HSE
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Report on the investigation into the snagging of hooks and their indiscriminate shedding of slings/pennants

Phase 1

Prepared by
Independent Consultancy Engineering
for the Health and Safety Executive

OFFSHORE TECHNOLOGY REPORT

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Report on the investigation into the snagging of hooks and their indiscriminate shedding of slings/pennants
Phase 1

Independent Consultancy Engineering
30 Millsmead Way
Loughton
Essex
IG10 1LR
United Kingdom

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SUMMARY

This study addresses the potential for hooks, that are typically associated with offshore crane activities, to snag and/or to indiscriminently shed their slings or pennants.

The hook snagging study involved a series of practical tests conducted by HSL (Sheffield) using various steel sections as snagging elements which were swung into, at various approach angles, by both single point (with spring action safety catch) and load closing type hooks. The tests repeatably showed that both hook types would snag readily, particularly so on scaffold tubing, flat plate and lipped materials such as equal/unequal angle sections etc.

The sling shedding study also involved a programme of practical testing, conducted by HSL at Buxton. Such testing was initially conducted on Buxton's mobile site crane where it was found that one of the primary causes of sling shedding, under no load conditions, was due to a phenomenon known as 'Interrupted Simple Harmonic Motion' (ISHM). This is an operating condition, where the swinging hook/sling assembly, when hoisted rapidly, causes a rapid rate of change of velocity of the swinging assembly due to the constantly shortening length of its pendulum. This effect, induces severe disturbing forces, which cause slings and/or pennants to flail chaotically and violently, often resulting in their unsolicited shedding from the hook.

The dangers arising from both the snagging of hooks and the shedding of slings/pennants from hooks when operating in an offshore environment, can be potentially lethal.

The report makes several recommendations for design improvements to equipment and its operation as to reduce risks and enhance safety in the workplace. It also recommends that further tests to quantify the magnitude of the forces involved in ISHM mode, be carried out under a PHASE 2 report.

Details of the test rig, equipment used during testing and testing procedures are contained in HSL report ME/RE/24/1999.

The HSL Video and Presentation Section (VPS) have produced a video entitled 'Sight Your Hook' showing the events sequence of hook snagging and sling/pennant shedding processes.

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1. INTRODUCTION

This study was initiated by the Health & Safety Executive (HSE), Offshore Safety Division (OSD) in order to identify possible reasons for the numbers of occurrences for hooks snaggging on various objects and, for the unsolicited discharge or shedding of slings/pennants from non-loaded hooks during crane operations offshore. It should be noted that there have been a number of occurrences where snagging of a crane hook on supply vessels, has resulted in serious structural damage to the crane and in extreme circumstances, of the crane being pulled from its mountings, with the consequential loss of life. Sling shedding of non-loaded hooks offshore is a frequent occurrence, so far however, no cases of serious injury have been reported.

A qualitative research programme was developed at the Health & Safety Laboratory (HSL) to evaluate the potential for hooks to snag and their slings to shed. In both cases (snagging and shedding), testing was conducted so as to re-produce, as closely as possible, conditions representative of those arising during crane lifting activities offshore.

The hooks used in the testing programme were, Single Point Hooks (incorporating spring action safety catch) and Load Closing Hooks - closed by action of the load on the hook.

The hooks and other lifting equipment used in the testing programme are detailed in HSL report ME/RE/24/1999

Significant events arising during testing were video filmed in both normal and high speed modes.

Arising from the test programme, the Video & Presentation Section (VPS) at HSL have produced a video with commentary, showing the event sequences of hooks snagging and slings shedding from hooks. This video entitled 'Sight Your Hook' Ref. No. JP0109-074 is available from HSE Videos, Daniel House, Trinity Road, Bootle, Merseyside L20 3TW.

It should be noted, that this report assumes the reader is familiar with the terminology's of lifting equipment and their use, in an offshore environment.

2. HOOK SNAGGING

For a hook to snag, both the hook and the snagging object must meet up and occupy the same space at the same time. For the purpose of this report, this occurrence is termed the 'Meeting Point'. Offshore crane activities, which involve freely swinging crane hooks, movements of support/supply vessels and/or movement of the operating installation itself, provide many Meeting Point opportunities where hooks can snag in various ways on a variety of receptive objects such as, vessel/rig structures, deck cargo, wire rope slings and wire rope rigging systems (other than those of the crane).

The majority of crane hooks used offshore are either Single Point Hooks incorporating a spring action safety catch or, Load Closing Hooks (also known as self locking hooks) - held closed by the load on the hook.

Provided that the latch of the Load Closing Hook is retained in the open position (by its manually operated safety trigger), then both types of hook can snag readily in basically two ways; by totally embracing the snagging object or; by engagement of the point of the hook under the snagging object. If an upward force is provided by the hoist rope or a downward force provided by the snagging object, then both types of hook will take a 'bite' on the snagging object. This 'bite' can be particularly problematical with Load Closing Hooks, since the operating geometry of these hook will hold the 'bite' on (even with a slack hoist line), requiring manual intervention to effect its release. Whereas release of the Single Point Hook, may be effected by releasing the hoist rope tension, e.g., by lowering the hook. However, this does not necessarily guarantee full and ready release of the snagged hook.

2.1 Hook Snagging Tests

The hook snagging tests were conducted by HSL (Sheffield) using a variety of Single Point and Load Closing type hooks in conjunction with a variety of snagging elements including, scaffold tubing, equal and unequal RHS, equal and unequal angle sections, flat plate and wire rope sections. For details of:

- hooks/pennants see Table 1 below
- snagging agents see Table 2 below

Table 1: Wire rope pennants/hooks used for testing

Pennant No	Capacity Tonnes	Description	Termination Type	Effective Length (mm)
1	10	New Gunnebo BK 22-8 self locking	Flemish Eye	3,055
2	10	Used Gunnebo BK 22-8 self locking	Flemish Eye	2,030
3	10	New Gunnebo OK 18/20 point hook	Flemish Eye	2,020
4	15	Ansell Jones point hook	Laboratory	2,585
5	8	Kuplex KHX 16E self locking	Non-concentric	2,000
6	8	Pewag 16-8 LH16 self locking	Laboratory	2,365
7	8	Nicroman 16-8 SY CL self locking	Laboratory	2,365
8	8	Crosby S-316 A self locking	Laboratory	2,365
9	15	Safe Handling Unit (SHU)	Flemish Eye	3,370

Table reproduced, courtesy of HSL

Table 2: Snagging elements used during testing

Snagging Agent	Description	Dimensions (mm)
1	Scaffold tube (standard)	Diameter 48
2	Angle (equal)	50 x 50 x 4
3	Angle (unequal)	80 x 60 x 6
4	RHS tube	50 x 25
5	RHS tube	50 x 50
6	Flat plate	150 x 25
7	Flat plate (strip)	75 x 10
8	Channel	78 x 50 x 6.5
9	Wire rope (17 x 7 multi-strand steel core)	Diameter 24

Table reproduced, courtesy of HSL

Basically, after establishing the Meeting Point, the snagging tests involved swinging both the Single Point and Load Closing (latch open) type hooks from a set point, into the various snagging elements secured in the test rig. The test programme variables are outlined in the following four categories; for a more detailed account, refer to Section 2 of HSL report ME/RE/24/1999.

Category A

- Hook swinging straight-on into the snagging elements - rope plumb at point of strike.
- Hook swinging on the rise into the snagging elements - hook rearward of the snagging elements (rope angle negative at point of strike)
- Hook swinging on the fall into the snagging elements - hook forward of the snagging elements (rope angle positive at the point of strike).

Category B

- Hook swinging with zero rope angle approach to the snagging elements with:
    - hook at 90^0 (front-on) to the snagging elements
    - hook at 45^0 to the snagging elements
    - hook parallel (flat-on) to the snagging elements
- Hook swinging at 45^0 rope angle approach to the snagging elements with:
    - hook at 90^0 (front-on) to the snagging elements
    - hook at 45^0 to the snagging elements
    - hook parallel (flat-on) to the snagging elements

Note: Angles/disposition of the hook relative to the snagging elements are approximate.

Category C

- Hook pulled over the snagging elements from an initial rest position against these elements

Category D

- Closed hook, including its wire rope eye termination, swinging (hook flat-on) to end-on snagging elements

NB: Each testing event in each category was performed five times in order to confirm repeatability. A total of 687 tests were carried out, with each test recorded on film.

2.2 Findings

Category A

In all test sequences of this category, Single Point and Load Closing (latch open) hooks would snag readily on a variety of snagging elements. However, snagging was generally more difficult to achieve when the hook was rising into the snagging elements than when it was swinging straight-on, or on the fall.

It was notable on Load Closing hooks, that an open latch brought the hook's CG forward thus making its suspended attitude more conducive to snagging, particularly when swinging straight-on and, on the fall into the snagging elements.

Category B

In this category, both Single Point and Load Closing type hooks would snag readily, regardless of the angle of swing (offset or straight-on) of the rope, or the approach angle of the hook to the snagging elements.

Category C

In this category, both Single Point and Load Closing hooks would snag readily as they were pulled over the snagging elements from an original point of rest against these elements. It was particularly notable, that the Load Closing hook, because of its forward CG position due to the open latch, made it the more conducive to snagging.

Category D

With the meeting point pre-established, all hooks swinging flat-on, would snag readily by either the protruding element entering the main void of the hook or, entering its wire rope eye termination.

2.3 Overview

All hooks tested, i.e., Single Point/Load Closing types, fitted with and without a swivel shank, would snag readily and repeatedly on a variety of snagging elements under category A to D conditions. The exception to this, was a load connector device, known as the SHU (Safe Handling/Hauling Unit). The SHU is discussed further under Section 2.4 Special case.

On Single Point hooks, the large protruding point (forward of the safety catch), designed to facilitate easy sling fitment, was of itself a factor which encouraged snagging, seemingly with a natural affinity to do so.

Similarly, Load Closing hooks, with the latch retained in the open position (which changed its suspended attitude), also embraced the snagging elements, seemingly again, with a natural affinity to do so. The action to readily embrace a snagging element was particularly evident during hook pull-over tests.

It is clear that offshore crane operations, where the motion of the crane hook relative to other objects in motion (vessels structure, cargo etc.), will provide many snagging opportunities, particularly in conditions where the hook is out of sight of the crane operator. It is essential therefore, that all hook movements and its disposition, are constantly observed and conveyed by a responsible person, i.e., banksman, slinger etc. to the crane operator, from commencement to the end of the lifting operation.

2.4 Special case - Safe Handling Unit (SHU)

The SHU offers a new concept for load connection, designed to reduce the risk of snagging and, to minimise sling shedding. Basically, the device comprises a barrel type receptor, which houses the swaged nipple termination of a load carrying rope sling/pennant.

The sling/pennant is held captive in the device by a self closing/locking latch, see HSL Report ME/RE/24/199 for details.
Tests on this unit, showed that snagging occurred under category D conditions only, i.e., striking end-on to a protruding snagging element. However, a simple modification to the unit could eliminate snagging under category D conditions - see Section 2.6 item d).

2.5 Snagging at rope terminations

In addition to the hook snagging programme, it was found that rope slings/pennants that utilised non-concentric swaged/pressed terminations, would, by virtue of the large abutment of the swaging, snag readily on elements that featured clean edges or lips, such as, flat plate, channel, angle section etc. Tests showed that the snagging of such swaged terminations could be extremely damaging and, therefore, such terminations are not advocated for lifting activities offshore. A typical non-concentric termination is shown in HSL report ME/RE/24/1999.

2.6 Recommendations for reducing snagging risks

Single Point Hooks

a) Improve the profile as to minimise protrusion of the hook beyond its safety catch, by paring back the point of the hook closely to the safety catch. The lead point of the hook should also be profiled with an outer radius.

b) Improve the design of the latch so as to inhibit any occurrence for the hook to snag, whilst ensuring that any slings/pennants etc., remain captive at all times. E.g., by provision of a second, outer spring applied catch, or, by an effective practical mousing system.

Load Closing Hooks

c) Provide a latch that will close automatically under no load conditions and will remain closed until manually released. Note: Some hooks are able to achieve this requirement by ensuring that the leading edge of the manual release trigger when engaged, is ‘sharp’. Rounding of this leading edge, by manufacturing process or through wear, can lead to the catch springing open under certain impact conditions - see HSL reports IR/L/ME/94/01 and IR/L/ME/95/01/A.

SHU

d) Modify latch to prevent entry of protruding snagging elements by for example, extending the latch as to provide a barrier against any undue insertive obstructions.

NB: The recommendations made for Single Point and Load Closing type hooks, should provide safeguards against snagging under category A to C conditions whereas, incorporating recommendation (d) for the SHU should, because of its otherwise smooth profile, provide safeguards against all snagging conditions, i.e., category A to D.

Rope terminations

e) Rope terminations for slings/pennants should be of abutment free, non snagging profile, e.g., Flemish eye type terminations which feature concentric swaging that tapers down, almost to the outside diameter of the wire rope, thereby minimising any significant abutment or shoulder on the swaging, are preferred.

Non-concentrically swaged/pressed terminations are not recommended.

f) During lifting operations, the hook must be kept in view by a responsible person. If the crane operator cannot see the hook at all times, then a second party must be part of the operation that has sight of the hook.

3. SLING SHEDDING

The shedding of slings/pennants from hooks during non-load carrying crane activities offshore, occurs more frequently than perhaps hitherto reported. Many crane operatives have experienced such occurrences. However, those reports (HSE OIR Forms) submitted on such events, have not always been detailed enough as to adequately ascertain the reasons or to identify the root causes of the incident. Accordingly therefore, a qualitative research programme was undertaken by HSL in order to establish the primary reasons for the indiscriminate shedding of slings and pennants from hooks that are in typical use offshore, i.e., Single Point (with spring safety catch) and Load Closing type hooks.

Preliminary tests (in the lab) on Single Point hooks, showed that the spring catch could be readily defeated by the rotating action of the sling/pennant wire rope soft and/or hard eye terminations or masterlink. The rotating action being such as to bring one side of the wire rope eye termination or masterlink, back over the point of the hook onto the outer frontal surface of the spring catch. At this point, only a small amount of force is required on the latch to effect immediate release of the slings/pennant from the hook. This action is clearly demonstrated on the video.

For Load Closing type hooks, HSL (Sheffield) have previously demonstrated by laboratory testing, that these hooks can be sprung open by application of discreet blows (shock loads) at key points of the hook. The application of such forces are clearly demonstrated on the video. Under such circumstances, it is expected that any non-loaded sling carried by the hook at the time, is open to the risk of shedding. Additional information on self locking hooks opening under impact is contained in HSL reports IR/LME/94/01 and IR/L/ME/95/01/A

3.1 Sling/pennant shedding tests

The sling/pennant shedding test programme was progressed in two stages and developed in accordance with key findings arising from the various tests. The two stages included:

Stage 1. Laboratory tests (at Sheffield)
Stage 2. Field tests using a mobile crane (at Buxton)

Details of the two stages as follows

Stage 1. Laboratory tests

Attempts to induce sufficient agitation of the slings/pennant using the test rig (details in HSL report ME/RE/24/1999) as to rotate the wire rope hard and soft eyed terminations or masterlink, proved to be totally ineffective, i.e., it was not possible to inject enough energy into the system by manual means, even with a dimensionally scaled down system of hooks, slings, pennants etc. Laboratory testing of this type was therefore abandoned in favour of progressing the testing programme via Stage 2.

It is important to note however, that Stage 1 testing effectively demonstrated, that if the dimensions of the hook (Single Point type), wire rope eye terminations and masterlink were such as to physically prevent the terminations and/or masterlink from rotating outside the point of the hook and onto the outer frontal area of the safety catch, then sling shedding would not be possible. This aspect is demonstrated on the video and is a significant factor in preventing the indiscriminate shedding of slings/pennants from Single Point hooks.

It is recommended therefore, that the selection of slings, pennants, masterlinks etc. for any given hook, is such that they cannot be physically rotated, or in any way, make contact with the frontal outer area of the hook's safety catch. Users, i.e., riggers, slingers etc., of such equipment should verify this by simple manual manipulation of the hardware on the hook prior to use.

Stage 2. Field tests using a mobile crane

It should be noted that the Stage 2 testing programme, which was wholly qualitative, was limited by the size and performance of the mobile crane and, restricted by site topography which particularly limited the active height of lift.
The performance and other technical details of the crane, slings, pennants, hooks etc., are listed in HSL report ME/RE/24/1999. However, the significant factors are as follows:

- the crane was fitted with a combination single point swivel hook block, that could be used in single, two and three fall modes - block weight 170 kgs.

- the active height of lift was limited to approximately 8.0 metres

- maximum hoist rope speed was 154 fpm (47 mpm)

- the swinging action of the hook block/slings was initiated by the slew motion of the crane creating an out-of plane angle of the hoist rope of about 25^0 from the vertical.

Testing commenced with the hook block reeved two-fall, since in this mode, it was considered that the inherent instability of the block, would contribute to the slings or pennant on the hook to flail uncontrollably. It should be noted, that the instability of the block, stems from its centre of gravity being 85mm above the lowest hoist rope suspension point at the bottom of the block's sheave groove. Thus, the block was top heavy and was only constrained from overturning by the falls of rope at each side of the sheave groove.

Full details of the hook block, boom head and hoist rope reeving system are shown in HSL Report ME/RE/24/1999.

Various non-load carrying slings were attached to the hook, which was free to swivel about its axis and to pivot in plane of the sheave on its trunnion mountings. The block was extremely sensitive to the motions of the crane, where, its inherent instability contributed to providing significant disturbing forces to the slings/pennants. Chain slings, being more flexible than their rope counterparts, reacted with greater volatility to the dynamic forces generated.

More significantly however, it was found, that by interrupting the natural SHM of the swinging block/slings, i.e., by hoisting the block whilst it was swinging, the induced dynamic forces caused the block/slings to flail with appreciably greater violence. Basically, the hoisting action on the swinging block, rapidly increased the acceleration forces at the block, due to the ever shortening length of hoist rope (pendulum length) between the boom tip and hook block.
Unfortunately, the testing programme thus far, had to be abandoned, due to the ever increasing frequency of the hoist rope defeating the rope guards and becoming jammed between the boom head sheaves, boom head side plates and/or rope guards. However, one notable significant factor that was evident from the tests so far, was that the swivel action of the hook absorbed much of the induced energy from the flailing slings. It was therefore decided to modify the hook, to facilitate lock-out of both the swivel and the swinging trunnion prior to any further testing. Similarly, the gap between the rope guards and the outer diameter of the sheaves was also significantly reduced.

NOTE: Offshore cranes predominately use a non-swivelling hook in conjunction with rope of non-rotating construction when operating in single fall. When the crane is configured in two or more falls, the block usually facilitates swivel/pivotal movements of the hook.

With the above changes in place, testing was resumed, with the block reeved two fall and, with the swivel and pivotal motions of the hook locked-out. In this mode and, under conditions of ISHM, the flailing of the various slings/pennants and main hook block, were expressly more chaotically violent than seen in earlier testing, i.e., when the hook was free to swivel/pivot. The flailing slings/pennants were now snagging repeatably around the crane boom and, the main hoist rope was also being continually trapped between the cluster of boom head sheaves and/or the boom head side plates either side of the sheaves, causing damage to the hoist rope, sheaves, sheave side plates and rope guards.

Because of the continued damage arising, it was considered prudent to evaluate events with the hook block reeved in single fall, before the worsening damage to the crane resulted in a permanent halt to proceedings.

With the block in single fall and with the swivel/pivotal motions of the hook locked out, testing resumed as for the two-fall system. However, with the hook speed now twice that of the two-fall system, the block, slings or pennant assembly behaved considerably more violently than anything previously witnessed, resulting in the shedding of one two legged chain sling set and two types of single rope pennants.

Unfortunately, as with the two-fall system, the hoist rope was now constantly jumping across the four boom head sheaves at will, becoming trapped with regular monotony. During what was to be the last freeing process of a trapped hoist rope, the hook pivotal lock-out was sheared, and, because of this and of the continual snagging of the slings and trapping of the hoist rope, it was decided to abandon all further testing forthwith.

It was evident from these tests, that whilst a top heavy hook block (two-fall) contributed to inducing disturbing forces to the slings/pennants, it was significantly more evident that ISHM was the prime provider of even greater disturbing forces. This was particularly so in a single fall system where the hook speed (154 fpm) was twice that of the two-fall system (77 fpm).

Therefore, the single-most elemental factor that provides the primary disturbing force which causes slings or pennants to shed from the hook when swinging in SHM, is the speed (hoist speed) by which the block/sling assembly is lifted or, put another way, the rate by which the length of swinging pendulum is shortened.

The disturbing force(s) produced by ISHM is of such magnitude, inducing such chaotic violence, as to cause:

a) Damage to boom head sheaves (block of four aluminium sheaves), damage included severe abrasion and material fracture of sheave groove flanks

b) Spread of boom head sheave retaining plates (permanent set)

c) Hoist rope to abrade, kink, crush and basket.

d) Hoist rope guards to be bent (permanently set)

e) Hoist rope to jump from boom head sheave to boom head sheave and to jam between any sheave and/or retaining plates at will. NB: This meant that the hoist rope could pass through a gap of between 3 and 5mm (0.25 rope diameter) between the rope guard and the outside diameter of the sheaves.

f) Pennant rope to kink; seemingly by flailing (whiplash) action

g) Slings/Pennants to regularly wrap around boom structure

h) Excessive forces and wear imparted to the chandelier type over-hoist cut-out unit

j) Excessive lateral forces at the wedge/socket hoist rope anchorage (anchorage designed only to permit movement in-plane of the boom)

As mentioned earlier, the swivel action of the hook seemingly absorbs some of the flailing energy in the slings/pennants. Similarly, it was found that the fitment of an additional link between the hook and the rope sling/pennant eye also acted as an energy absorber. However, whilst the use of a swivel hook and/or fitment of an additional link might reduce the dynamic forces generated in the system, it should not necessarily be taken to mean that such an arrangement will prevent the occurrence of indiscriminate shedding. The dynamic effects and any energy absorbing qualities arising from the use of swivel hooks and the use of an additional link, would need to be assessed under a PHASE 2 testing programme.

3.2 Overview of Stage 2 Testing

The two major contributing factors to sling shedding emerging from this particular testing programme, are

i) the disturbing forces induced by the use of top heavy hook blocks and

ii) the disturbing forces arising from ISHM.

The latter being the most significant and, the main contributor to the problems identified a) to j) above.

The two factors mentioned may not have been previously recognised or understood by the lifting industry at large and/or, their effects on hardware listed a) to j), which may have mistakenly been attributed to other operational causes or actions. Recommendations for the hook designer, the crane designer and operators of lifting equipment are presented in Section 3.4 of this report.

3.3 Recommendations for Further Sling Shedding Testing

The testing programme carried out in this PHASE has been wholly qualitative, there being no measurement of the dynamic forces involved under conditions of ISHM. It is therefore recommended that further testing (PHASE 2) should be undertaken that focuses on the dynamic forces and their effects generated under controlled ISHM conditions. These forces should be monitored and recorded in real time according to various arcs of swing of the non-loaded hook block, various hoist speeds of the hook block and the rate of change of the length of pendulum of the swinging hook block. For such a testing programme, it would be preferable that the hoist speed and height of lift identify as realistically as possible with those achieved during crane lifting operations offshore. Testing should also quantify the effects of swivelling/pivoting hooks versus non swivelling/pivoting types since both types are widely used offshore.

3.4 Recommendations arising from Sling Shedding Testing

The forces arising from the effects of ISHM on hooks, slings and crane components as identified in this report can be potentially dangerous and damaging. Accordingly therefore, the following recommendations as appropriate, apply to crane designers, hook designers and crane operations personnel. Loosely categorised, these are:

Crane designers

01. Rope guards should be of robust construction, designed prevent permanent deformation. caused by rope 'whiplash' forces. The gap between rope guards and sheaves should be the minimum practical, preferably no greater than 0.25 times the rope diameter.

02. Over-hoist cut-outs of the 'Chandelier' type should be constructed to resist excessive forces and wear as induced by ISHM with particular attention given to the provision of high security anchorages.

03. Wedge/socket anchorages at the boom head should preferably permit pivotal movement in both the plane of the boom and lateral to the boom.

04. Avoid the use of 'Top Heavy' multi-fall hook blocks. Such blocks rely entirely on the rope in the sheave grooves to prevent the block from overturning. The constant movement between rope and sheave gives rise to wear and abrasion to both rope and sheave(s), particularly so when the block is reeved two-fall.

Hook designers

05. The design of the hook should ensure that slings/pennants remain captive under all operating conditions. For Single Point type hooks, consideration should be given to modifying existing hooks by 'mousing' in some cases, or, by fitment of both inner and outer spring applied catches.

Load closing type hooks should not open under impact conditions.

06. Alternative practical load connecting designs should be considered.

07. Review design of rope guards - see item 01.

08. Refer to item 04.

Crane operations personnel

09. Endeavour to avoid excessive swinging of the hook block/sling/pennant assembly and/or simultaneous fast hoist speeds.

10. Apply recommendations 01 to 08

11. Ensure that when selecting slings, pennants etc., the eye/master link terminations cannot be physically rotated over the point of the hook onto the outer frontal area of the hook.

12. Regularly inspect the hoist rope, slings and pennants for abrasion, kinks, basketing etc., and sheaves for wear and mechanical damage. Check for undue bending or shear damage of wire rope at anchorages, e.g., at wedge & sockets.

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Video, entitled 'Sight Your Hook' Ref. No. JP0109-074, produced by HSL Video and Presentation Section (VPS) is available from HSE Videos, Daniel House, Trinity Road, Bootle, Merseyside L20 3TW.

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