Canadian Coast Guard
Garde côtière canadienne

TP 9396E

WEAR STANDARDS FOR CARGO GEAR

Ship Safety Branch

Direction de la Sécurité des Navires

WEAR STANDARDS FOR CARGO GEAR

INTRODUCTION

These standards are primarily applicable to ship's cargo gear and are designed to limit strength loss due to deterioration of a part such that the remaining safety factor will not be less than 4:1 or, alternatively, the remaining strength will provide 80 percent of the original safety factor, where the original safety factor was less than 5:1. They are also intended to limit a loss of reliability in a part, due to increasing clearances or to changes in the condition of the part.

The values quoted in this standard are arrived at by test, statutory reference, calculations or are considered reasonable practices. They are intended as end-of-use standards. Changes to any limit will be considered if supporting data is provided.

In applying these standards, the necessary survey shall be made by a competent person, and in assessing a damaged structural member, the limiting loss shall be the proportional sum of the losses from any coincident indentation, bend or corrosion.

These standards may be applied to other than shipboard gear by applying the appropriate modifiers set out in the standard.

Where a certifying body stipulates a particular wear limit, such limit shall be observed.

TP 9396

CANADIAN COAST GUARD SHIP SAFETY BRANCH

WEAR STANDARDS FOR CARGO GEAR

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1.0 APPLICATION OF STANDARD TO OTHER THAN SHIPBOARD GEAR

1.1 Dock side loading equipment such as shiploaders, container cranes, and mobile cranes are generally designed with smaller safety factors than shipboard gear.

1.2 In order to ensure an adequate margin of safety, an adjustment to the indentation, corrosion, and deflection sections of this standard should be made, when the unadjusted design factor to yield is less than 2, or the column buckling less than 4. The unadjusted safety factor is the safety factor without allowance for such items as windload, snowload, or dynamic impact.

1.3 The adjustment to the standard where bending is critical shall be as follows:

Design Yield - 1 = Allowable Proportion

e.g. If the design safety factor to yield is 1.8, then only 80% of the allowable limits set out in the subject sections should be used.

1.4 The adjustment to the standard where column bucking is critical shall be as follows:

$$\frac{\text{Column Safety Factor}}{4} = \text{Allowable proportion}$$

e.g.If the design column safety factor is 3, then only 75% of the allowable limit set out in the subject sections should be used.

1.5 In the absence of specific data, the following criteria should be used.

Shiploaders, container cranes, and similar structures:

SF Yield:1.5
SF Column:3

Mobile Cranes:

SF Yield:1.25
SF Column:2

2.0 WEAR LIMITS

2.1	Shackles, Links, Rings Chains and similar parts	:	Full SWL up to 10% wear
2.2	Pins	:	Full SWL up to 10% wear (subject to clearance limitation for fitted pins)
2.3	Lugs	:	Full SWL up to 10% wear
2.4	Swivels Eye Stock	:	Full SWL up to 10% wear
		:	Full SWL up to 10% wear, or maximum arc freedom 14 degrees
	Block	:	Full SWL up to 20% loss of depth

Also, where swivels are provided in rigging arrangements, they are to be free other than where their function is redundant.

The wear loss is to be measured as loss of diameter or section depth.

2.5 Loose gear such as hooks, rings, shackles, chains, etc., which have been flawed, significantly strained or deeply nicked, are to be removed from service.

Flaws: Defects in the metal such as tears, cracks and poor welds.

Significant Strains: Deformation such that the part has been bent or twisted 5 degrees or more (1 in 10), or parts in tension that have suffered a permanent elongation, or hooks that are deformed by opening up.

Rings, links, etc. which have suffered a loss of form equal to 10% of the affected dimension, across the whole part.

Deep nicks: Nicks that after suitable grinding out would reduce the bar dimension in way of the nick by 10% or more.

3.0 SHEAVES OF BLOCKS OR BUILT-IN SHEAVES ON CRANES OR DERRICKS

3.1 The table below gives the minimum sheave groove wall thickness required for sheave metal of 28 tonnes PSI (432 N-mm^2) tensile strength. Intermediate values are proportional:

SWL of Wire	Minimum Thickness in Track Area of Sheaves
2 tonnes	4.0mm
4 tonnes	5.5mm
6 tonnes	7.0mm
8 tonnes	8.0mm
10 tonnes	9.0mm
12 tonnes	9.8mm
14 tonnes	10.6mm
16 tonnes	11.0mm

3.2 At least the thickness shown on this table should exist over the lower curved section of the sheave groove. The walls of the groove may taper to 1/3 of the above value at the rim, and the rim should be smooth. The actual rim could be a little less than 1/3 provided the wall thickness taper is as first described.

3.3 This table may be used with cast steel, forged steel, ductile iron, malleable iron and other similar materials. Grey cast iron sheaves require a wall thickness of twice the value shown above. This latter type of material can be detected as thin sections will break rather than bend.

3.4 The table is intended for use with sheaves having central web plates or spokes. Sheaves with double central web plates with the groove path located between them must have a groove thickness of at least 6mm for all safe working loads shown on the table. At 8mm the sheave must be cleaned and checked for defects particularly in the quadrant welds.

3.5 Scoring in the track of a sheave is regarded as having a wearing effect on the wire used in association with that sheave. Sheave wall thickness should be measured from the bottom of the scores. Greasing the wire and sheave will help minimize wearing effect. For moderate scoring recognized by the existence of flats between adjacent scores, where examination of the wire shows it to be in good condition, no further action is needed; if, however, the outer wires are worn over 25% and occasional broken wires are found, replace the wire. Severe scoring is recognizable by the virtual absence of flats between the score marks. The condition should be corrected without undue delay, so that a possibly deteriorating condition is not allowed to continue.

3.6 The wire used in association with severely scored sheaves should be in virtually new condition.

4.0 INDENTATION

4.1 COMPRESSION MEMBERS

4.1.1 Round tube sections:

(1) Up to 10% indentation - Full SWL

4.1.2 Box tube sections:

(1) Indentation affecting depth, and including corner deformation: Up to 8% indentation - Full SWL

(2) Indentation affecting width only: Up to 10% indentation - Full SWL

4.1.3 “I” beam sections:

(1) WEB - No deformation

(2) FLANGES - Upper and lower together - each arm 15% deflection at the tip. (The percentage is taken on the distance from web to tip.) - Full SWL

4.1.4 Angle sections:

(1) AT CORNER - No general indentation. However, small scars not deeper than half metal thickness or longer than twice thickness - Full SWL

(2) AT FLANGE - Up to 15% deflection one arm, or sum of both equal to 15% - Full SWL (The percentage is taken on the inside flange width.)

4.1.5 On compression members, indentations shall not produce contours in way of maximum indentation exceeding the following:

Contours Measured Along Thrust Line	% Perimeter of Section Indented
1 in 2	10%
1 in 3	15%
1 in 4	20%
1 in 5	25%
1 in 6	30%

4.1.6 With respect to local bending stress in the indented area, it is essential that it be able to redistribute itself, and to enable this to occur, there must be no creasing, tearing, or cracking of the metal in the indented area.

4.1.7 Where several tubes are used to make a composite compression member, while no significant change in the overall modulus may occur due to a 10% or 15% indentation in an individual tube, the permitting of deeper indentations rated on the whole section would tend to produce contours in the damaged area, such that its ability to resist compressive stress across the damaged area would be seriously impaired. Consequently, each tube used in the formation of a composite member is limited in its individual damage to the same extent as if it were a single member.

4.1.8 The limit of involvement of parameter in indentation is 30%.

4.2 CANTILEVERS AND BEAMS IN BENDING

4.2.1 On compression side - No indentation at reaction points as indentation here will normally have occurred from overloading; elsewhere on the member, half of the limit for full compression members for corrosion, indentation ancontour, provided no local distress of the metal is evident. However, a cantilever with a uniform section may have a progressively larger degree of damage, up to the same limit as compression members, towards its outer end in proportion to the decrease bending moment.

Note: The failure of beams and cantilevers is by yielding. The original safety factor for a mild steel cantilever or beam would be about half of the safety factor to critical buckling of the same member used as a column.

4.2.2 On tension side - Indentation and contours to same standard as full compression members.

4.3 PURE TENSION MEMBERS

Providing there is no tearing, cracking, creasing or similar distress of the metal, the indentation or bending of the member is not considered critical. To limit local stress, the contour at the indentation should not exceed 1 in 2.

5.0 SLIGHTLY BENT COMPRESSION MEMBERS

5.1 The maximum deflection of centre line of compression members having a uniform bend over their whole length (e.g. derricks and crane jibs) shall be 1/250 of the length of the member, but shall not exceed 50mm.

5.2 The deflection is to be measured with the gear in a loaded condition to include the effect of compound bending.

5.3 Column deformation of angle iron section perpendicular to the ZZ axis not to be greater than the thickness of the material. (Also see indentation limit.)

6.0 CORROSION

6.1 PLATES, TUBES, “I” BEAMS, OR “L” SECTIONS

6.1.1 The loss of material at any particular section shall not exceed 15% of the total cross sectional area, also

- up to 25% depth of loss overall on any face of a tube
- up to 30% depth of local pitting (compensation factor .75)
- up to 30% depth of local severe corrosion patches (compensation factor 1.25) and partial combinations of the above not exceeding 15% of the original total cross-sectional area.

6.1.2 A reduction factor of 0.75 is used in conjunction with pitting to reflect the fact that a total loss of material does not occur with pitting.

6.1.3 An augmenting factor of 1.25 is used to compensate for the lost material between the 30% corrosion patch and the lesser corroded remaining part of the member.

Example: A box section tube 380mm x 760mm x 12mm, with 30% pitting effecting 380mm lineal of the cross section, and a 30% corrosion patch effecting 130mm lineal of the cross section.

Cross sectional area 26784mm^2

Allowable section loss 26784 x .15 = 4017mm^2

Perimeter 2280mm

Loss due to pitting and corrosion patch:
(380 x 12 x .3 x .75) + (130 x 12 x .3 x 1.25)
= 1611mm^2

Remaining allowable loss 4017 - 1611 = 2406mm^2

Maximum depth of corrosion permitted on rest of section :

$$\frac{2406}{1770} = 1.4\text{mm}$$

6.2 BOLTS

6.2.1 The maximum corrosion loss for bolts is as follows:

Body - 10% of diameter of the body of the bolt

Head - 20% loss of depth - but not reduced to less than .4 of the root diameter of the bolt
Nut - 20% loss of depth - but not reduced to less than .8 of the root diameter of the bolt Loss of width of head or nut must not reduce the dimension across the flats up to the half height of the head or nut, to less than 1.25 x diameter of bolt hole or washer hole. The upper part of the head or nut may be further reduced to 1.25 x bolt diameter.

7.0 CLEARANCES IN FITTED PARTS

7.1 SHEAVE PIN CLEARANCE

.1 Sheave with roller bearing: 1mm total free movement
.2 Sheave with bushed bearing: 2mm total free movement

7.2 PINS ON WHICH THE LOAD IS APPLIED ABRUPTLY

e.g. Jib pivots of a slewing crane.
Heel block cross pins: 4mm maximum free movement

7.3 PINS WHICH ACCEPT SLOW ROTARY MOVEMENT WHILE UNDER LOAD

e.g. Gooseneck and trunnion pins of a swinging derrick.
Derrick heel cross pins when luffing: 4mm + 2% of pin diameter

7.4 PINS NOT SUBJECT TO ROTARY MOVEMENT WHILE UNDER LOAD

e.g. Gooseneck, heel cross pin, and trunnion pins of a derrick which is being used in a fixed condition. Pinned joints in structures: 6mm + 2% of pin diameter

7.5 CRANE MOUNTINGS

.1 Roller bearing type: 3mm maximum vertical free movement
.2 Pintle type: 4mm total lateral free movement

7.6 The above clearances are related to the workability of the parts rather than to strength. As clearance develops bearing pressures will increase, alignment changes may interfere with rotational freedom, and take-up motion may subject the parts to high dynamic loads.

8.0 CRACKS

8.1	Where the load lifted directly induces bending, shear, or tensile stress into a part. Also main parts usually in compression such as derrick booms and the longitudinal members of crane jibs.	No visible cracks in any such part.

8.2 Diagonal or cross bracing or brackets and other similar parts which serve to reduce slenderness ratio, or stiffen structures.

So long as a crack does not threaten penetration into the main structure, cracks may be permitted which are not more extensive than the lesser of:

(i) 10% of lineal connection
or
(ii) 3 X metal thickness.

8.3 For round sections, the whole perimeter is taken as the lineal length of the connection. For box sections or angle sections, each straight is considered separately.

8.4 GANTRY RAIL WELDED ATTACHMENT

Where the rail flange is welded to the structure the extent of cracking in any of the flange attachment welds shall be limited: -

(a) For continuous welds:

10% of the length of the weld not exceeding an individual crack length of 30 cm.

(b) For intermittent welds:

The end welds on any section must be intact.
Any short intermittent weld with any visible crack shall be regarded as having failed.

In any rail section not more than 10% of the intermittent welds shall have failed.

(c) Welded rail clips shall be regarded as similar to intermittent welds.

(d) Cracks shall not penetrate into or exist, in the foundation plate or main support structure, or the rail itself.

9.0 GEARING

9.1 OPEN GEARING

9.1.1 For all open gear systems such as spur and pinion winch drives, transporter drives, or rack and pinion drives, where failure of the gearing would result in loss of the load or equipment, the wear on the teeth should not reduce the tooth thickness on the pitch circle to less than 55% of the base thickness of the tooth.

9.1.2 The pitch circle is considered to be at half the actual working depth of the teeth.

9.1.3 Where transporter drives are not critical, by virtue of multiple fitted systems or other reasons, gears which have reached the above wear limit shall be subject to independent engineering review before effected equipment is used, and additionally shall be scheduled for replacement or further review at monthly intervals.

9.1.4 Gearing on subcritical systems shall be replaced once the flat at the top of the tooth has disappeared and the pitch circle width of the tooth has fallen to 45% of the base width.

9.2 ENCLOSED GEARS

Gearing forming part of enclosed reduction gears or gear boxes must be replaced if mating surfaces are breaking down irrespective of the actual wear.

9.3 SPLINES

Splines shall be replaced if there is any sign of wear or damage.

10.0 BRAKES

10.1	Automatic brakes on electric winches and brakes on electric motor systems generally.	Brakes to be in good apparent order. No sag rate at working loads.
10.2	Automatic brakes whether internal or external, on hydraulic winches in excess of 1000 PSI working pressure.	Brakes to be in good apparent order. No sag rate at working loads.

10.3	Automatic brakes on hydraulic winches of up to 1000 PSI working pressure.	Brakes to be in apparent working order, with slippage at working loads not to permit a sag rate at the hook in excess of 1m. minute. There is to be an observable reduction in the drum rendering rate between the controller being placed in neutral and subsequent to the brake setting. Where topping and main line winches are involved, the combined sag rate shall not exceed 1m. minute.
10.4	Manually applied brakes on low pressure hydraulic winches where the brake can be applied from the operator's position.	Brakes to be in sufficiently good condition to retard the descent of the working load. Without the brake being applied, the sag rate at the hook shall not exceed 1m. minute.
10.5	Slew brakes:	These shall provide effective stopping of the slew, with the ship heeled 3 degrees, and with the jib being slewed downhill, across the centre line of the vessel at full SWL and maximum radius. - Stopping efficiency at load point same as table in subsection 10.7

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10.6	Hydraulic slew systems:	Where slight creep occurs in a low pressure slew system (<1000 psi), with controller in neutral, provided the slew brake test is passed, lateral creep under the same condition as the

	slew brake test shall not exceed 1m. minute. Where a sag problem also exists, the combined sum of the sag and lateral slew shall not exceed 1 m. minute.
10.7 Brakes on drive systems for gantries and trolleys driven by electric motors or hydraulic motors.	<u>Operating Speed</u> <u>Stopping Distance</u> 0.25m/sec 0.3m 0.5m/sec 1.2m 1.0m/sec 2.0m At speeds above 1.0m/sec. Stopping distance at maximum speed not to exceed distance from the slowdown limit switch to end of travel buffer.

11.0 SAG RATE

11.1 Sag rate shall mean the rate at which the cargo hook of a crane or derrick descends, with the controller in neutral. It is measured without the application of manually applied brakes, but after the automatic brakes have set, and after the expiry of any brake delay function which is designed into the system.

11.2 Where any sag rate occurs involving an electric winch, no further use of the winch to be made until the brakes have been serviced and the winch brakes tested at full proof load. This applies whether or not the winch is fitted with single or multiple brakes, and irrespective of the type of brake fitted.

11.3 Where any sag rates occurs involving a hydraulic winch with a working pressure in excess of 1000 PSI, no further use of the winch to be made until the motor, pump and brake have been checked and serviced where necessary, the problem corrected, and the system tested at full proof load.

11.4 Where any hydraulic winch with a working pressure of up to 1000 PSI, whether fitted with automatic brakes or not, is responding properly to its controls and is in apparent good order, other than for a sag rate problem, and is not exhibiting any erratic behaviour, and pressure levels are normal; then as the winch itself has better inherent braking function due to the larger fluid volumes involved, less critical clearances due to lower pressures and is often designed with a moderated sag rate resulting from lubrication clearances in the system which has increased as a result of wear, then the crane or derrick associated with this winch may be used up to full working load, so long as the sag rate does not exceed 1 meter per minute.

11.5 A division point of 1000 PSI was taken on the basis of it being a neutral area, as low pressure systems are about half this pressure and high pressure systems about twice this pressure.

11.6 <u>GUIDELINES FOR THE INSPECTION OF HIGH PRESSURE CRANES</u>

A high pressure crane is defined as a crane having a hydraulic hoist motor with a working pressure in excess of 1000 psi.

.2 Prior to witnessing the crane in operation handling a load, assurance should be obtained from the ship that the low pressure sensor (6 bar switch or equivalent), monitoring the line pressure at the low pressure side of the hoist motor, is in circuit and set correctly.

.3 If the response of the crane is not in accordance with the controller input, including a failure to lift the rated load or to lower the load smoothly, the crane should not be used pending correction of that condition.

.4 If the loss of performance when handling a load is in the hoist system itself, the leak rate of both the hoist motor and pump are to be checked by a crane technician and compared to the manufacturer's specifications.

.5 If a stop use citation is issued due to the structural condition of the crane, such as may arise for example from indents, wear or rope conditions, the correction of the condition and the resumption of use of the crane would be the same as for cargo gear in general.

If the citation was issued due to system malfunction, correction of the condition is to be confirmed by a crane technician's report.

12.0 WIRE ROPE (STANDING GEAR, RUNNING GEAR, SLINGS, ETC.)

12.1 In addition to other consideration relative to the condition of a wire rope such as corrosion or distortion of lay, the wire rope may be assessed as follows:

.1 Wear limit 40% of the diameter of the individual outer wires where the condition is fairly general. (International Standard 4309)

(For Seale construction wire ropes limit loss to 35%)

This condition may be recognized by the virtual elimination of the valley between adjacent wires at the crown of the strand, or examination of the section of a broken wire.

In examining a wire rope for wear, compare a working section with a nonworking part so that flattened wire types are recognized.

.2 10% of the wires broken in a length of 8 diameters.

.3 Reduction in diameter of the wire rope in excess of 7% when elongation of the lay has occurred or a strand is becoming buried, or reduction in wire rope diameter in excess of 10% with the lay still uniform.

.4 Combination of wear and broken wires, as follows:

% Wear on Outer Wire	% Broken Wires in 8 x D
40% (35% for Seale Type Wires)	Nil
up to 35%	1%
up to 30%	5%
up to 25%	9%
under 25%	10%

12.2 The above table is aimed at preserving 80% of the strength of the wire rope so long as the wire rope is not corroded or suffering numerous internal breaks which have not been considered. The lay of the wire rope should be opened at one or two places if its internal condition is doubtful.

12.3 Additionally, the number of allowable broken wires shall be reduced by multiplying the number given in the table by the following factors, where they apply:

Condition	Adjustment Factor
Breaks within 1D of fitting	.3
Breaks within 3D of fitting	.4
Seale construction	.7
Damage concentration in strands away from end fittings - 1 strand	.5
- 2 stands	.8

12.4 Wire ropes which have been designated as subject to internal fatigue failure, should be replaced if any external wires are found to have fatigue breaks.

12.5 Multi strand wire rope shall, in addition to any wear limits common to other wire ropes, be limited to component wire loss in a lay length, in any strand, to a number not exceeding 1/3 of the number of component wires in the strand.

Where 1/3 of the wires is a fractional number, the next highest number shall be taken.

Examples of Wire Evaluations:

e.g. 6/19 regular laid rope, about 25% wear on outer wires.
Broken wires in most strands.
Total wires = 114; permissible loss 9% = 10 wires in 8D

e.g. Same rope as above but with broken wires close to fittings - (apply wear factor even if local wear is less than wear in main part of wire. This is to compensate for fatigue).
Total wires = 114 x .09 x .3 = 3 wires at fitting

e.g. Same ropes as above - damage in one strand only.
Total wires = 114 x .09 x .5 = 5 wires in 8D

e.g. Seale laid rope 6 (9/9/1) about 30% wear.
Broken wires in most strands.
Total wires = 114; permissible loss 5%.
Seale factor .7
Allowable wire loss = 114 x .05 x .7 = 4 wires in 8D

Note: The .7 compensation factor is applied to Seale laid wire rope as it has a significantly larger proportion of its metallic cross section concentrated in the outer wires.

13.0 WEBBING (SLINGS, ETC.)

13.1 With respect to general deterioration, and where doubt exists as to the remaining strength of webbing or rope slings, then one or more sample slings representing the quality of the slings in question shall be tested to destruction. Obviously, poor slings should be culled out.

13.2 Where the safety factor is found to be:

.1 4.5 or better; slings to remain in service without qualification.

.2 4.0 or 4.5; slings to be retired after current cargo operation is completed.

.3 less than 4; slings to be removed from service.

13.3 With respect to damage occurring on slings and provided that the above safety factors are maintained, the limits on acceptable wear are as follows:

.1	Edge Damage	-	Maximum penetration of any actual cutting, not to exceed an amount equal to the thickness of the webbing.
.2	Abrasion	-	This may be extensive in areas covering the whole width of the webbing and may be of sufficient depth to sever the surface cordage, particularly in multiple webbing. In any case, the penetration of the abrasion is not to exceed an approximate 15% of the thickness of the webbing, taken as a proportion of all plys. The abrasion, where it approaches the above limit should occur on one side of the webbing only, or proportionate wear on both sides.
.3	Local Damage -	(a)	Warp thread damage up to 50% of sling thickness but not extending to within 1/4 width of the edge, and damaged area not exceeding 1/4 width of the sling, or proportionately warp thread damage to full depth, but not extending to within 1/4 width of the edge, and damaged area not exceeding 1/8 width of the sling.

(b) Weft thread damage allowing warp thread separation up to 1/4 width of sling - and extending in length not more than twice the sling width.

.4 Reasonable combinations of the above types of damage of approximate equal total effect are acceptable.

.5 Areas of damage reasonably separated should be considered independently.

14.0 ROPE (RUNNING GEAR, SLINGS, ETC.)

14.1 STRANDED

Stranded ropes with the following deterioration to be discarded:

.1 where cutting or abrasion has severed 20% of the yarns in a strand, at one point; or 10% of the total yarns in the rope at any length of 20 diameters. Two yarns at 50% abrasion are considered equal to a cut yarn and proportionate abrasion, or

.2 where the surface fibbers are brittle and break on twisting or bending, or

.3 where the surface fibbers are loose to the extent that they can be manually pulled out, or

.4 where the interior of the rope is no longer clean and bright, or

.5 where any general breakdown is occurring in the rope. The most practical way to ascertain this is to cut a representative piece of the rope in two, then shake out the yarns and examine them. If the individual yarns are not able to withstand a manual pull, reject the rope, or

.6 where a representative sample is found to have a safety factor of less than 4:1.

14.2 <u>BRAIDED CORE AND COVER TYPE - (Running Gear, Slings, etc)</u>

Braided ropes with the following deterioration to be discarded:

.1 where cutting or abrasion has circumferentially severed 25% of the perimeter of the outer braid, or

.2 where the cutting or abrasion has longitudinally severed the outer braid for a distance equal to the diameter of the rope, or

.3 where abrasion affecting the rope surface generally has reduced the exposed yarns to 40% of their original size, or

.4 where a representative sample is found to have a safety factor of less than 4:1.

15.0 BOLTED CONNECTIONS

15.1 When evidence exists that a bolted joint which is required to have pre-loaded bolts has lost pre-load in some of the bolts or has suffered bolt failure, the joint shall be evaluated and corrected as follows:

(i) The required pre-load and torque for the bolts shall be ascertained.

(ii) The bolts in the joint shall be torqued in the tightening direction to 2/3 of the required set-up torque.

(iii) Where the sum of missing bolts and bolts found under- torqued at the 2/3 level, exceed 10% of the bolts in the joint, then all of the bolts in the joint, then all of the bolts are to be drawn for inspection (in crane mountings draw alternate bolts as a group). All defective bolts are to be replaced and the mounting rebolted to the specified bolt torque.

(iv) Where the sum of missing bolts or under-torqued bolts does not exceed 10% of the bolts in the joint, replacement bolts and slack bolts may be torqued to specification, and the other bolts left undisturbed.

An entry shall be made in the machinery register recording the repair.

(v) It should be noted that a special provision applies to log barge cranes, requiring that once a pre-loaded bolt has been removed from the mounting it will not be re-used.

16.0 DE-RATING OF CARGO GEAR

16.1 No immediately applicable provisions are made for de-rating cargo gear worn beyond the limits described in this standard, to permit its use at a reduced safe working load.

17.0 USE OF "ON OR BEFORE RETURN" CITATIONS

17.1 These are citations which require correction of a condition, before the vessel presents the subject gear for use, on a subsequent return voyage. This type of citation would be appropriate in the following instances:

(i) Gear which is noted to be worn beyond permissible limits, but which the ship elects not to use and not to repair at that time.

(ii) Gear which, after survey, is noted to be very close to its wear limit.

(iii) Gear which is noted to be accumulating a significant amount of subcritical damage.

(iv) Certification or identification problems of a less than critical nature.

17.2 For dock gear and stevedore gear, similar citations may be used, but an appropriate time limit should be stipulated for scheduling repairs or supply of parts.

Note: In order to make prominent in the ship's records that an unresolved safety-related condition exists with some part of the ship's cargo gear, the surveyor issuing an "ON OR BEFORE RETURN" citation, shall make an entry in the machinery register, in the column provided for an entry relating to a condition affecting the safe working load of the cargo gear.

The entry should be made as follows:

DATE:..PORT..

REPAIRS ARE PENDING TO PART OF THIS SHIP'S CARGO GEAR - SEE

CITATION #.................................. DATED:..

SIGNATURE:...

AUTHORITY:...