Safety Aloft

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(Website Version)
Background

- Sail Training: TSYT & JST
- Offshore Construction: Health and safety considering both the benefits and when it gets unrealistic and unworkable
- Professional Rigger: Implementing Work at height regulations and training to IRATA level 3
Why is safety aloft important

• Injury
• Death

• Regulation – because the potential for injury or death is not sufficient to make all employers or worker manage safety aloft correctly there are regulations with penalties for breaching the regulations which include fines or imprisonment.
Regulations which apply to Work at height and their Marine Guidance Notice

**Work at Height Regulations 2010**
The Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Work at Height) Regulations 2010

**‘General Duties’ Regulations 1997**
The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997
[Who the regulations apply to and risk assessments requirements]

**PUWER 2006**
The Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations 2006
[Use of tools and machinery in work aloft]

**LOLER 2006**
The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006
[LOLER applies as a suspended person is defined as a load, the regulations also define inspection of equipment used to support the load (person)]
COSWP - Code of Safe Working Practices

Chapter 17
Provides more specific guidance on how to apply the regulations

What is work at height?

Rule of thumb rule that work at height is work above 2 meters is not correct.
What is work at height?

- Work on or with ladders & scaffolds
- Working near open hatches or other opening in the ships structure
- Working in tanks, especially deep tanks
- Working near or over the ships side
- Working near or on Fixed Ladders, stairs, gangway
- Basically any where with a risk of falling which could cause injury
Completion of a Risk Assessment

Leads to implementation of control measures, and possible requirement for permit to work

Works at height need to be:

1. Properly Planned
2. Appropriately Supervised
3. Conducted in a safe manor

The people in requirements 2 and 3 need to be competent for the roles they are performing.
Risks & Control Measures

Personnel Falling
• Personnel need appropriate Training and Experience
• Use barriers to keep people from the falling hazard
• Use appropriate PPE to prevent people from falling

Dropped Objects
• Use Exclusion Zones to stop dropped objects falling on people
• Use lanyards on tools, equipment and materials to prevent them falling
• Use bags or buckets to secure loose items, if the bag and bucket cannot be covered then risk of tipping needs to be considered
• Use methods to reduce risk of dropped objects.
  
  *Eg sending blocks aloft secured where the rope runs so the eye of the block can be connected before disconnecting the halyard.*
Risks & Control Measures

Collapsing Structure
• Section of structure to climb or anchor too needs to be strong enough for potential loads (inc dynamic fall loads)
• The structure need to be properly maintained so it is and remains strong enough
• There may be requirements for testing & certification, especially of anchors

Equipment Failure
• The correct equipment for the application needs to be selected
• Equipment must be used correctly
• Inspection and quarantine procedures need to be set up and followed.
Weather

- Are the weather conditions suitable, what are the limiting weather conditions.
- Is there a suitable weather window for the operation planned, especially important for longer jobs.
  
  *Eg can you disconnect a yard and lower to the quay before the weather conditions change*

Vessel Motions

- Can the operation be completed at sea, what is the limiting sea state.
- If completing in harbour or at anchor is there a requirement for low wash around your vessel to complete the operation safely.
Risks & Control Measures

**Tools**
- Have the tools been inspected and is there a quarantine procedure to prevent the use of damaged tools
- Tools need to be used correctly
- Is PPE required for the tools being used.

**Radar, Aerials, Whistle**
- If the work is near the Radar, Aerials or Whistle then they need to be isolated.
- Do you require a Permit to work and lock out procedure.
Risk Assessments

Below is a risk assessment method I have found easy to help identify the risk and control measures. You start with the activity, then list a hazard associated with it. Next identify the probability (P) and consequence (C) from the table to give the risk (R) associated with the hazard without control measures. Now you start adding your control measures for the activity and identify how they affect the probability and or consequence to give your reduced risk value (RR). If you can reduce the risk to green with all your the control measures you are good to go for this hazard. If you can only reduce it to yellow you need to consider if you can sensibly go ahead and are likely to need a permit to work. If you cannot reduce the risk below red then you need to find a different way to complete the operation which is safe.

Once you have finished adding control measures you examine the next hazard for the activity, eg Personnel falling. Once you have analysed all hazards for an activity you look at the next activity associated with the operation, eg Painting

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hazard</th>
<th>P</th>
<th>C</th>
<th>R</th>
<th>Control</th>
<th>P</th>
<th>C</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Aloft</td>
<td>Dropped objects</td>
<td>4</td>
<td>5</td>
<td>16</td>
<td>Only authorised and experienced personnel working aloft</td>
<td>3</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All items secured at all times when aloft, or kept in collective bags</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Exclusion areas set up below works aloft</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Suitable weather conditions</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Consequence (C):
- Severe: Fatality
- Major: Disability
- Moderate: Doctor or Hospital Required
- Minor: 1st Aid Required
- Insignificant: No 1st Aid Required

Probability (P):
- Rare
- Unlikely
- Possible
- Likely
- Certain
1. Avoid - Eg remove or lower the mast

2. Prevent
   2.1 Work restraint collective – Barriers and Scaffolding
   2.2 Work restraint personal – Harness and tether to stop you reaching the fall hazard (like child’s reins)
   2.3 MEWP – Mechanical Elevated Work Platform or Cherry Picker

   2.2 Work Positioning – Suspended in a harness or on a bosuns chair. You require 2 connections for work positioning.

3. Minimise
   3.1 Fall arrest collective – Nets or air bags
   3.2 Fall arrest personal – fall arrest lanyards. You need to ensure you have the required fall distance for them to work properly.

4. Ladders

Underlined items require a rescue plan.
Images of options on next slide

Preference decreases as you move from Avoid to Ladders.
Planning
Hierarchy of Work at Height Options

1. Avoid
2.1 Work Restraint Collective
2.2 Work Restraint Personal
2.3 MEWP
2.4 Work Positioning
3.1 Fall arrest collective
3.2 Fall arrest personal
Ladders

Short Duration

1m + above
if using for access to a upper level

Top securely Lashed

Secure Sections
If a section or telescopic ladder

4:1 incline (75 deg)

Secure base
Feet, lashing, person

Harness and lanyard recommended in COSWOP
Practical Example
Mast Access

Using a Gantline or Halyard

Work Positioning (because you are suspended)

2 Points (Required)
Practical Example

Mast Access

Also need to consider weight

Start out same weight of rope either side of sheave

As the person is hoisted aloft there is less weight of rope on their side. This can make it difficult for them to get back down especially with friction in the system. *Eg a tall mast so a big change in rope weight or lots of friction such as 4:1 or 6:1 throat halyard.*

Better solution tie a rope of similar diameter into the gantline so there is less weight change. Also can be used to help haul one down if too much friction.
Practical Example Mast Access

Options:

2 Gantlines
Simplest option but quite crew intensive. 1 person aloft, 2+ on hauling gantline, 1+ on back up gantline. Both lines controlled from deck so can operate either for rescue.

1 Gantline & 1 Back up system
Requires some extra equipment but has advantages.
Less crew: 1 person aloft, 2+ on hauling gantline.
All back up system equipment is certified and traceable so will satisfy an external inspection.
Back up system designed for rescue so can be operated from deck to lower the aloft worker.
Practical Example
Mast Access

1 Gantline & 1 Back up system
Currently in operation with Pioneer Trust
Practical Example
Ratlines (Fixed Ladders)

Options:

**Free Climb** ✗
No control measures if you let go you fall, so not an option as you cannot risk assess and justify.

**Double Clip** ❓
Clip on to the rigging as you climb. Safe if you clip on to suitable anchors which are strong enough to take a fall. However this system has a high potential for voyage crew to clip onto something with insufficient strength to take a fall such as a ratline. If incorrect anchors are used then it has a higher risk than free climbing as a fall is more likely due to the distraction of clipping / believing you are safe.
Options:

Double Clip on to a Safety Line

Installing a safety line secured every 2m or so means the voyage crew have a defined thing to secure too. However this option only works if used with a Via Ferrata lanyard. If a normal lanyard / tether is used very high forces >18kN (>1,800kg) will be generated by the 3-5m fall allowable with a safety line! These forces will cause significant internal injuries and have the potential to exceed the break load for the tether and safety line! (Forces should be limited to below 6kN (600kg) to limit injuries, and minimum brake load of equipment varies but is often in the region of 15kN to 22kN). Therefore the injured person could still fall to deck or overboard, meaning it can have a higher risk than free climbing as a fall is more likely due to the distraction of clipping / believing you are safe.

If using a Via Ferrata lanyard it must be used correctly and both clips kept on the safely line. If one clip is on the safety line and one is on the harness it will not operate correctly and too high forces will be experienced.
Options:

Fall Arrest System
This uses a mobile fall arrest on a fixed line up the shrouds or ladder, allowing you to climb without the distraction of clipping and unclipping therefore reducing the probability of a fall. However the mobile fall arrest must be chosen carefully because not all types are suitable for this application:

• Some devices do not operate if they are grabbed in a fall, which is a natural reaction, and/or they need adjusting to climb down.
• Some devices need a loose hanging line to operate correctly (using a cam action to grab the line), however the line up the mast cannot be loose as it will need some tension to keep it in place as the vessel rolls.
• Some devices allow you to slide until the fall force is less than 6kN, but with ratlines and platforms below, fall distance wants to be limited.
Practical Example
Ratlines (Fixed Ladders)

Fall Arrest System
Currently in operation with Jubilee Sailing Trust

JST is using ASAP locks as they found them to be the best device for this application when considering the points raised in the previous slide. They can be used with a 20cm or 40m tether. Petzl ASAPs would also work but the ASAP does not remain connected to the harness when removed from the fixed line, creating a dropped object risk. However it would work well for a ‘1 Gantline & 1 Back up system’ as connection and disconnection is only on deck.
Practical Example
Ratlines (Fixed Ladders)

Other considerations:

UV damage
When using a fixed safety line for either ‘Double Clip to a Safety Line’ or a ‘Fall Arrest System’, consideration of decreased rope strength from UV damage needs to be factored in and the ropes replaced as part of a routine maintenance program.

Rescue Plan
Any of these systems will require a suitable rescue plan to be in place.