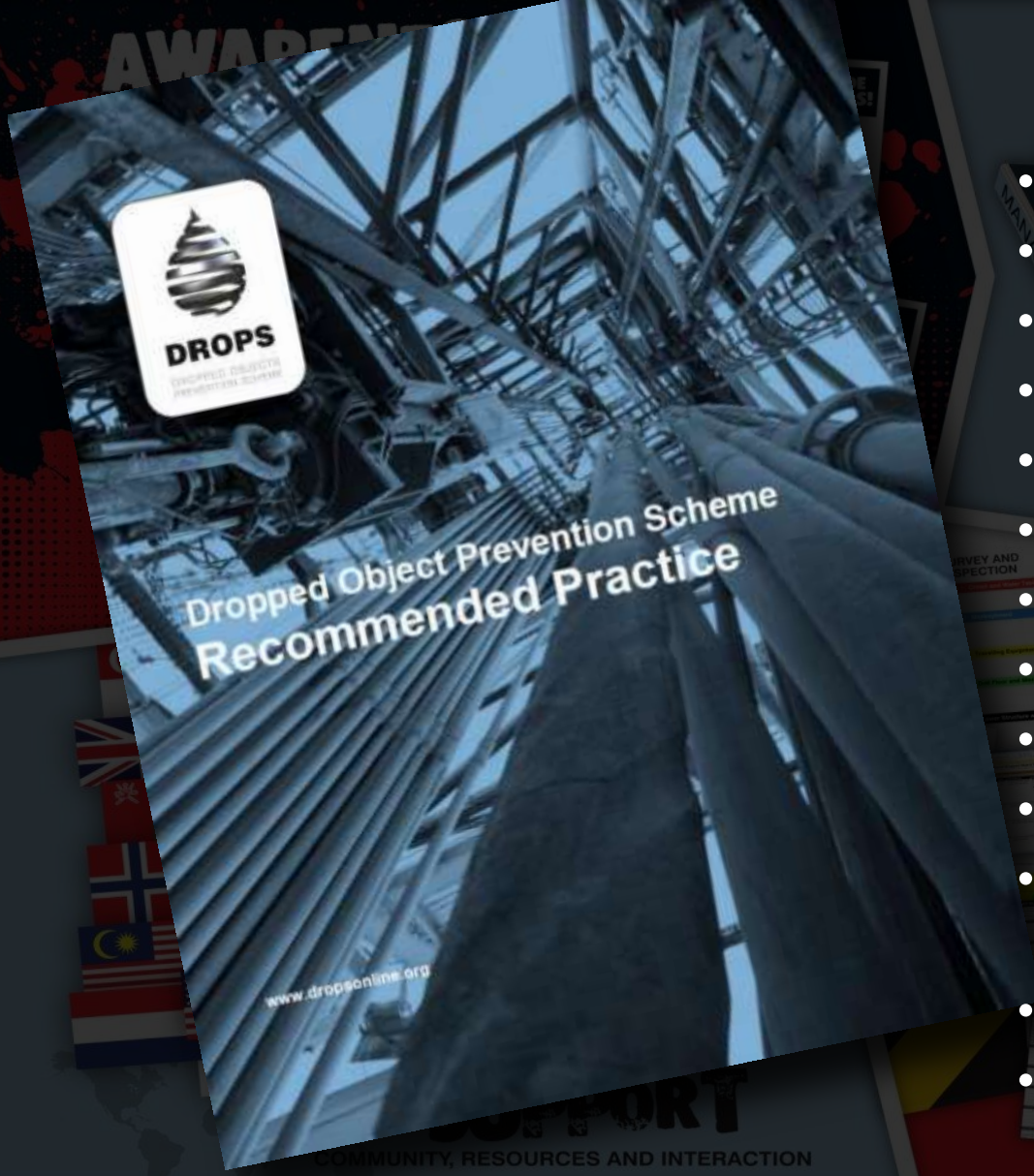

DROPS
DROPPED OBJECTS PREVENTION SCHEME

- **Eliminate injury to people and damage sustained to equipment due to dropped objects throughout the full supply chain;**
- **Ultimately to deliver a ‘second-nature’ dropped objects prevention strategy.**

- **BEST PRACTICE** ☑
- **RECOMMENDATIONS** ☑
- **GUIDANCE** ☑
- **COMMITMENT** ☑
- **POLICIES** ☑
- **RESOURCES** ☑

COMMON DROPS OBECTIVES

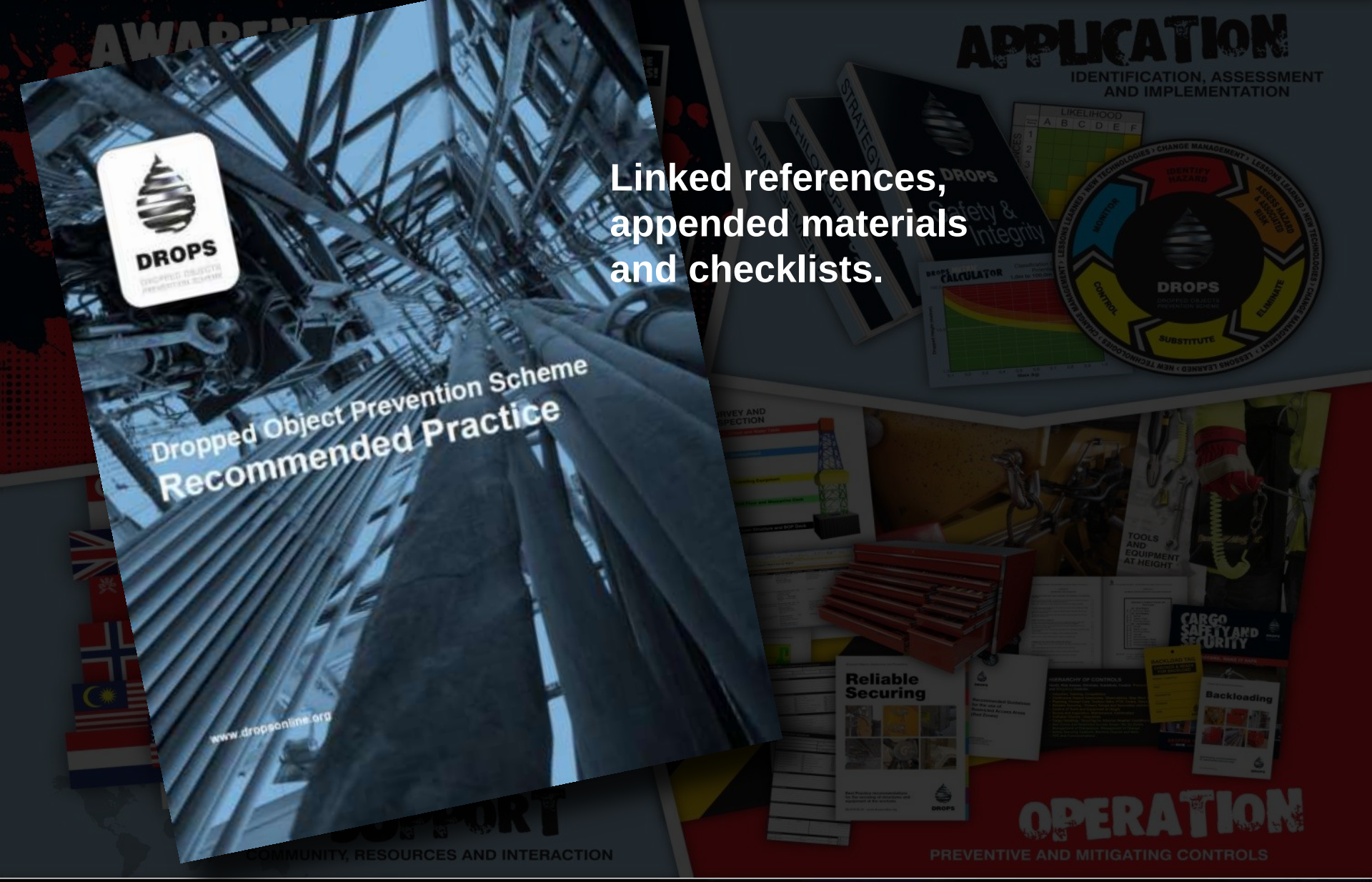


- DEFINITIONS
- RISK ASSESSMENTS
- CALCULATOR
- CONTROLS
- ROLES
- SMS BRIDGING
- ZONE MANAGEMENT
- MONITORING
- TRAINING
- SURVEY & INSPECTION
- WORKSITE HAZARD MANAGEMENT
- REPORTING
- GAP ASSESSMENT

COMMON APPROACH

- Sets out the minimum recommended practices that support the development of dropped object prevention policy and procedure for Company SMSs.
- It is not the finalised requirements of a Company Drops Scheme.
- Application is risk-based, additional guidance is included (or made reference to) and principles are applicable to all industries.

COMMON APPROACH



COMMON RESOURCE

www.dropsonline.org

COMMON RESOURCE

WHAT'S NEW?

- **Standardised DROPS Definitions**
- **Removal of Brand Names**
- **Revised Bolting Section**
- **Risk Assessment reflects RP**
- **Worksite Best Practice** (minor amends, focus on tools)
- **New Hoisting and Lifting Sections**
- **Industry Specialist Review**
- **Refined 'Recommended Practice'**

CONSOLIDATED GUIDANCE

Introduction

This document is intended to help eliminate the risk of dropped objects. It embraces the requirement for worksite hazard management and illustrates best practice recommendations for Reliable Securing.

The content applies to all personnel, tools, equipment and structures associated with design, supply, transportation, installation, maintenance, operation and dismantlement activities across industry.

Reliable Securing is an independent publication developed in close collaboration with equipment suppliers and users. It's purpose is to disseminate knowledge and best practice.

In many cases, the recommendations presented in this handbook will identify opportunities for improvement.

Whilst it may be impracticable to adhere to all the recommendations, the content sets a standard we should aspire to.

Should you choose to adopt Reliable Securing best practice, the onus is on you to effectively manage any subsequent changes to existing equipment, systems and working practices.

The recommendations presented in this document do not affect, replace, or supersede any applicable industry Codes, Standards, Type Approvals or OEM Recommendations.

Please be advised:

- ***Any modifications made to equipment, tools, structure or working methods - even if they provide a safer solution – will be subject to Management of Change.***
- ***Always identify Original Equipment Manufacturer (OEM) recommendations with regard to securing.*** *(In many cases, appropriate retention methods may already be integrated or are available on request.)*
- ***Always identify all associated ownership, maintenance, inspection and certification of equipment, tools and structures.***
- ***Always confirm that you have the authority, knowledge, experience and skills to proceed before applying any of the tools or techniques presented in this document.***

What is Reliable Securing?

In simple terms, Reliable Securing is the appropriate selection, application and management of all fastenings and fixings. To achieve and assure the required levels of performance, these should be designed accurately, installed properly and maintained consistently.

Reliable Securing provides a safeguard against potential yielding, displacement or failure of fastenings which can lead to equipment or structure falling.

This revised edition of DROPS Reliable Securing demonstrates dependable retention methods and technologies.

Reliable Securing reduces the Probability of dropped objects through good design, planning, inspection and application of preventive controls and barriers.

Reliable Securing reduces the Consequences of dropped objects through implementation of appropriate safety securing systems, mitigating practices and processes.

Reliable Securing outlines the key factors that contribute to dropped objects and identifies opportunities to improve hazard identification and risk assessment processes.

RELIABLE SECURING DEFINITIONS

Primary Fixing

The primary method by which an item is installed, mounted and secured to prevent the item falling, *(eg bolted connections, screws, pins, buckles, clips, welds etc.)*

Secondary Retention

The engineered method for securing the primary fixing to prevent loss of clamping force or displacement of fastening components, *(eg locking washers, locking wire, split pins / cotter pins, etc.)*

Also referred to as Second Barrier or Fail Safe feature in some engineering descriptions.

Note: Double Lock-nutting or Dual Nutting is NOT recommended as a reliable method for retaining loads in tensioned bolting.

Safety Securing

An additional mechanism for securing the item to the main structure, suitably selected to restrain the item or its components from falling should the primary fixing fail, *(eg rated steel or synthetic nets, lanyards, baskets, wires, slings, chains etc.)*

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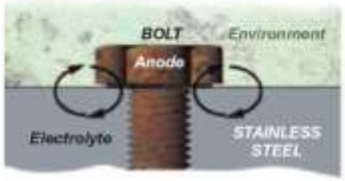
Galvanic Corrosion

As a basic rule, only metal of the same or almost the same nobility should be combined in a corrosive environment.

Galvanic corrosion occurs when two dissimilar metals with different voltage potentials are in contact with each other in the presence of an electrolyte (damp film or seawater / fresh water). **When this happens, the less noble metal becomes the anode and the more noble metal the cathode.**

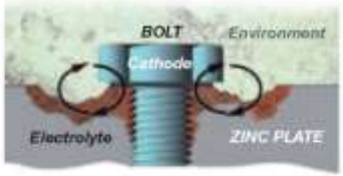
For example, if a steel bolt is fixed into a stainless steel plate, the bolt will become the **anode** since stainless steel is the nobler metal.

The bolt will rust rapidly as the difference in potential is greater.



If the same steel bolt is fixed into, or is in contact with a less noble material, eg a zinc plate or washer, the bolt will become the **cathode** and will not rust.

The zinc will corrode, as it is less noble than the screw.



Always consider the potential for galvanic corrosion where new materials such as passivated stainless steel are introduced.

Certain working environments apply strict controls and guidance with regard to the introduction of alloys. Always check first.

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Reliable Securing of Tension Joints

Here we illustrate secondary retention for tensioned bolted connections, eg nuts and bolts tightened with a suitable tool to the appropriate design load, typically used for the securing of mechanical and structural joints.

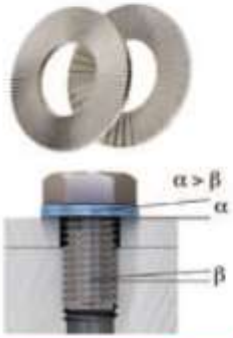
The following methods are recommended for mechanical and structural connections where maintaining the **clamping force is critical.**

WEDGE LOCK WASHERS

Wedge Lock washers safely secure bolted joints against loosening caused by simple flexing, vibration and shock loading.

Wedge locking technology secures bolted joints with tension instead of friction, allowing lubrication to aid assembly and maintenance. The system comprises of a pair of lock washers that have cams on the inner face and radial teeth on the outer face.

Almost unlimited use in bolted joints where reliable securing or secondary retention is required.



Surface material compositions may influence washer selection. Always refer to OEM data sheets to verify application requirements.

THREAD PROFILE LOCKING

The nut has a specially designed threaded profile that locks when tightened and distributes the tension over the whole length of the thread. This provides better load distribution, which in turn helps to improve the locking of the screw connection. Also available as a thread insert.

Almost unlimited use in bolted joints where reliable securing or secondary retention is required.

EXPANDING PIVOT PIN

The system consists of an assembly that includes an axle (tapered at both ends), expansion sleeves, tension washers and fasteners. When the fasteners are torqued, the tension washers push the expansion sleeves up the tapered part of the pin, thereby locking the system into the lug ears and eliminating movement that causes pivot wear.

The double-sided locking mechanism provides increased stability, security and a backlash-free joint. Installation can be easily done in the field, reducing downtime and cost.

Used on top drives, pipe rack cranes and other pipe-handling equipment.

MULTI-BOLT TENSIONERS

Available as nuts or bolts as replacements for conventional bolting elements. They only require hand tools for installation and removal, eliminating requirements for hydraulic tightening equipment. Their design makes them resistant to loosening caused by dynamic loading.

Particularly useful for larger fasteners and where tightening is difficult at height and in restricted spaces.

To identify and establish the suitability of each bolting method, always consult with the manufacturer, plant owner or operator. For further guidance, consult relevant design and industry codes or standards, or discuss the issue with a Subject Matter Expert.

CONSOLIDATED GUIDANCE

Reliable Securing of Other Bolted Connections

Here we illustrate secondary retention for bolted connections typically used for securing of equipment components and other ancillary items.

The following methods are recommended for bolted connections where maintaining the **clamping force is incidental and non-critical.**

NYLON INSERT NUT

This nut includes a nylon collar insert. The collar deforms elastically as it is applied to the bolt. This increases friction between both sets of threads creating the required purchase for the connection.

A versatile fastening for ***non-critical*** connections.

Re-use is not advised. May rotate and loosen when exposed to dynamic loading or excessive UV radiation. !

METAL LOCKING NUT

Metal locking nuts may be used on all bolt dimensions. This type of nut comes in various forms and may feature a deformed head, split neck or toothed collar ring.

Purchase is created by friction, cutting into the thread or contact face. Friction grip relies upon high pre-load and correct torque.

A versatile fastening for ***non-critical*** connections.

Lubricating the threads without adjusting torque specifications may lead to over-tensioning of the fastener. !

CASTLE NUT AND SPLIT PIN

Castellated nuts provide a visual and reliable method for locking bolted connections.

The nut has radial slots and is locked by a non-corrosive split pins inserted through a hole in the bolt shank to prevent movement.

Used on connections where clamping force is not required (eg the bolt operates as a hinge) and where components are disconnected frequently.

May also be referred to as Slotted or Crown nuts.

These arrangements are only suitable for bolted connections exposed to shear forces. !

SELF LOCKING COUNTER NUT

These nuts cut into the bolt threads when applied and tightened, and should only be applied over the standard nut once it has been correctly installed and tensioned.

Not suitable for re-use. Low-grade counter nuts may corrode in marine environments. !

WASHERS

There are various washer types and assemblies available, some with specific applications and some that are shown to be ineffective in preventing nut loosening.

It is imperative that OEM and Subject Matter Expert or Duty Holder guidance is sought on the suitability of washer type / assembly for the specific application.

ADHESIVES

Thread locking compounds are primarily used where vibration is moderate and the environment is mild / non-corrosive.

In selecting this method, be aware that there may be no visible evidence of its application.

Always ensure that any locking compound is clearly specified on assembly drawings, on Bill of Materials and documented in maintenance and operations procedures.

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Safety Securing Devices (Wires, Connectors, Lanyards)

Wherever possible, equipment installed at height should have integrated secondary retention (eg locking washers, lock wire, split pins etc).

Where this is not possible, or where such equipment is exposed to a risk of becoming disengaged, the equipment should have **safety securing in the form of wires or chains and connectors** that are securely attached to a sound body or structure.

BEST PRACTICE RECOMMENDATIONS:

- It is important that the selection and rating of any safety securing device considers the weight of the item to be retained, potential shock load / break load and swing
- The length of the safety securing device should be as short as possible to minimise the buildup of dynamic fall energy and minimise the risk of snagging on other moving equipment
- Purchase/manufacturing/installation and inspection of safety securing devices should be documented. *(eg. batch marking, manufacturer/ importer, production year, installation date, and information about the minimum breaking load)*
- Only use acid-proof securing wire (AISI 316, type 7x19 IWRC)
- All connectors/snap hooks/ carabiners should be made of acid proof steel (AISI 316), with screw lock or self-lock gates and include captive eyes
- Shackles for use with securing devices should have nuts and correctly installed split pins
- Chain should be made of acid-proof (AISI 316) or galvanised steel
- Qualification and verification of materials used in ferrule crimping should be established, in accordance with Steel Wire Termination industry safety guidance
- Onsite crimping is not recommended
- Ensure devices are suitable for the operation and the environment, with due regard to potential galvanic corrosion.

Always check design ratings of electrical equipment before installing securing devices as integrity may be compromised.

Never re-use securing wires, connectors or chains that have sustained shock loading.

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Tool Cabinets for Work at Height

Tool cabinets for work at height are now readily available and employed on many facilities. The appropriate recording, securing and control of tools used at height can help to eliminate unnecessary dropped objects at the worksite.

BEST PRACTICE RECOMMENDATIONS:

- All tools should be appropriate for use at height and they should have documented attachment points
- All tools should be adequately secured within the cabinets
- In addition to the necessary tools, cabinets should be equipped with:
  - a sufficient number of correctly dimensioned safety wires / lanyards
  - a sufficient number of connectors / snap hooks / carabiner hooks with screw lock and eyelet
  - special belts for fastening tools and bag
  - a sufficient number of tool bags with internal fastening devices
- Each cabinet should have an inventory list of certified and traceable contents and be kept locked, and one person should be designated as responsible for the cabinet
- The responsible person should register all tools taken from and returned to the cabinet, with the authority of the Area Lead.
- The contents of the cabinet and the register of tools in use should be checked at the end of every shift.

TYPICAL TOOLS ALOFT REGISTER

CHECK TOOLS OUT					VERIFY TOOLS RETURNED				
Date	Description of Tools / Equip.	Name	Authorised (Area Lead)	Time	Date	Description of Tools / Equip.	Name	Authorised (Area Lead)	Time

CONSOLIDATED GUIDANCE

Sheaves and Snatch Blocks

The DROPS Reliable Securing Focus Group has, through co-operation within the industry and equipment manufacturers considered best practice methodologies for installation and use of permanent and temporary blocks at height.

This collaboration and study has focused principally on the secondary retention of sheave and snatch block fastenings, and the importance of informed risk assessment to identify requirements for the addition of safety securing wires or slings.

BEST PRACTICE RECOMMENDATIONS:

- Blocks should have two integrated barriers in both the head fitting and the shaft ie primary fixing (forged, machined, threaded) and secondary retention (split pin, lock wire)
- Side plates should contain / enclose / capture the sheave should a centre pin failure occur, and catch the line in the event that it jumps the sheave
- Only 4-Part shackles (bow, pin, nut and split pin) should be used for the suspension of sheave blocks
- All blocks and suspension shackles should be marked with ID number and load rating
- All detachable caps, guards and covers should incorporate secondary retention, or safety securing where no secondary retention is possible
- A documented maintenance programme should be established. It is a requirement that blocks, shackles and lifting lugs should be inspected at least every twelve months by a competent person
- Blocks should be dismantled at the request of the competent person or in accordance with the manufacturer's recommendations, and at least every five years.

Always refer to Company Rigging and Lifting guidance and Manufacturer's recommendations for installation, operation, inspection and maintenance.

Primary Fixing and Secondary Retention is the principle consideration in ensuring the integrity of sheave and snatch block retention at height.

In conjunction with competent use and frequent inspection, maintenance and certification, dropped objects can be prevented.

Safety securing is a mitigating measure and should be installed in specific response to an assessed risk.

Typically, the purpose of additional safety securing is to arrest the fall of the block during installations / transitions, particularly when secondary retention devices are removed.

It is important that the selection and rating of safety securing considers the block weight, shock load (fall energy) and swing.

Establishing safety securing measures for a potential suspension failure of a block under load is not realistically practicable, due to the significant forces involved. **It is therefore imperative that all rigging, hoisting and lifting procedures are rigorously observed.**

Block with Safety Securing device

It is not practicable to install safety securing devices to arrest the fall of a block arrangement caused by operational overloading or catastrophic damage.

BEST PRACTICE RECOMMENDATIONS (Safety Securing)

- Safety securing slings should be secured to an independent anchor point from the block
- Safety securing slings, fittings and anchor points should be certified and clearly display the WLL
- Safety securing slings should be as short as possible to minimise shock loading and should not interfere with the performance, operation, movement or maintenance of the block
- Only 4-Part shackles (bow, pin, nut and split pin) should be used to attach the safety securing sling
- Safety securing slings should be subject to routine inspection and certification.

CONSOLIDATED GUIDANCE

Chain Hoists

Chain is a durable and flexible product and is used across a range of industrial hoisting equipment.

It does not kink or curl and has good shock absorbing properties. It is heavier to move and install so is often used in relatively short length in lifting assemblies.

BEST PRACTICE RECOMMENDATIONS:

- Hoists should only be selected, used and maintained by a competent person knowledgeable in the applications and environment where it is used
- Hoists should only be attached to beams / rails or anchor points that are certified for the WLL of the hoist and the weight of the hoist assembly
- All rail / beam systems should have end stops installed at all times, of sufficient strength and size to preclude any hoist assembly running off the ends
- Permanently installed hoists should be included in the DROPS Register detailing all components, fasteners, secondary retention features and safety securing devices (if fitted)
- Chain hoists should not be used for prolonged suspensions without approval from the appropriate authority
- Inspection and maintenance of chain hoists should be in accordance with manufacturer's recommendations and regulatory requirements
- Chain buckets, chain and chain block pockets should be protected from contamination by potentially harmful or corrosive materials
- Chain bucket assemblies should be inspected frequently to ensure all fastenings are secure
- Chains should be lubricated in accordance with manufacturers' instructions particularly when used in a corrosive environment.

Manual chain hoist

Electric trolley beam chain hoist

BOP chain hoist

Steel chain should be removed from service if conditions such as the following are present:

- Cracks, breaks, excessive wear, nicks or gouges
- Stretched, bent, twisted or deformed chain links or components
- Evidence of heat damage or weld spatter
- Excessive pitting or corrosion
- Lack of ability of chain or components to hinge (articulate) freely
- Any other conditions that cause doubt as to the continued integrity of the chain or its operation.

Generally if a chain is 3% longer than when new, it will have exceeded the OEM recommendations for use and should be removed from service.

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Valve Wheels and Handles

Many cases have been discovered where valve wheels and valve handles for manual stop valves are not adequately secured.

BEST PRACTICE RECOMMENDATIONS:

- Valve wheels and handle securing should have integrated secondary retention (eg. split pin)
- Where possible, nuts and split pins should be used in the valve stem on stationary valve handles and wheels. On large handles and wheels, bolts and locking nuts should be used instead of split pins
- When mobile handles and wheels are used, they should be secured by a bolt, or locked by a split pin, through the valve stem
- During storage, handles and wheels should be adequately secured against falling
- If Seeger rings (circlips) are used for locking / securing, frequent inspections should be made to check for corrosion and / or mechanical damage
- Inlet / outlet connection end caps or plugs should be attached by a suitable safety securing device (see page 18).

Where there is a potential for handles or components to loosen and inadvertently disengage, suitable safety securing should be applied (see page 18 for guidance).

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AVAILABLE NOW

- **FREE to download** (PDF)
- **Issued with all DROPS Campaign Pack updates** (2018)
- **Preview copies in circulation**
- **A6 Printed Copies in stock**
- **Bulk purchase options**
- **Member Only ‘branded version’ options**
- **Translations in hand.**

Thank You to the Workgroup!

SPIRIT OF COLLABORATION

WHERE CAN **DROPS** INFLUENCE OTHERS?

- Design, Manufacture, Installation, Operations, Inspection, Repair, Maintenance, Decommissioning
- Fixed and Mobile Structural Components, Machinery, Ancillaries
- Lifting Activities, Plans, Procedures, Inspections of Loads
- Risk Assessment (causal factors)
- Tools and Equipment at Height, Storage at Height
- Service and Supply Chain…
- DROPS Best Practice = Consensus of END USERS
- **WE ALL SHARE COMMON OBJECTIVES**

DROPPED OBJECTS

STILL HARMING
STILL KILLING

Thank You

DROPS

DROPPED OBJECTS PREVENTION SCHEME

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