**Safe Work Requirement**

Drops Standard

Contents

[1. INTRODUCTION & BACKGROUND 1](#_Toc53772410)

[**1.1** **OVERVIEW** 1](#_Toc53772411)

[**1.2** **SCOPE** 1](#_Toc53772412)

[**1.3** **UNDERSTANDING DROPPED OBJECTS** 1](#_Toc53772413)

[**1.4** **ROLES AND RESPONSIBILITIES** 4](#_Toc53772414)

[2. PLANNING AND RISK MANAGEMENT 6](#_Toc53772415)

[**2.1** **DROPPED OBJECTS PREVENTION STANDARD REQUIREMENTS** 6](#_Toc53772417)

[**2.2** **WORKING AT HEIGHT** 10](#_Toc53772418)

[**2.3** **DESIGN, MANUFACTURE, COMMISSION & DECOMMISSION** 13](#_Toc53772419)

[**2.4** **PACKAGING AND TRANSPORT BY ROAD** 16](#_Toc53772420)

[**2.5** **OPERATIONS** 17](#_Toc53772421)

[**2.6** **MAINTENANCE & MODIFICATIONS** 24](#_Toc53772422)

[3. ECDC DROPPED OBJECT PREVENTION PRINCIPLES 27](#_Toc53772423)

[4. ECDC PROHIBITED EQUIPMENT AND PRACTICES 29](#_Toc53772424)

[5. STRICTER REQUIREMENTS 30](#_Toc53772425)

[6. GLOSSARY OF TERMS 30](#_Toc53772426)

[**APPENDIX 1 - DROPS CALCULATOR** 31](#_Toc53772427)

[**APPENDIX 2 - INSPECTON GUIDELINES** 32](#_Toc53772429)

[**APPENDIX 4 - EQUIPMENT GUIDELINES** 38](#_Toc53772430)

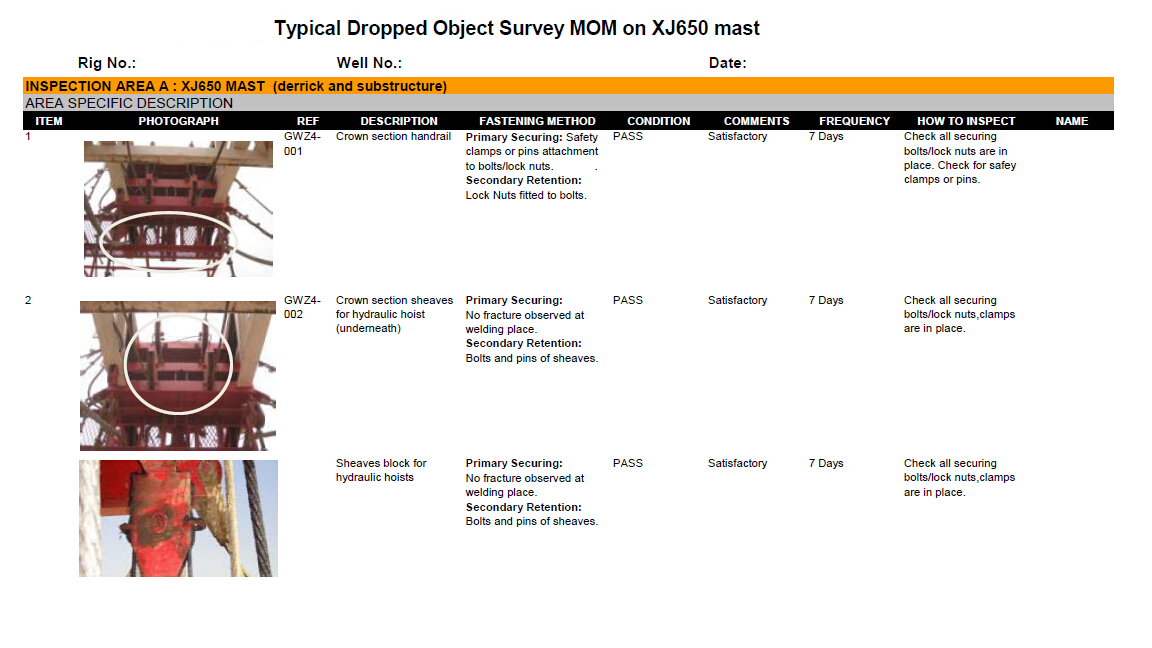
[**APPENDIX 5 - DERRICK TEMPORARY EQUIPMENT REGISTER** 40](#_Toc53772431)

[**APPENDIX 6 - DERRICK TEMPORARY EQUIPMENT CHECKLIST** 42](#_Toc53772432)

[**APPENDIX 8 - NO‑GO AND RED ZONES** 44](#_Toc53772434)

[**APPENDIX 9 - RELIABLE SECURING** 46](#_Toc53772435)

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| INTRODUCTION & BACKGROUND  * 1. **OVERVIEW**   This manual describes the arrangements for the prevention of dropped objects within ECDC operated activities. It specifies the requirements for the prevention of dropped objects and, if they do occur, how to mitigate the consequences. The main body of the manual specifies the mandatory requirements and the appendices provide reference material or guidance on how to comply.   * 1. **SCOPE**   This includes all structures, and equipment used in or on those structures, necessary for drilling, workover and servicing wells, including, but not limited to: rigs, platforms, units, cranes, derricks, masts, lifting baskets, substructures, etc.  This standard pertains to all ECDC operated sites and activities as well as those operated by other 3rd party contractors. ECDC procedures are to be used in preference to those of the contractor. Where this standard is to be used in “parallel” with other standards the one containing the higher set of controls (in conjunction with the relevant national legislation) that reduces the risk of a dropped object to that as low as reasonably practicable (ALARP) must be adopted.  The overall objective of this standard is to ensure that potential dropped objects are managed in an acceptable manner and that all information in relation to their management is (where relevant) reported and recorded, notified to the right people in a timely manner and investigated appropriately.   * 1. **UNDERSTANDING DROPPED OBJECTS**  1. **What is a Dropped Object?**   Dropped objects, derive their capability for damage and harm from the conversion of their potential energy to kinetic energy prior to impact. **Appendix 1** contains a DROPS calculator, which can be used to assess the impact of a dropped object.  For the purpose of focusing prevention and elimination strategies dropped or potential dropped objects are classified as either static or dynamic.  ECDC recognizes a dropped object as any item or object that falls (or has the potential to fall) from its previous position. ECDC also recognizes that the greatest challenges that lie within the prevention of dropped objects relate to behavior, work processes and inadequate securing of equipment and does not accept that dropped objects are an inevitable consequence of operations within their organization.  Dropped Objects investigations historically reveal failures in existing barriers which have been implemented to break or prevent a specified undesirable chain of events. Safety alerts and incident reports have shown the following recurring themes may or have resulted in a potential dropped object:   1. Inadequate Risk Assessment (failure to identify dropped object hazards) 2. Human Factors (operator error, poor behavior, complacency, neglect) 3. Inadequate Procedures (bad planning, no management of change) 4. Failed Fixtures and Fittings (corrosion, vibration, poor design, selection or improper installation) 5. Poor Housekeeping (pre-existing hazards from previous tasks) 6. Collisions and snagging (lifting, travelling equipment, tag lines, service loops) 7. Inadequate Inspection, Repair and Maintenance (ignoring unsafe conditions) 8. Redundant, neglected and home-made tools and equipment (should be eliminated) 9. Inadequately Stored or Secured Tools and Equipment (no lanyards or tethers being used) 10. Environmental Factors (wind, motion, extreme conditions)   ECDC classifies all dropped objects into one of the following two categories:   1. **Static Dropped Object**   Any object that falls from its previous position under its own weight (gravity) without any applied force (for example; failure caused by corrosion, vibration or inadequate securing). A static dropped object is a solid object, initially at rest, that falls from its original position under its own weight. Examples of static dropped objects include nut dislodged in rig derrick, fallen cable tray due to failed (corroded) fastenings.   1. **Dynamic Dropped Object**   Any object that falls from its previous position due to applied force (for example; collisions involving travelling equipment or loads, snagging on machinery or stacked items, motion, helicopter downdraft or severe weather). Examples of dynamic dropped objects include the top drive hitting the rig floor, a stand of drill pipe falling across the derrick and hitting and breaking a light resulting in the light falling to the rig floor.   1. **When can a Dropped Object Occur?**   Dropped Objects continue to account for the majority of actual and potentially fatal incidents in the upstream oil and gas industry. Dropped objects can occur, but are not limited to：   1. Design 2. Manufacture 3. Packaging 4. Transportation 5. Operations 6. Maintenance & repair 7. Energy sources such as gravity, wind, heave and mechanical motion can all contrive to initiate a sequence of events that result in something falling. Add corrosion, lack of awareness and inadequate inspection or maintenance and you can almost guarantee a dropped object will occur.   Statistics show that around 30% of all dropped object incidents are related to design, technical or mechanical issues but almost half can be attributed to human factors.   1. **How have Dropped Objects been managed and prevented successfully?**   In the broadest terms companies aligned with the International DROPS Forum have implemented specific management systems and utilize suitable trained and competent personnel to maintain focus at the highest level and risk as low as reasonably practicable.  A host of factors can contribute to a dropped object incident. It is important to consider these during worksite hazard identification.  For instance it is common and good practice to assign DROPS Focal points who can take ownership of all DROPS related aspects effecting safety performance and related consequences.   * 1. **ROLES AND RESPONSIBILITIES**  1. **The Rig Manager will be responsible for** 2. Ensuring the effective on site implementation of this standard. 3. Establishing arrangements for conducting suitable dropped object inspections and audits. 4. Ensuring that relevant inspections are completed and recorded in a timely manner. 5. Ensuring that all relevant personnel involved in conducting required inspections are trained and competent and that they have completed a suitable Dropped Objects Training program. 6. Communicating inspection findings to the relevant personnel or departments. 7. Encouraging all client, subcontractor or client subcontractor involved within their area of authority to complete the company approved dropped objects awareness training. 8. Verification of inspections and audit findings, and follow through on actions arising and identification and reporting of non-compliances. 9. **The Site DROPS Focal Point will be responsible for** 10. Ensuring that the Dropped Objects Inspection Books are maintained secure and up to date on site at all times and particularly following any change (including but not restricted to Equipment modifications / upgrades / Installation / removal of equipment. 11. The collection of all relevant DROPS information (for example: alerts, best practices, legislation – including amendments) and subsequently communicating this information in a suitable format (including within work instructions if appropriate) to relevant persons within a suitable time frame. 12. Reviewing and reporting upon the standards and competence of the training available and delivered to personnel in order to ensure it is satisfactory and that compliance rates are maintained at a suitable level. 13. **The ECDC RIG HSE SV will be responsible for**   Supervise implementation and check caravan zone drops in site.   1. **The ECDC Crane Operator will be responsible for**   Check crane zone drops and carry on position modification if unsafe condition.   1. **The ECDC Forklift Operator will be responsible for**   Check forklift zone drops and carry on position modification if unsafe condition.   1. **The ECDC HSE Dept. and HSE Manager will be responsible for**   The overall implementation and upkeep of this procedure.   1. **ECDC Personnel will be responsible for**   Completing the “Understanding Dropped Objects” Training program as required.   1. **It is the responsibility of all personnel to**   Report any concerns or fail items to the appropriate site supervisor. PLANNING AND RISK MANAGEMENT  1. 1. **DROPPED OBJECTS PREVENTION STANDARD REQUIREMENTS**   This standard requires that at all stages of operation suitable and sufficient consideration is given by a competent person(s) in regard to the management of the prevention of dropped objects.   1. **Risk Assessment**   This standard requires that all levels of risk assessment define adequate control barriers with regard to preventing dropped objects. The adequacy of the control barriers employed will be decided after consideration has been given to the potential consequences of the identified hazard.  Due consideration shall be given to the Risk Management Procedure which describes the minimum standards for risk assessments that apply to all ECDC activities, occurring on ECDC managed sites or performed by ECDC personnel engaged in work related activities. It ensures consistent and effective management of risks throughout the company and compliance with the Policy and the ECDC Risk Management framework.  Consequences, in terms of dropped objects, should be quantified by the use of the internationally recognized DROPS Calculator. (**See Appendix 1**)  **Figure 2-1: Preventive and Mitigating Barriers (Controls)**  7L_MC5A`4`G}IK8C0%L0H%4  It is a requirement of this standard that, only in the event those preventative barriers are not practicable, should barriers that mitigate be considered.    All such risk assessment processes will consider the Hierarchy of Controls as a way of eliminating, otherwise preventing or mitigating potential dropped objects from the work-scope. (**See Figure 2-2 below**)  YM2]$S1JD`8N~S{XOSLZ2MX  **Figure 2-2: Hierarchy of Controls**   1. **Red Zones**   The implementation of Restricted Access Areas is an effective tool in reducing the potential risk of personnel exposure to dropped objects. This is particularly prevalent (but not restricted to) on and around rig sites.  On any rig, areas where personnel may be exposed to drop object hazards will be classified as DROPS RED ZONES. All personnel in this Zone must be required for the current operation and must be authorized by the Rig Manager.  The Rig Manager must also ensure that all personnel entering any Red Zone are aware of the hazards and ensure an appropriate plan is in place for specific operations.  All personnel working under authority within a Red Zone must have a specific responsibility during the task, understand the placement of personnel, and be aware of machinery which may be operated during the task and identify safe ‘Step Back’ zones during high risk activities such as lifting, jarring or movement of machinery above.  This offers opportunities to consider reducing or even eliminating time spent in the DROPS Red Zone.  DROPS Red Zones are unique to each worksite. Drill Floors, Pipe Lay down and many other areas where there is a high risk for dropped objects may be designated as DROPS Red Zones.  These Zones are highly visible and may include color coded barriers, walkways and floor coverings. (**See Appendix 8**)   1. **Cone of Exposure**   The “bounce effect” which is sometimes referred to as the “Cone of Exposure” is regularly overlooked or underestimated during the hazard identification stages or planning process.  Should a dropped object occur it is very seldom that it will fall entirely vertically without contacting other equipment and even when it impacts the lowest level, it will not usually stop there immediately.  Any risk assessment should define the “Cone of Exposure” and shall include but not be restricted to the following considerations –   1. Potential path that a dropped object may take, 2. Effects of deflection, 3. Weather factors. 4. Load weight and centre of gravity.   06_S]C5SM%WG9YGCQL[96KB  **Figure 2-3: Cone of Exposure**  *NB – It is not always practical to barrier off the entire “Cone of Exposure”*   1. **Incident Reporting and Investigation**   All incidents and unplanned events which are related to that of dropped objects (or the potential for) must be investigated and the findings appropriately communicated in accordance with the most current ECDC Incident Management Procedure.   1. **Lifting Equipment used in DROPS Prevention**   All lifting equipment, accessories and practices utilized in the prevention of dropped objects, including but not restricted to the retention of fixed equipment, shall conform to ECDC Lifting Procedure and also to the ECDC Safety Rules.  For clarity fixed lifting equipment does include pad eyes and as such all pad eyes shall be registered in the maintenance management system and shall have a unique visible identification number or other unique means of identification. The safe working load shall be clearly visible to the user. (In addition, all fixed lifting equipment shall have an original certificate and / or fit-for-purpose documentation).   * 1. **WORKING AT HEIGHT**  1. **Definition**   There are various definitions available for “Work at Height” including the following  ECDC Safety Rules “All personnel, when engaged in work 2 meters (if Client required 1.8m is also defined in its operations) or more above a working surface or where a fall could result in a significant injury; should be protected at all times from falling by guardrail systems, fixed platforms or personal fall arrest systems. Note: Risk of significant injuries may occur from heights less than 2 meters (or 6 feet), as such, appropriate controls and mitigation measures must be in place to manage such risks.  Either of these definitions would mean that standing beside a pit could be just as relevant as working from a stabbing board 50ft above the rig floor.  With regard to the successful management of potential dropped objects while “working at height” the following statement and qualifiers should be considered and are most valid.  Work operations often involve work at height. Many operations therefore contain an element of risk in that   1. Personnel are exposed to work or equipment above them. 2. Personnel below are exposed to the work. 3. Personnel working at height could fall and therefore become a dropped object. 4. **Rescue from Height**   Anyone using personal protective equipment against falls from height must have documented training (including rescue method training). The necessary rescue equipment and trained personnel must always be available at the workplace when work at height is performed.  Supervisors of persons working at elevated positions, and using fall protection, must when carrying out a pre-job planning or risk assessment, develop a rescue plan in the event a worker falls.  Consideration shall be given to the safety of rescue personnel, the means of retrieval of the fallen person, and the method to be used to lower or raise the fallen person, perhaps in an injured condition, to the floor, the deck, or the ground.  The use of cranes, air hoists, or specially provided and rigged equipment should be considered.  Fall arrest equipment must of an approved type, incorporate an anti-trauma safety device and comply with an accepted standard and any personnel anchor point for suspension must be rated to 2270Kg (22kN).  Working at height equipment (for personnel use) should be checked at least every 6 months by a competent person. Thereafter Inertia reels and other fall arrest equipment should be clearly marked within an effective system (color coding) to indicate to the user that they are “in date”.   1. **Working at Height Equipment**   Where it is not practicable or possible to secure all items personnel must consider and employ catchment below the work area using tarpaulins, fire blankets, nets, etc. Otherwise the area shall be barriered off and all personnel removed.   1. **Tools at Height**   The use of Tools at Height must be completed in conjunction with the most recent DROPS guidance available.  Before work starts and when the work is complete; a full check must be carried out to ensure that no loose material or equipment has been left behind.  All tools and portable equipment used at height shall be adequately secured to either the user or the work place (as deemed appropriate by risk assessment).  Tools heavier than 2kg should not be secured to the body but secure to the adjacent worksite structure and lanyards used to secure tools should be in conjunction with the latest DROPS guidance and/ or OEM guidance.  Tools used at height and secured by a lanyard will be done so in a way that does not compromise the tool’s effectiveness and it is prohibited for any tool, securing assembly or lanyard to be altered from the OEM design (unless a suitable and sufficient ECDC approved Management of Change process has been followed and the relevant engineering approval given).  Carrying pouches must always be used for radios and any other portable equipment without certified securing points. Locks on pouches must have a double securing mechanism to prevent unintentional opening. Belt clips that allow equipment to become detached when turned 180º should not be used.  Tools used at height should be kept separate from those which are for general use. These tools should be kept secured within a toolkit and inventoried. The inventory of each tool kit should be kept at the site of the toolkit and be verified by a responsible person at suitable intervals (for example: the beginning and/or end of each shift).  Procedures should be in place to ensure that upon request of a “work at height” tool the responsible key holder should issue the tool and, along with the person intending to use the tool, sign a Tool Issue Register stating (as a minimum) that it has been inspected, is fit for purpose, where it will be used and the time and date it was issued. The Tool Issue Register will also be signed by both parties upon return of the tool.  No personnel may work at height with tools unless they have been deemed competent to do so by their supervisor and the risks involved have been identified (and suitably controlled) as a result of an appropriate risk assessment carried out by a competent person.   1. **Derrick / Mast Access**   Procedures should be in place to ensure that prior to ascending a derrick, mast or other elevated work space dictated as relevant by the DROPS Focal Point, an Access Log must be signed by the Rig Manager (or designee) and the person intending to climb the structure. As a minimum this log should record the following   1. The name and signature of the individual and Rig Manager (or designee), 2. The time and date of ascent, 3. The area intended to be accessed (for example: Crown block) 4. The tools and equipment taken with the work party.   This log must be counter-signed again by both the individual and the Rig Manager (or designee) when the work is completed.   * 1. **DESIGN, MANUFACTURE, COMMISSION & DECOMMISSION**  1. **Design / Manufacture**   Good and proper design criteria reduce the probability of dropped objects. The guidance contained within this section will be applied to any equipment, structure or constructed assembly that will be involved within ECDC operations.  When procuring, manufacturing or fabricating new assets; tools, equipment and integrated barriers along with safety systems must be a primary consideration. This is the fundamental basis for eliminating dropped objects and as such all designers, suppliers and buyers must be aware of this requirement.  Equipment will be designed, manufactured and commissioned in conjunction with all relevant and governing standards; for example, those of the International Organization for Standardization (ISO) and/ or the American Petroleum Institute (API).  During the design phase, appropriate engineering processes will be applied whereby the risk of dropped objects in future operations will be reduced to a level as low as reasonably practicable.  Any engineering processes should include consideration of the relevant functional recommendations documented within the latest DROPS guidance.   1. **Bolted Connections**   Adequate and proper bolted connections are only achieved after consideration is given to   1. Load design, 2. Choice of materials with a view to mechanical properties and corrosion resistance, 3. Where appropriate, use of lubricant 4. Pre-loading (pre-tensioning) and 5. Use of the correct torque equipment.   To prevent nuts and bolts from loosening, a reliable, tested and suitably approved secondary retention method should be used. This is prerequisite where maintaining the clamping force across the bolted connection is critical.  This shall normally require the fitment of lock / indicator wire on stud bolts and split pins and castellated nuts on through bolts. This requirement does not exclude the fitment of other recognized bolting systems (**such as Nordlock**) in conjunction with lock wire or split pin assemblies.  Lock wire should only be applied by competent persons.  Securing devices must be dimensioned in accordance with the equipment supplier’s calculations.  Further information on recognized bolting systems can be found within the DROPS website. http://www.dropsonline.org/ (**See Appendix 9**)   1. **Picture Book based Dropped Object Management Systems**   Picture book based dropped object management systems shall be provided and utilized as a minimum standard for at least the following ECDC site aspects   1. Derrick and Mast structures including travelling equipment therein 2. Substructure BOP Deck 3. Fixed Crane Equipment (A-Frame / Engine Cab and Access level / Boom and Lifting Equipment) 4. Forklift 5. Caravan(CCTV / Satellite / TV Receiver / Antenna )   Other generic areas or equipment sets that should be considered carefully for inclusion in any picture book inventory based Dropped Object Prevention Management System includes   1. Raised Catwalks / Conveyors / Walkways 2. Communications Masts and surrounding elevated areas 3. Fixed third party equipment (Cement units / Snubbing units / Wireline units / CT Units)   Any other areas identified by the DROPS Focal Point rig management team (For example: specific machinery spaces, mud pump room, sack store, engine room, columns, etc.)  Management systems and work instructions therein should be available in English and the predominant local language.  *NB – Picture books should only be developed or finalized once the equipment is in site and has been commissioned.*   * 1. **PACKAGING AND TRANSPORT BY ROAD**   The potential for dropped objects exists during all modes of transportation; ECDC shall seek to ensure that cargos handling best practices are applied through vigilant inspections and adherence to procedures.  ECDC Lifting Procedures shall be followed at all stages of any ECDC related cargo transportation.  **General**  Procedures shall be in place to ensure that checks include the requirement to inspect prior to transportation at least the following for insecure or loose objects in or around the following   1. Forklift Pockets 2. Top of all lifts 3. All horizontal and vertical surfaces within and around the structure of open framed lifts 4. Tanks to ensure that all valve caps are closed and secured 5. Bundles of pipe externally and internally and that protectors are correctly fitted 6. Thread protectors and end caps are securely fastened 7. Contents are properly secured to prevent items escaping during transit 8. Doors and hatches etc.   All equipment and loads shall be inspected prior to transportation, for secure retention or removal of loose objects not intended for transportation to the operations site or return to logistics base.     * 1. **OPERATIONS**   This includes all operations and activities associated with the drilling, work over completion in wells. This shall include the mobilisation and transportation of personnel and equipment to or from the installation or until rig, hoist, mast or equipment comes ‘off-contract’, or, in the case of ECDC equipment, is removed from service.  Throughout the operational phases at all ECDC operated sites and activities (as well as those operated by others whilst on contract to the organization) Dropped Object Surveys and Inspections are a key element of dropped object control and prevention management systems.  Asset personnel will regularly perform dropped object inspections as part of routine maintenance and operational activities. Hazard hunts and area housekeeping audits which include consideration towards dropped object potential may fulfill this requirement.  Large scale Independent Dropped Object Surveys will be undertaken periodically, typically by subcontractor personnel to complement the Asset or sites dropped object prevention strategy. These surveys should provide added assurances that all potential dropped object hazards are identified, assessed and recorded such that control measures and corrective actions can be recommended and implemented within the Asset or sites Management System.  An independent dropped object survey of any rigs shall be performed prior to all rig start-ups and every two years thereafter.  ***Consideration shall be given throughout operational life and any inspection to the potential for dropped objects caused by poor behaviors, inadequate securing, corrosion, vibration, environmental factors and much more besides***.   1. **Independent Dropped Objects Survey**   ECDC requirements for conducting a dropped object survey are as follows  The Common Guidelines for Independent Dropped Object Surveys as stated within the DROPS Forum website should be implemented and followed. The most recent Reliable Securing document should be referred to in conjunction with the prohibited practices detailed in Section 4 of this document.  Subcontractor personnel conducting third party Independent Dropped Objects Surveys / Inspections shall be able to demonstrate suitable competency and clear understanding with regard to ：   1. Reliable Securing Best Practice 2. Safe Bolting Techniques 3. Lifting Operations (including Lifting Equipment) 4. Moving / Dynamic Equipment and Machinery 5. Basic Knowledge of drilling, work over Equipment and Functions (due to the forces induced during operation, anti-collision systems and the following potentials for dropped objects) 6. Awareness of relevant Safety Alerts and Safety (HSE) bulletins issued by equipment suppliers 7. Risk Assessment 8. Hazard Reporting 9. Asset specific DROPS management system 10. DROPS definition (static/dynamic), causes, consequences   The independent dropped object survey shall consider all geographical areas of the site by dividing it into manageable areas The Survey shall identify and record equipment condition considered to “Fail”, including comments (i.e. Satisfactory or Reason for Failure) in and around the required geographical scope.  The survey findings and recommendations shall be integrated or entered into an appropriate maintenance management system; ensuring corrective actions are implemented, monitored and tracked to closure as appropriate.  Any report template resulting from an independent dropped object survey should document or include the following information:   1. Equipment location by Inspection Area 2. Photograph each item surveyed 3. Unique identification number to each item 4. Item description 5. Primary Securing method(s) 6. Secondary Retention method(s) 7. Record of equipment condition particularly, including comments or reason for failure. |



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| **Figure 2-4: Sample Dropped Object Survey Report Template** |
| The independent dropped object survey (or) shall consider the requirement to develop or ensure existence of a suitably effective Dropped object management system.   1. **Dropped Objects Management System**   Particular guidance regards the development and management of suitable Dropped Object Management Systems can be found within the DROPS website Dropped object management systems should be established by independent dropped object surveyor or Specialist Companies and by personnel able to demonstrate suitable competency and clear understanding of the processes involved  In establishing an effective dropped object management system, facilities, structures, sites and locations are typically separated into manageable areas. Within these areas major structures may be separated further to represent levels, equipment areas and modules.  For each area, an inventory shall be prepared detailing and uniquely referencing all equipment that is located, stored, held, mounted, secured or used at height. This inventory forms what is commonly known as the Dropped Object Inspection Book. |
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| **Figure 2-5: Sample Dropped Object Survey Drops Picture Book template** |
| As stated previously, the Inspection Book should be grouped by Inspection Areas. Each section should include the following:   1. Photograph of the equipment to be inspected 2. Equipment tag number 3. Description of specific item to be inspected 4. Primary securing method(s) of item 5. Secondary retention method(s) of item 6. Inspection Procedure (populated from the ‘How to Inspect’ column of the Equipment Family Inspection Criteria) 7. Inspection Frequency (populated from the “Inspection Frequency” column of the Equipment Family Inspection Criteria)   The Dropped Object Inspection Book will be used by site personnel deemed competent to conduct and support periodic inspections  If a fail item has the potential to be an indication of a trend (deemed as so by the DROPS Focal Point) then a sweep inspection of similar items on the site should be undertaken as soon as reasonably practicable.   1. **Dropped Objects Inspections**   A full scheduled internal inspection of the mast shall be carried out **monthly.**  In addition to the scheduled inspections DROPS inspections shall also be carried out whenever the structure or equipment has been subjected to an exceptional force (including post jarring, environmental conditions and those relative to the equipment’s OEM parameters), immediately after an incident of suitable seriousness (deemed by the DROPS Focal Point) or after such time as structural change has taken place for example mast raising.   1. **Other Routine Inspections**   Preventative maintenance procedures shall be assured and maintained up to date for all cranes and other mobile lifting equipment on site. This should include spot hires and short term rental equipment.  The DROPS Focal point should ensure that a suitable inspection is carried out prior to operations commencing with any such equipment for the first time.   1. **DROPS Focal Point**   It shall be the responsibility of the senior ECDC Project manager to ensure that a site specific DROPS Focal Point is appointed at all ECDC sites and activities.  The Site DROPS Focal Point will champion and actively support the implementation of all requirements contained within the ECDC DROPS Prevention Standard, including the provision of such information, instruction, training and supervision as is necessary to ensure compliance with this standard.  The DROPS focal point should   1. become the local Subject Matter Expert and be fully familiar with the content of this standard and contribute to updates to it 2. Actively participate in safety meetings with representatives of ECDC and its contractors, focusing on management and control of DROPS issues. 3. Act as a focal point for rig teams and liaison with the ECDC HSE Superintendent, providing support for resolving issues (e.g. secondary retention, derrick surveys, etc.). 4. Support, facilitate or carry out DROPS risk assessments. 5. Participate in installation audits to check the effectiveness of DROPS inspections and DROPS hazard identification. 6. Lead in-house training or awareness program covering DROPS issues and risks. 7. Participate in significant DROPS incident investigations.   Participate in Incident Review Panels for DROPS incidents.   1. **DROPS Training**   All personnel involved in activities at any ECDC operated site or engaged in any ECDC influenced activity whereby there is a risk of a potential dropped object must be made aware of the arrangements in place in relation to the prevention of dropped objects in a timely manner.  Personnel must have had their specific responsibilities in concern to the prevention of dropped objects communicated to them before they are permitted to be involved in any operation.  A dedicated Dropped Object Awareness Training program shall be provided to all personnel working at any ECDC site.  Each site shall have a system that defines the level of training and competence personnel require with regards to the management of DROPS. All core crew members at workover and wells associated sites shall complete suitable training and demonstrate a satisfactory level of practical skill and theoretical knowledge.   * 1. **MAINTENANCE & MODIFICATIONS**  1. **Preventative Maintenance Systems**   All equipment, either fixed or temporary and considered “at height” or having the potential to result in or prevent a dropped object should be included within a suitable maintenance system.  Apart from maintaining the functionality and condition of assets, written work instructions within preventative maintenance systems should also direct personnel to consider relevant DROPS aspects including as a minimum, the primary and secondary securing of the fixture. Wherever it is possible and practicable, work procedures should reference OEM drawings.  OEM maintenance requirements shall be integrated within preventative maintenance tasks and thereafter followed or communicated adequately by suitably trained personnel.  Procedures should be in place to ensure that third party equipment where installed and in use is being suitably maintained   1. **Integrating Picture Books**   Dropped Object inspections should be adequately managed within the preventative maintenance system. Where dropped object inspection books have been developed then dropped object inspection frequencies should be included within the inspection books and be aligned to the preventative maintenance management system, which shall generate suitable inspection requirements.  The condition of any item should be maintained up to date within the master inspection book and should include fail items or criteria identified previously.  Any change in condition, including but not restricted to impact damage, detachment, missing pieces or significant changes in corrosion levels or integrity should be documented and reported.  Any new or additional “Fail” item or areas of concern noted during regular dropped object inspections must be addressed or reported immediately to the responsible authority and noted in the comments section of the preventative maintenance work instruction.  Procedures should require that on completion of the regular inspection the inspectors name position and all findings should be recorded within the preventative maintenance system work instruction prior to close out, to indicate that checks have been completed. Any repair or raised work order should be recorded and cross referred accordingly.   1. **Management of Change / Modifications**   A Management of Change procedure shall be followed prior to mounting fixtures to existing structures, or installing new equipment at height, and shall include engineering design review and approval at appropriate level in the Asset owner’s organization.  ECDC Management of Change policy and procedures provides a guideline to project and operational teams for the implementation the Change Management Work Process, communicating the importance of change management, defining roles and responsibilities, and establishing reporting requirements.  Adequate procedures within the management of change process are required to ensure that any Dropped Objects Inspection Books and / or PM Systems are updated efficiently and effectively to accommodate the following:   1. Reported materialistic or condition changes 2. Equipment modifications / upgrades 3. Installation / removal of equipment 4. Any new areas or equipment being inspected regularly and not included in the last Independent Survey   Similarly these additions / modifications must be considered and where necessary incorporated into anti-collision systems and integrated control systems.  A derrick temporary equipment register shall be in place, and contain all equipment temporarily installed or used at height.  Suitable and adequate procedures should be in place to ensure that wire ropes are maintained and changed out in accordance with a schedule agreed to meet OEM recommendations and API and Class requirements. This requirement includes but is not restricted to crane ropes, guy ropes, drilling line, tugger lines.  Adequate procedures should be in place to ensure that directives within and from OEM technical bulletins and industry safety alerts etc. are included within the maintenance system. ECDC DROPPED OBJECT PREVENTION PRINCIPLES The following is a list of processes and principles which should be adhered to with the application of this standard on any ECDC sites or associated activities (as well as those operated by others whilst on contract to ECDC).  If clarity on any principle is required then the DROPS Focal Point should be consulted or, in their absence, the ECDC HSE Manager   1. Potential for dropped objects and controls thereafter shall be considered and documented in all task specific procedures or work methodology statements. 2. Where possible, objects should be fitted with secondary retention to prevent them from falling in the event the primary securing method fails. Surplus or redundant equipment must be identified for removal. 3. Regular Inspections must be performed in specific areas with significant potential for personnel injury if a dropped object was to occur. Specific area mapping should be in line with the DROPS Forum “Common Guidelines for Independent Dropped Object Surveys”. 4. All potential and actual dropped object related incidents shall be reported, notified, classified and investigated as per the stated requirements within the ECDC Incident Reporting Procedure. 5. Frequency and consequence of dropped object related events and / or potential incidents should be incorporated into KPI’s. Goals and objectives should be set and communicated to continuously improve relative performance. 6. Dropped object potential will be calculated by use of the DROPS calculator. The height and mass will be entered into the calculator and the resultant outcome will be directly mapped to a potential severity utilising the Severity Ranking Table. 7. Throughout operational life, always consider the potential for dropped objects caused by poor behaviors, inadequate securing, corrosion, vibration, environmental factors. 8. Tools must never be left unsecured at height, including grease tubes/guns, water bottles, radios, detectors, pens, phones, etc. 9. Loads must never be left suspended without proper authority. 10. The length of any securing wire must be as short as possible to minimize the potential build-up of fall energy. 11. Securing devices must be installed, maintained and inspected in accordance with the instructions provided in the supplier’s user manual. 12. 2-Part Shackles (Screw Pin or Round Pin) should never be used in high vibration areas, for lifting, permanent suspension or application where the pin can roll under load and unscrew. 13. Appropriately rated secondary retention lines shall be installed as a minimum underneath all winch, tong hanging and other load bearing lines in such a manner as to catch the line in the event it ‘jumps’ the sheave or one of the components of the sheave rigging system fails. The Safety line shall be secured to an independent point and not to the same suspension point as the sheave itself. Ideally, the safety line will also be secured integrally through the sheave cheek plates. The safety line shall not interfere with the effective operation of the sheave mechanism. 14. Audits to check for compliance with this standard shall be conducted according to a suitable audit schedule. An independent dropped object survey of any rigs shall be performed prior to all rig start-ups and every two years thereafter.  ECDC PROHIBITED EQUIPMENT AND PRACTICES Numerous incidents have occurred as a result of misuse of equipment, lack of maintenance or misplaced creativity by individuals trying to get the job done. To avoid such incidents, the following high risk items are forbidden.  The following is a list of processes (including equipment and practices) which are prohibited on any ECDC sites or activities (as well as those operated by others whilst on contract to ECDC).   1. Use of equipment that is uncertified, customized or “home-made” and has not been subject to the approved engineering acceptance processes 2. RF{RB9C9}2F(HE)8R`Z819BUse of pins on lifting equipment or for securing of equipment or structure at height which only require a single action to release. This does prohibit the use of Linch Pins, R-Clips, spring pin or Roll Pins. Whilst split pins are the preferred option, ECDC does permit the use of “Nappy Pins” as they require two actions to release.   Figure 4-1: pin types   1. Use of Welding rods/wire/tie wraps must not be used instead of split pins or safety securing pins. 2. Fall arrestors must not be left un-retracted when not in use. 3. Re-use of securing wires, connectors or chains that have sustained shock loading. 4. Slings wrapped around derrick/mast beams. 5. Drifting stands in the derrick without a formally documented procedure and risk assessment (TRA / JSA) detailing how the No-Go or Red Zones will be controlled. 6. Use of hammers with wooden handles at height. 7. Use of hooks on any part of the rigging on winch lines and stabbing board. 8. Surface drill pipe filters. 9. Bolts secured with a double nut arrangement. 10. Unsecured water bottles, grease tubes/guns.   (Note: This list does not represent a fully comprehensive list of forbidden practices.)  If clarity on the processes is required then the DROPS Focal Point should be consulted or, in their absence, the ECDC HSE Superintendent. STRICTER REQUIREMENTS Where local experience or national legislation dictates stricter requirements than specified in this manual, then the stricter requirement shall take precedence over the governing requirements of this manual. GLOSSARY OF TERMS  |  |  | | --- | --- | | **Abbreviations /definitions** | **Description** | | Color code | In some areas, a color code is used (and required by legislation) to indicate validity of certification/inspection of the equipment. | | DROPS | Dropped Object Prevention Scheme | | Lifting equipment | Lifting equipment comprises lifting appliances (equipment performing the lifting), lifting accessories (devices which connect the load to the lifting appliance) and lifted equipment. (Ref. EP 2005-0264). | | SWL | Safe working load | |

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| **APPENDIX 1 - DROPS CALCULATOR** |
| 7}_{$[DGJ4_CKMAB@[`LCXJ |
| **Figure A-1: The Drops Calculator** |
| It is available at: Drops forum website  http://www.dropsworkpack.com/downloads\_news.htm.  The DROPS calculator has been developed on the basis of kinetic energy calculations. The calculator does not take account of the shape of the dropped object, e.g. sharp objects, which can potentially increase the consequences should the object strike a person. |

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| **APPENDIX 2 - INSPECTON GUIDELINES**   1. **Derrick and elevated lights, cameras, loudspeakers, etc.** 2. Is the light/unit working; is the unit defective, i.e. cracked or dirty glass, water ingress, etc.? 3. Does it have an effective safety line or another effective form of locking device; will it prevent all parts of the unit from falling if they come loose? 4. Is the sling secure, in good condition and of the correct type, e.g. not made on the rig? 5. Is the clamp in good condition, i.e. tight, free from rust, etc.? 6. Is the clamp secured with an approved locking method, (see above)? 7. What improvements can be made to the current securing arrangement? 8. Are cables, ground wires, etc., in good condition? 9. **Cable trays/junction boxes** 10. Are cable trays firmly attached to the derrick structure, e.g. no excessive movement? 11. Are the clamps/fixings secured with an approved locking method (see above)? 12. Are the cable trays in good condition, e.g. free from rust, cables secured with appropriate tie-wraps? 13. Are cables, ground wires, etc. in good condition (visual inspection)? 14. Are junction box bolts secured with approved locking method? 15. Are junction box face bolts tight and cable glands in good condition (visual inspection)? 16. **Winch/tong line sheaves** 17. Does the sheave have the current colour code and have the correct rating and type? 18. Is the safety line effective, will it prevent all parts of the unit from falling if they come loose? 19. Is the sling of the correct colour code/rating, e.g. can it support the maximum SWL of the winch? 20. Do the shackles/pad eyes have the correct colour code/rating for the winch? 21. Is the shackle of the approved type, i.e. bolt type shackle with safety pin, SWL, and ID number on it? 22. Is the grease line nipple in good condition and does the sheave turn freely? 23. Ensure that all safety lines do not foul winch/tong lines. 24. Ensure winch lines run freely and do not contact derrick/mast beams, monkey board fingers, etc.. 25. Ensure tong counterbalance weights are suitably secured. 26. What improvements can be made to the current securing arrangement? 27. **Crown block** 28. Check painted lines on crown block hold down bolts to ensure they have not slackened off. 29. Check crown sheaves for defects, i.e. excessive noise or melted grease (signifying sheave running hot). 30. Check hold down arrangement on each individual sheave and ensure it is tight and secure. 31. Check crown sheaves for excessive tar build-up, especially below the crown block. 32. Check from all possible angles to ensure there is no tar build-up on steelwork. 33. Consult with the driller prior to removing excess tar. Ensure the drill floor is barriered off, in case of dropped tar. 34. Check all grease lines and grease nipples, ensuring grease lines are properly secured. 35. No grease tubes/guns left at height. 36. Check the drill line retaining device on crown sheaves. Report any signs of fouling keeper bars or excessive movement on bars. Report any changes from previous inspection. 37. Is the bumper block in good condition and secured? 38. What improvements can be made to the current securing arrangement? 39. **Ladder/steelwork** 40. Check ladders and derrick steelwork as you climb to ensure you identify defective areas before you get onto them. 41. Check paint marks on ladder brackets to ensure bolts have not slackened off. 42. Check steelwork for bent or damaged sections. 43. Report any excess movement of any ladder, even if the bracket is secure. 44. Check individual rungs for even spacing and uniform construction. 45. Check safety frames (back scratchers) for damage/security. 46. Check climbing assist devices, especially around top sheave and wire line termination. 47. **Walkways and platforms** 48. Are handrails and gates secure and in good condition, i.e. free from rust, no excessive movement? 49. Are clamps/brackets secured with an approved locking method? 50. Are grating clips or welds intact; is the grating of the correct size, i.e. no gaps or holes? 51. Do all work platforms/walkways have kick plates securely attached to them? 52. Are all safety lines effective; will they prevent all parts of the unit from falling if they become loose? 53. Are all hinges on crown area hatches in good condition with effective safety lines fitted? 54. Are all walkways free from debris and loose equipment? 55. What improvements can be made to the current securing arrangement? 56. Are fall arresting devices available for safe access to monkey board fingers, stabbing board, etc.? Are they in good condition and correctly secured? 57. Are Derrick man's belly buster or Safety Harness, working ropes, etc., correctly secured at the monkey board? 58. Is Derrick man's emergency escape system in good condition and correctly secured? |

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| **APPENDIX 3 - WORKPLACE CHECKLIST – HANDING TUBULARS** |
| Notes:   1. The checklist is intended for use on rigs, for drill floor activities such as tripping and moving pipe through the V-door. 2. Observe the rig crew from a safe location. You may also need to discuss some of the questions with them. 3. The expected performance standard is that all questions which apply can be ticked ‘yes’. |
| |  |  | | --- | --- | | Location / | Date: / / | | **Aspects of tubular handling observed/** | Y or N | | • Pre-job team talk / |  | | • Drill floor layout and equipment / |  | | • Tubular handling task – details / |  |  |  |  |  |  | | --- | --- | --- | --- | | **Question/** | Y | N | N/A | | Pre-job team talk / | | | | | Evidence that the talk was well-prepared? / |  |  |  | | Translations provided if required? |  |  |  | | Linked to documented procedures for the task, and a risk assessment?？ |  |  |  | | Full team present and contributing? / undoubtedly |  |  |  | | Clearly defined responsibilities? / |  |  |  | | No more than one ‘Green Hand’ or Relief in team? / |  |  |  | | If so, ‘buddy’ for that person agreed? / |  |  |  | | Discussion of relevant Life Saving Rules? / |  |  |  | | Reinforcement of Obligation to ‘STOP the job’ if deemed/perceived to be unsafe? |  |  |  | | Team talk suitably recorded? (subject(s) discussed and those present |  |  |  | | **Drill floor /** | | | | | Driller has clear sight of working area? / |  |  |  | | Where applicable, hands free communication system functional and tested between driller and roughnecks and driller and derrick man (monkey board)? |  |  |  | | Correct bails, elevators, slips rigged up? All elevators and lifting subs shall be inspected (checked), and independently double checked prior to handling tubular, for correct size, latch function, latch springs, hinge pins, elevator shoulder and sub thread type?？ |  |  |  | | **Question /** | Y | N | N/A | | All other equipment needed is readily available? / |  |  |  | | All equipment not needed is stored, leaving a clear work area |  |  |  | | All tong pinch points clearly marked as hazardous? / |  |  |  | | All tong hand-holds clearly marked and soft grips fitted were suitable |  |  |  | | Any temporary equipment tested before the task begins? |  |  |  | | Checklist(s) used for these tests? |  |  |  | | Tubular handling task (by observation, for …….. minutes) |  |  |  | | Clear line of sight between driller, floor men, derrick man? |  |  |  | | Correct pipe handling by floor men? (palms -, not fingers, crossed hands). No hands/fingers inside pin at any time? |  |  |  | | Two people for stabbing operations? Stabbing guide used? |  |  |  | | Buddy demonstrating and coaching Green Hand or Relief? |  |  |  | | Physical barriers in place and effective? |  |  |  | | Slipping hazards suitably minimized? |  |  |  | | Rope used for tailing in pipe? |  |  |  | | Drill floor tailing: rope double-wrapped and properly knotted？ |  |  |  | | V-door tailing: rope live end double wrapped through shackle |  |  |  | | Flush-mounted slips? |  |  |  | | All pipe fingers down before derrick man leaves his position？ |  |  |  | | Protectors, drifts, etc. returned to deck/ground level safely or stored safely on rig floor |  |  |  | | When crane is used: tubular tailed in are slung double wrapped with load balanced? Tag lines installed and of sufficient length? Dedicated banksman? Radio communications available and tested with Crane operator, banksman and rigfloor? |  |  |  |   Check completed by: Position / |

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| **APPENDIX 4 - EQUIPMENT GUIDELINES**   1. **Fastening requirements for equipment at height** 2. - All light fittings have stainless steel safety lines. This line should prevent all parts of the light from falling if a failure occurs. 3. - All bolts fitted in threaded holes torqued and lock wired. 4. - All nut and bolt arrangements torqued, then secured with an approved locking device. 5. - Nut and bolt arrangements should be fitted with one spring washer only. Flat washers, or any combination of the two, should not be used. 6. - Lock nuts should be avoided if possible as they are single use only and shall be replaced if they have to be backed off. 7. - Four part bolt type anchor shackles secured with a safety pin of the correct size. Current colour code, SWL and ID number shall be clearly visible. 8. - All brackets and clamps galvanized or fully protected against corrosion. 9. - All pad eyes certified and marked with SWL. 10. **Tools at height** 11. - All tools used at height should be logged out at the start of a job and logged in after the job has been completed and before operations continue. 12. - All tools at height should be tethered with a lanyard. 13. - Tools regularly used in the derrick should be stored separately and kept specifically for use at height (Derrick Tool Kit with tethers for all tools). 14. - A tethered tool kit should be made available for working at height in all areas e.g. work on crane booms. 15. **Substructure** 16. - All hoisting equipment at substructure area needs to be inspected prior to each use, biannual or annual maintenance and inspection schedule. Pad eyes, shackles, winches, tuggers, cables and trolleys for BOP, SSTs, THSs, umbilical handling. 17. - Contractor to provide engineered sub structure load ratings. 18. - Inspection and maintenance schedule for riser tensioner system and equipment. 19. - Inspection of temporary platforms that maybe used under Substructure when running riser and umbilical. |

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| **APPENDIX 5 - DERRICK TEMPORARY EQUIPMENT REGISTER**   1. **Temporary equipment includes all hand tools taken into the derrick.**   Temporary equipment, such as wire line sheaves, coiled tubing equipment and casing handling equipment, which has to be rigged up in the derrick shall be subjected to the same degree of scrutiny as the fixed derrick equipment. All lifting points, shackles, safety slings and lifting slings shall be visually inspected as a minimum by the driller.  All third party equipment shall be inspected by the drilling contractor, prior to installation of the equipment in the derrick.  The senior service company representative shall confirm that the equipment has been inspected for defects (e.g. damage during shipping) since its arrival onboard.  The derrick temporary equipment register shall be completed for all temporary equipment to ensure that all items are accounted for and have been removed from the derrick after the completion of any task.  A derrick temporary equipment checklist should be completed prior to installation of equipment in derrick.   1. **Derrick temporary equipment register**   The following register is to be filled out and updated by the driller. When this register is completed, it is to be kept on file for a period of six months. |

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| **APPENDIX 6 - DERRICK TEMPORARY EQUIPMENT CHECKLIST** |
| |  |  |  | | --- | --- | --- | | Item | Task | Checked | | 1 | Current certification for all lifting equipment used to install temporary equipment in the derrick (i.e. slings, shackles, snatch blocks and lifting points) is available on the rig and has been checked by the relevant Supervisor, including valid certification for the temporary equipment itself (if applicable). |  | | 2 | Safe working load, colour code and identification number is clearly visible on all lifting equipment to be used for this task. |  | | 3 | All securing methods to be used for temporary equipment comply with the Asset owner’s requirements and guidelines. |  | | 4 | Appropriate rigging equipment as specified in specifications is to be used to anchor temporary equipment in the derrick, e.g. a sling wrapped around derrick steel work is not acceptable, a beam clamp/pad eye shall be used. |  | | 5 | Temporary equipment rigging and securing arrangement has been discussed with a qualified person. |  | | 6 | Temporary equipment rig-up will be checked for balance as close as possible to the rig floor prior to hoisting into the derrick. |  | | 7 | Pad eye or structure from which the temporary equipment is suspended is adequate for the maximum possible load and has valid certification. |  | | 8 | Proposed location of temporary equipment in the derrick has been assessed by the Asset owner to check for potential clashes with derrick travelling equipment, e.g. top drive, racking arms, winch wires, etc.). |  | | 9 | If applicable, the senior third party representative has given written verification that his equipment has been inspected for defects (e.g. damage during transportation) prior to use. |  | | 10 | Derrick temporary equipment register has been completed detailing number, location and type of all temporary equipment in the derrick. Ensure register is updated as soon as equipment is removed from the derrick. |  | |

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| **APPENDIX 7 - LIFTING AND HOISTING** |
| A complete register of lifting equipment shall be available to record data on all lifting equipment and its certification status, including ID number, SWL and date into service. The register shall include items such as slings, shackles, pad eyes, trolley beams, hoists, tuggers, manlifts, manriders, harnesses. |
| |  |  |  |  | | --- | --- | --- | --- | | Confirm that you can answer ‘yes’ to the “ Questions for a Safe Lift” before all lifting and hoisting operations.  “YES” | | | | | 1. | Is everyone aware of and do they fully understand the lifting and hoisting procedures applicable to the lift? |  | | 2. | Has everyone attended the toolbox talk? |  | | 3. | Has a pre‑use inspection of the lifting equipment been carried out and are the lifting accessories tagged or marked with:  • safe working load?  • a unique identification number?  • a valid certification date? |  | | 4. | Are all safety devices working? |  | | 5. | Does everyone know the person‑in‑charge of the lift? |  | | 6. | Is everyone competent and aware of his or her tasks? |  | | 7. | Is there a current lift plan and Job Safety Analysis and does everybody understand the job and precautions? |  | | 8. | Does everyone know the environmental limits, e.g. maximum permissible wind speed for the lift? |  | | 9. | Is the lift area controlled and is everyone out of the way if the load falls or swings? |  | |

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| **APPENDIX 8 - NO‑GO AND RED ZONES**  No‑Go Zones are those in which there is a high potential risk for dropped objects. These areas shall be controlled with a permit to work and be physically marked off at all times with rigid or chained barriers.  Red Zones are those in which there is a medium potential risk for dropped objects. A designated person in charge (PIC) shall be accountable for permitting personnel to enter the Red Zone. Step back safety zones adjacent to the Red Zone shall be clear and shall have fixed gates across designated access points to Red Zones to provide additional control and increase awareness.  Some No-Go and Red Zones will change during different phases of an operation. Changes to the No-Go zones shall be managed via the **Permit To Work System.**  Floor men move in and out of the Red Zone depending on the operation. It is important to define the Red Zone for each location/rig. ‘Safer’ areas shall be clearly defined using Step Back Safety Zones – areas where floor men will step back to during movement of the blocks. |
| **Figure A-2: Example of Red Zone Change According To Operations** |
| It is not intended to define the rig floor as a No‑Go Zone hence Red Zone classification. In some areas, the catwalk area is defined as No‑Go during tripping and a work permit is required. This has proven to be a control which has saved people's lives, particularly when dealing with automated or semi‑automated equipment. HAZID sweeps of the Facility should be done with help of suitably skilled staff. |

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| **APPENDIX 9 - RELIABLE SECURING**  This manual applies to equipment that is going to be procured and to equipment that is already in use on many installations. **As a reference.**  It covers all the equipment, components and circumstances, e.g. corrosion, that have the potential to cause or become a dropped object and what should be done to prevent this.  Equipment that is not an integral part of the structure on which it is mounted shall have a suitable secondary method of retention to the structure. The correct installation and secondary retention of all permanent equipment in the inventories shall be shown in a picture book that is available on site. The equipment condition shall be visually inspected against the requirement in the picture book during routine DROPS inspections. Appropriately rated secondary retention lines shall be installed as a minimum underneath all winch, tong hanging and other load bearing lines in such a manner as to catch the line in the event it ‘jumps’ the sheave or one of the components of the sheave rigging system fails. The safety line shall be secured to an independent point and not to the same suspension point as the sheave itself. Ideally, the safety line will also be secured integrally through the sheave cheek plates. The safety line shall not interfere with the effective operation of the sheave mechanism.  All hand tools, to be used at height, shall be tethered to prevent them from dropping. This requirement shall be clearly stated in the relevant written procedures and the Job Safety Analysis (JSA).   1. **Galvanic Corrosion** |
| 18(9)Z[N5~Y4{C1M1IV@NWN |
| **Figure A-3: Nobility of Various Metals** |
| 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 (**see Figure A-3**).  If a steel screw is fixed into a copper plate, the screw will be the anode since copper is the nobler metal (**see Figure A-4**). The screw will rust rapidly as the difference in potential is great. |
| H0Y86%J$75(ZO164T2S)3X2 |
| **Figure A-4: Steel Screw on a Copper Plate** |
| If the same steel screw is fixed into a less noble plate, e.g. a zinc plate, the screw will be the cathode and will not rust (Figure A-5). The zinc plate will corrode, as it is less noble than the screw. |
| VRQ1ZFQ@7_BQV9]GSNA}7SW |
| **Figure A-5: Steel Screw On a Zinc Plate** |
| For these reasons, it is important that all securing devices are of the stainless steel type. This applies to cotter pins, safety pins, securing wire and locking wire for threading through nuts and bolts, etc.     1. **Bolted connections**   At present, bolts are being produced to 85 different industrial standards and the requirements for bolted connections (**Figure A-6**) vary for the different sectors depending on the given design, operational and maintenance requirements.  Achieving a stable bolted connection will, therefore, require a qualified evaluation of the following factors.   1. Load design. 2. Choice of materials with a view to mechanical properties and corrosion resistance. 3. Use of lubricant where appropriate. 4. Pre‑tensioning and use of the correct torque equipment. 5. Need for locking bolts to secure against loss of torque/pre‑tension.   Eighty‑five per cent of all damage to bolts is due to fatigue.  This is primarily a result of:   1. dynamic load with inadequate pre‑tensioning 2. overload resulting in reduced pre‑tensioning.   }ZXJLU4`H9NJQW2_$Y3[Z1L  **Figure A-6: Bolted Connections**   1. **Special bolts** 2. **Bondura Bolt**   www.boltnorge.no  Bondura has a construction that can take up movement and ovality by using expanding tapered sleeves at both ends of the bolt. There are several variants of the bolt, both straight-through versions to other that are fitted from one side. Standard screws are tightened to press in the cones. The bolt is fixed directly to the machine or equipment with locking screws. This prevents the bolt from loosening, falling out or rotating in the bolt hole. Bondura bolts must be fitted and maintained in accordance with the manufacturer’s specifications. Bondura is certified in compliance with API 8C and F.E.M. regulations.  *Areas of use:*  For example, as a replacement for clevis bolts in top drives and hinge bolts on dollies, pipe handling equipment and cranes. |
| $JKOMKRZ8RBKABW{8G_9ZIG |
| **Figure A-7: Bondura Bolt 6.6 Bondura Bolt 6.1** |
| 1. Superbolt/Supernut   www.superbolt.com  Superbolt/Supernut are constructed such that standard nuts are replaced by 'stretch nuts' with integrated jack bolts and washers. Use can be very beneficial in terms of HSE because only hand tools are needed for fitting and dismantling. Rigging of heavy torque equipment and use of sledgehammers during installation and disassembly is avoided. An additional benefit is that time is saved during the operations. Bolts must be fitted and maintained in accordance with the manufacturer’s specifications. Both Superbolt and Supernut are available in a special corrosion resistant offshore version.  *Areas of use*  Almost unlimited; available in both inch and millimetre dimensions and diameters from M20 to M160. |
| F8TR]V4DNSD8M7%~6_}VA2S |
| **Figure A-8: Super Bolt （超级螺栓）** |
| **Bolted Connections**  **Dual nuts are forbidden for locking of bolted connections. The following methods are recommended for locking bolted connections.**  Nord-Lock Bolt Securing System  www.nordlock.com  When correctly installed, the Nord-Lock Bolt securing system provides a guaranteed secure bolted connection. Locking is achieved by means of two washers that ensure the clamping force is maintained in the bolted connection. Nord-Lock has DnV (Det Norske Veritas) type approval.  *Areas of use:*  Particularly suitable for connections exposed to vibrations, e.g. grating, loudspeakers, cable trays, ladders, guide rails, etc. But it has an almost unlimited range of applications. |
| **Figure A-9: Nord‑Lock Bolt Securing System** |
| 1. **Spiral Lock**   www.spiralock.com  Spiral Lock is an all-metal lock nut/bolt and 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 helps to improve the locking of the bolt connection.  *Areas of use:*  Almost unlimited, frequently used for critical bolt connections. |
| **Figure A-10: Spiral Lock** |
| 1. **Castle nut with cotter pin**   Adopted from the aviation industry, Castle nuts provide a visual and reliable method for locking bolted connections. The nut has radial slots and is locked by noncorrosive cotter pins that are inserted through a hole in the bolt.  *Areas of use:*  Unlimited, but frequently used for critical bolt connections. |
| {8LXXA860TA]PA862Z)B~RL  O}A[{5(W72RO[CK]6D_7CMC  **Figure A-11: Correct Installation of Cotter Pins and Bolts** |
| 1. **Nyloc lock nut**   Nyloc lock nuts are extensively used throughout the industry. Nyloc lock nuts should only be used once. Standard Din 985 Nyloc nuts have a temperature rating from -70 °C to +120 °C.  *Areas of use:*  This type of nut is recognised for locking in connections where a certain degree of lost pre-tension can be accepted. |
| 5{(OR`2A6}$(BTDUICLV86A  **Figure A-12: Nyloc lock nut Figure A-13: All-metal lock nut Figure A-14: All-metal lock nut** |
| 1. **All-metal lock nuts**   All-metal lock nuts can be used on all bolt dimensions. The nut locks by the threaded section or top of the nut deforms/splits, or through the nut having a toothed ring under the collar. This provides greater friction between the bolt/underlay and nut, providing a secure connection. There are many varieties and suppliers on the market.  Areas of use:  These nuts have an almost unlimited area of use.   1. **Tab washer/tab plate DIN 93/463**   Tab washers can be used on all dimensions and in any place designed for the use of tab washers. There are several types with different areas of use for locking either nuts or bolts. It is important to use the right type for each purpose.  *Areas of use:*  Typically in use on machinery where it is important to prevent the bolt from rotating. |
| F7QHU[22M~KJQHEB$O)2VHY  **Figure A-15: Tab Washer** |
| 1. **Lock-wiring**   Lock-wiring of bolts is a locking method adopted from the aviation industry. In brief, the method involves threading a special stainless wire through a hole in the bolt head, twisted and locked to the next bolt or structure, thus preventing the bolt to rotate and loosen. The wire can be used to lock a maximum of three bolts in a row, as shown in the illustration. (For info on the size of the hole in the bolt head, see ISO7378).  *Areas of use:*  Used extensively for locking external bolted connections on drilling and pipe-handling equipment. Often used where there are no through-bolts and/or there is *a need for easy visual control of the locking.* |
| IZC@]2LYT(4OIG7SSC[3KV2  **Figure A-17: Lock Wiring of Bolts** |
| 1. **Securing pins/safety pins**   Within the industry various types of inappropriate securing pins are used. These are unsafe because they can easily be knocked out, for example; spring type split pin.  Best practice   1. NB! Securing pins of the type shown in the pictures must never be used in lifting appliances. 2. Securing pins shall provide secondary retention. 3. Securing pins shall be of the proper size and quality. 4. Securing pins shall be secured by wire (where this is appropriate) to prevent drop. 5. It is a requirement that securing pins as described above are   **Areas of use:**  Scaffolding bolts, security bolts on removable railings, claw couplings and securing brackets on gas cylinder racks, etc. |
| J[MULV}ZZ[GP`)[T%XAK[90  **Figure A-18: Security Pins / Safety Pins** |
| 1. **Correct use of cotter pins**   The industry has experienced problems with the correct use of cotter pins and the choice of materials.  Best practice   1. Cotter pins must be bent to prevent them from being knocked out. 2. Where there is a danger of personnel exposed, the cotter pin must be bent as shown in the illustration. 3. When hoisting persons and loads, always use four part shackles. 4. Linchpins, spring type split pins or any other type of safety pins that can be knocked out must not be used for lifting operations. 5. Cotter pins should be made of stainless steel. 6. It is a requirement that cotter pins as described above are inspected regularly and replaced when required. |
| }F_SP2EGQXBAPKWH1%[(MOE  **Figure A-19: Cotter Pin in a Shackle Bolt** |
| 1. **Securing devices (wires, chains and couplings)**   Wherever possible, equipment installed at height shall have integrated secondary retention. If not possible, or where equipment is exposed to the risk of collision, the equipment must be equipped with secondary retention securely attached to the structure.  Best practice   1. Securing devices must be dimensioned in accordance with the equipment supplier’s calculations. The quality of materials used must be consistent throughout the entire assembly. 2. Only acid-proof securing wire (AISI 316, type 7x19 IWRC) shall be used. Wires must be locked with double press locks (for example Talurit locks). The locks must be made of copper and the minimum distance between the locks must be approximately equal to the length of a fully crimped lock. 3. All connectors/snap hooks must be made of acid proof steel (AISI 316) and be equipped with locks. Snap hooks attached to shackles should have eyelets. 4. Chain must be made of acid-proof (AISI 316) or galvanised steel. 5. Shackles for use with securing devices should have rotating bolt with nut and cotter pin, marked with WLL/SWL and traceability, at least in the form of batch marking. 6. The chain or securing wire must be as short as possible to minimise the potential fall energy. 7. Securing devices must be installed, maintained and inspected in accordance with the instructions provided in the user manual or maintenance instructions. |
| D`G72[{VS4]8J~EFUY$6{7J  **Figure A-21: Securing Devices (wires, chains and couplings)** |
| 1. **Securing of personnel**   When working at height, for which anti‑fall equipment as shown in **Figure A-22** is mandatory, the necessary expertise is required to ensure safe working conditions.  Best practice   1. Anyone using personal protective equipment against falls from heights must have documented training. The training must also cover rescue methods. 2. The necessary rescue equipment must always be available at the work place. 3. The equipment must have approval markings (e.g. CE) and comply with an accepted standard. 4. The equipment must be checked at least every six months by a competent person. 5. The control or validity date must be shown on the equipment. 6. The choice of equipment must be made after evaluating the geometry of the work place. |
| H9[BOX5TE~W09I)%M1_Z9AN  **Figure A-22: Anti-Fall Equipment** |
| 1. **Derrick evacuation equipment**   Equipment must be protected from wear and harsh environment.  Equipment should be stored in cabinet/locker to protected it from UV radiation and weather.  The riding belt or harness must be attached to the evacuation block or to the guide line where appropriate.  Evacuation block, guide line, attachment point, couplings and shackles are defined as evacuation equipment/anti-falling devices and must be checked, certified and marked accordingly.  Anchor points for suspension must be able to support at least 10kN.  The equipment must be checked at least every 12 months by a competent person and shall be marked with the next inspection date.  Safe access to and use of the equipment must be ensured. |
| S@SI90H4CD%}D_OBU54UKV3  UPFA@OT3K5M0)D[U%8NWQFP  AIJ4RF$B9X9I][6O3%7$J}M |
| **Figure A-23: Evacuation Equipment(example only)** |
| 1. **Securing of tools at height**   **Securing of tools at height (<5kg)**  There is a significant potential of dropped objects when using tools at height.  Best practice   1. Use of tools at height must be risk-assessed. 2. Wires and connectors must be used between the tools, belt or bag. 3. Swivels with set screws should not be used. 4. Weak link shall be installed between the bag belt and safety wire. 5. A tool bag with internal loops should be used when various tools are deployed at height. 6. Wrist straps must not be used because of potential personal injury. 7. If an attachment point other than the belt or bag is required, use an appropriate part of the surrounding structure, preferably above the work level. 8. In limited areas, for example the derrick, flare boom and cranes, tools used at height must be logged out and in to ensure that nothing is left behind. 9. All tools at height to be registered (e.g. in derrick log book). |
| Z01YU(CH1ZD]INSAKGMAHDF  **Figure A-24: Weak Link**  ROQ2%KHV{Q7RK960[RNIW$7  **Figure A-27: Safety Wires and Connectors** |
| 1. **Securing of permanently attached equipment**   **Railings**  Major defects in railings have been observed in the industry, and particularly in collapsible, movable and aluminum railings.  Best practice   1. Railing must be 1100mm high as a minimum and have integrated toe boards that are at least 100mm high. 2. Railing must have a functional design for the area it is intended to secure, e.g. wire mesh must be installed as required (locked areas). 3. Railings shall not have deformations or cracks that affects the functionality or strength. 4. It must always be possible to insert movable railings into the fastenings and insert a securing through-bolt. 5. The safety bolt must be adequately locked using a securing pin, snap hook (with eyelet) or a cotter pin (see also the section on securing pins). 6. Both the safety bolt and locking must be secured in the immediate vicinity of the attachment. 7. All connections between elements in the railing must be secured with through-bolt and lock nut. 8. Use of setscrews are not recommended in permanent railings. 9. Railings and attachment points for collapsible and movable railings must be inspected on a regular basis to maintain adequate securing and functionality.   **Toe boards**  Shortage of and incorrectly installed toe boards are observed throughout the industry. Commonly, the gap between the toe board and deck are exceeding requirements.  Best practice   1. Decks, gangways and platforms must have toe boards with a minimum height of 100mm. 2. On stairways, every step must have a toe board with a minimum height of 50mm. 3. All landings in stairways must have toe boards with a minimum height of 100mm. 4. The gap between the deck or grating and toe board must not exceed 10mm. |
| **Figure A-29: Toe Boards** |
| **Grating**  At present there are a number of different ways of fastening grating to underlying structures or frames. As a result of vibrations and defective locking of fastening, there are incidents of loose grating and loose or missing fastening clips.  Best practice   1. Grating must be adequately fixed to underlying structures to prevent loosening due to vibrations or loads. 2. Grating should be secured against major sideways displacement in all directions. 3. Through-bolts or threaded connections with locknut, are recommended for securing to structure. 4. Openings in the grating must not exceed 20mm where personnel may traffic the area below, and should otherwise not exceed 35mm. |
| 8VEK$US4_L]HLFVFHAE@QWV  **Figure A-30: Different Type of Grating Fastenings** |
| **Swing gates**  On many swing gates, the hinges are fitted without the required material quality or design strength to serve the intended function. Many older gates also lack integrated toe boards.  Best practice   1. Gates must be of the same strength as the surrounding railings. 2. Gates must be secured in order to prevent disengaging. 3. Gates must open/swing inwards to the platform or deck. 4. Gates must be designed to automatically return to and remain in closed position. 5. On floating rigs/installations it is recommended to fit a latch to secured the gate in closed position. 6. Toe boards must be integrated in gates. 7. Wherever possible, the hinges should be an integral part of the gate. 8. Swing gates must be inspected and maintained on a regular basis to ensure adequate function. |
| $4_NU[_MQ0XI0S)NTBM]HRW  **Figure A-31: Example Swing Gate** |
| **Floodlights**  Floodlights are rarely adequately secured against dynamic drop caused by hits from moving equipment.  Best practice   1. Floodlights must be positioned to prevent being hit by equipment/loads. 2. If there is a potential of the floodlights being hit by mobile equipment/loads, they should be protected with reinforced cages. 3. Floodlights must be equipped with two independent barriers. The attachment points should be integrated, for example with eye bolts threaded into the floodlight housing. 4. Strength of attachment points and securing devices, related to the relevant fall energies must be evaluated. 5. Fastening devices for securing of equipment to bracket or structure should be fitted with secondary retention. 6. Hatches for replacement of light bulbs must be hinged or secured with wire to the floodlight housing/frame. 7. For new installations or for installing securing devices on existing equipment, a user manual maintenance instructions should be available. The instructions should also cover securing devices. |
| _0QI$L]NQ9@W(R5JUIV2%SC  **Figure A-32: Floodlight** |
| **Snatch blocks**  Best practice   1. Blocks must have two barriers both in the suspension and the shaft. 2. A maintenance programme must be established in accordance with the user manual, including requirement for inspection every twelve months of blocks, shackles and lifting lugs by a competent person. 3. Blocks must be dismantled at the request of the --competent person or in accordance with the manufacturer’s recommendations or, in any case, at least every fifth year. 4. Snatch blocks and suspension shackles should preferably be marked with coloured tie wraps using the designated colour code of the year. |
| QCZ]H21T)AOD5[(Z8D9VWVL |
| **Figure A-33: Snatch Block** |
| 1. **Loop hoses**   Faulty installation or inadequate maintenance of loop hoses, and especially high-pressure hoses, is a potential safety risk.  Best practice   1. The equipment manufacturer’s instructions for installation and technical description must be followed. 2. Clamps must be attached and securely fastened where the hose is marked with; 'Attach safety clamp here'. 3. Safety chains must be as short as possible and installed as close to the vertical as possible, to prevent fall energy and pendulum effect. 4. Securing devices for hoses must be designed to support the maximum loads generated by a burst hose. The design basis must be documented. 5. The required resistance to wear and tear, chemicals, heat and UV radiation must also be documented 6. The securing system for hoses must be certified and traceable. 7. The securing devices must be checked and marked in accordance with the norm for lifting appliances. 8. In addition to correct instructions for installation, the user manual/maintenance instructions should contain guidelines for necessary maintenance and inspection of the hose securing system. |
| WB4$BQ]%S2H@FPN8W98~AET  **Figure A-33: Snatch Block** |
| 1. **Correct use of shackles**   Best practice   1. Shackles must be certified, and approved, i.e. be marked with the designated colour code of the year (preferably by using coloured tie wraps). 2. Shackles must be equipped with two barriers: nut and cotter pin. 3. Shackles must only be used for their intended purpose and manner. 4. The user must be familiar with the applicable limitations and guidelines for use. 5. Shackles are designed to support the load at the bottom of the hollow torus and evenly across the shackle bolt. 6. If shackles are exposed to loads in other places, this must be taken into account during use as it will reduce capacity. 7. Point loads on the shackle bolt should be kept to a minimum as it will reduce capacity. 8. On shackles with a capacity of more than 8.5 t, or have large openings, the reduction factor shown at the bottom of the figure may be used to prevent deformation of the shackle bolt. |
| NFM9@H_TI03~V(B9{2EY7VX  **Figure A-34: Safe Use of Shackles(limitations)** |
| 1. **Correct use of eye bolts/eye nuts**   Best practice   1. Eye bolts/eye nuts must be certified, and approved, i.e. be marked with the designated colour code of the year (preferably by using coloured tie wraps). 2. Eye bolts/nuts must only be used for their intended purpose and manner. 3. The user must be familiar with the applicable limitations and guidelines for use. 4. (Eye bolts/nuts for use on and offshore shall be at least grade 80.) N/A in ECDC. 5. Grade 80 eye bolts/nuts are labelled with the permitted load in the least advantageous direction, i.e. 90 degrees on the fastening bolt. 6. Eye bolts/nuts must be adequately tightened prior to use. 7. Manufacturer installed eye bolts/nuts are normally appropriate for use during installation/removal of the units they are installed on, e.g. gear boxes, pumps, motors and valves. 8. Eye bolts/nuts must be removed after use, and the threads in the equipment on which they have been used must be preserved by for example; grease and a plastic plug. |
| M3JWWKQ8XL@1@L~)QAQI9F1  **Figure A-35: Showing Correctly and Incorrectly Installed Eye Bolts.** |
| 1. **Racks and storage**   The design of racks for storage of material and equipment is often not appropriate to ensure safe storage.  Best practice   1. Ensure that temporary storage in modules is permitted in a controlled manner with respect to type of goods, duration, storage area and housekeeping. 2. Storage must not obstruct accessibility or evacuation of the module. 3. Ensure that the stored materials do not obstruct access to emergency equipment. 4. Storage racks and storage areas must be designed to ensure that equipment cannot accidentally drop to lower levels. 5. The heaviest equipment should be stored lowest. 6. On mobile units, temporary storage space/racks must be fastened and shelves shall be equipped with baffle plates. 7. Storage racks should be appropriately secured to avoid toppling/collapse e.g. due to top heavy loading. 8. **Temporary/permanent storage of gas cylinders**   Gas cylinders temporarily stored are often poorly secured with rope or cargo straps.  Best practice   1. Storing of gas cylinders must not obstruct passage. 2. Gas cylinders must be stored and secured safely. 3. Storing of gas cylinders must be risk assessed. 4. Temporarily stored gas cylinders must be secured with chain. 5. Permanent storage racks must be equipped with securing brackets/chains. 6. **Unnecessary equipment at height**   Obsolete equipment is often found at height. This equipment is often excluded from established inspection and maintenance procedures, and introduces a considerable risk potential.  Best practice   1. It is required on regular basis to evaluate what equipment is required or should be removed. 2. The assessment should establish whether equipment should be relocated to reduce the risk of collision with mobile equipment. 3. Inspection and maintenance procedures should be revised regularly, to ensure inspection and maintenance of all equipment installed at height. 4. Final checks must be carried out consistently to ensure |
| VBIN8ZE`LD_31~IRSI1AF3Q_Z)RKB4E_NA3X7EMU%3GE`J |
| **Figure A-36: Example of Unnecessary Equipment Found At Height** |
| 1. **Securing of parts, equipment and material during work at height**   The potential for dropped objects during repair and installation work at height is severe and is reflected in a significant proportion of reported incidents.  Best practice   1. All repair and maintenance work at height must be risk assessed. 2. All parts, equipment and material used at height must be secured against drop. 3. Small parts must be stored in suitable storage containers or similar. 4. In limited areas, for example the derrick, flare boom and cranes, tools used at height must be logged out and in to ensure that nothing is left behind. 5. When the work is complete, a final check must be carried out, to ensure that no material or equipment have been left at height. 6. **Post inspection/final check of the work site**   Always keep your work site tidy.  Best practice   1. Tools, equipment and material must be secured in a safe location, at the end of each shift. 2. When the work is finished, a final check and inventory count must be carried out to ensure that no tools, equipment or material are not left behind at height. 3. The work site must be left in a tidy and clean state, and all tools, equipment and material must be returned to their designated storage place. |