Lifting and rigging

OPERATIONS

Instructor

Andy Bruce

AIMS AND OBJECTIVES

Target Audience:-

This 3 day course is intended for all categories of personnel involved in slinging and lifting operations.

AIMS:-

To ensure delegates have an understanding of the legal requirements pertaining to hoisting and lifting operations, the practical ability and skills necessary to direct crane operations using both British standard hand signals and radio communications, the requirements for pre-use inspection and discard criteria of lifting equipment, the safe working procedures for slinging operations and to ensure delegates can use lifting equipment safely and effectively.

SAFETY

- ALARMS
- MUSTER POINT
- FIRST AID
- MINIMUM PPE TO BE WORN
- QUARRY EDGES, ETC.
- COLOUR CODE
- MEAL BREAKS ETC.
- FIRE EXTINGUISHERS

COURSE TIMES

0830 > 1700.

Content:-

Legislation
Regulations
H S E Guidance
British standard hand signals
Basic Crane Appreciation
Weight estimation
Pre- use examination of lifting equipment
Inspection of lifting equipment
Safe operating procedures
Slinging of various loads
Wire rope safety, inspection and care
Load stability
Safe slinging principles
Radio communication

L O L E R

Reg`s Cont`d

6. Every employer shall reduce to as low as possible.

- **The load from striking people.**
- **Load drifting.**
- **Falling.**
- **Being released unintentionally.**

7. Every employer shall ensure that
I.e. equipment for lifting people is clearly marked.

8. Properly planned
Properly supervised
Carried out in a safe manner

L O L E R

Loler regulations

1. Came into effect 5th Dec 1998.
   From this date holders must comply with all the all duty requirements.
2. Defining the terms etc.
   I E. 1974 act means the Health and safety at work act 1974.
3. To whom and where.

- Ships Merchant Shipping.
- Slips Trips And Falls.
- Risk Assessment.

4. Calls upon the employer to ensure that the strength and stability are adequate.
5. Lifting equipment for lifting persons.

L O L E R

Reg`s Cont`d

9. Thorough examination and inspection.

- Lifting persons every 6 months.
- Accessories lifting gear slings hooks shackles 6 months.
- Lifting equipment, mechanical device capable of raising or lowering a load 12 months.

10. Report and defects.

11. Keeping of information.

LIFTING OPERATIONS
APPLICABLE LEGISLATION

- HEALTH & SAFETY AT WORK etc 1974.
- MANAGEMENT OF HEALTH&SAFETY AT WORK REGULATIONS 1992.
- LIFTING OPERATIONS AND LIFTING EQUIPMENT REGULATIONS 1998.
- PROVISION AND USE OF WORK EQUIPMENT REGULATIONS 1992 (AMENDED 1998).
- MANUAL HANDLING OPERATIONS REGULATIONS 1992.

LIFTING OPERATIONS APPLICABLE LEGISLATION

HEALTH & SAFETY AT WORK etc ACT 1974

- EMPLOYERS RESPONSIBILITIES
  - It shall be the duty of every employer to ensure,as far as is reasonably practicable, the health, safety and welfare at work of all his employees.
- EMPLOYEES RESPONSIBILITIES
  - To take reasonable care for the health and safety of themselves and others who may be affected by their acts or omissions.
  - They must co-operate with their employers as far as is necessary to enable that duty or requirement to be performed or complied with.
  - No person shall intentionally or recklessly interfere with or misuse any equipment provided in the interest of health,safety or welfare.

LIFTING OPERATIONS
APPLICABLE LEGISLATION

Management Of Health & Safety At Work Regs 1992

- Requires employers and self employed persons to assess the risks to workers and any others who may be affected by their undertaking
- Employers with five or more employees must also record the significant findings of that assessment
- Assessment should be reviewed and if necessary modified when the nature of the work or the physical conditions of the work place changes.
- Suitable and sufficient risk assessments should -
  - be carried out by a competent person
  - ensure that all relevant risks or hazards are addressed
  - determine the likelihood of injury or harm arising
  - take into account any existing control measures.

LIFTING OPERATIONS
APPLICABLE LEGISLATION

Management Of Health & Safety At Work Regs 1992 cont`d

-Identify the measures that employers must take in order to comply with their duties under the applicable health and safety legislation.

-Generic or “model”risk assessments are acceptable where similar activities are being under taken in similar places of work.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Provision And Use Of Work Equipment Regs 1992

- **Every employer shall:-**
- Ensure that work equipment is so constructed or adapted as to be suitable for the purpose for which it is used or provided.
- The suitability of work equipment should be addressed from three aspects.
  - it's initial integrity,- the place where it will be used,- the purpose for which it will be used.
- In selecting work equipment every employer shall have regard to the working conditions and to the risks to the health and safety of persons which exist in the premises or undertaking in which the work equipment is to be used.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Provision And Use Of Work Equipment Regs 1992 cont`d

- "suitable" means that it must be suitable by design, construction or adaptation for the work it is provided to do and suitable in every respect which it is reasonably foreseeable will affect the safety and health of any person.
- Risk assessments carried out under the MHSWR will help employers to select work equipment and assess it's suitability for particular tasks.

Every employer shall ensure:-

- That work equipment is maintained in an efficient state,in efficient working order and in good repair,and the where there is a maintenance log it is kept up to date.

LIFTING OPERATIONS
APPLICABLE LEGISLATION

Provision And Use Of Work Equipment Regs 1992 cont'd

- The use of work equipment is restricted to those persons given the task of using it.
- That all persons who use or supervise the work equipment have available to them adequate health and safety information and where appropriate written instructions pertaining to its use.
- That all persons who use work equipment have received adequate training in the methods which may be adopted when using the work equipment, any risks which are entailed and precautions to be taken
- That effective measures are taken to prevent contact with dangerous parts of machinery,this includes measures at four levels-fixed enclosing guards,other guards or protection devices,protection appliances and the provision of information.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Manual Handling Operations Regs 1992

- Manual handling operations-means any transporting or supporting of a load by hand or bodily force -I.e. lifting, pulling, pushing, carrying, putting down or moving thereof by hand or bodily force.
- They refer to the manual handling of loads by human effort as opposed to mechanical handling by a crane or other such equipment.
- A load in this context must be a discrete moveable object but does not include an implement, tool or machine while in use.
- The reg`s seek to prevent injury to any part of the body and as such account should be taken of physical properties which may effect grip or cause direct injury.
- Each employer shall so far as is reasonably practicable,avoid the need for his employee to undertake any manual handling at work.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Manual Handling Operations Regs 1992 cont`d

- Where it is not reasonably practicable to avoid the need for the employee to under take manual handling which involves the risk of injury,the employer shall make a suitable and sufficient assessment of all such manual handling operations.
- The assessment should be carried out by a competent person and shall take into account the task,load,and working environment.
- Properly based generic assessments are acceptable if they draw draw together common threads from a range of broadly similar manual handling operations.
- Manual handling assessment findings must be recorded.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Lifting Operations And Lifting Equipment Regulations 1998

- **Regulation.1-** Citation and commencement-lays out scope and timing.
- **Regulation.2-** Interpretation -Definitions
- **Regulation.3-** Application-Details where and to whom the regulations apply.
- **Regulation.4-** Strength and stability-Calls upon the employer to ensure that the strength and stability of lifting equipment is adequate for use.
- **Regulation.5-** Takes precedence over all other **LOLER** reg`s when lifting of persons is to be carried out.
- **Regulation.6-** Positioning and installation of equipment to minimise risk.

LIFTING OPERATIONS APPLICABLE LEGISLATION

Lifting Operations And Lifting Equipment Regulations 1998 cont'd

Regulation. 7-Marking of equipment to reflect SWL.

Regulation. 8-Organisation of lifting operations to reflect operational safety,adequate supervision and planning.

Regulation. 9-Thorough examination and inspection to ensure valid certification,proper manufacture and fitness for use.

Regulation.10-Reports and defects places a duty on the examiner to provide a report of examination to employer and HSE in certain circumstances.

Regulation.11-Keeping of information to ensure that initial conformity certificates and examination reports follow a piece of equipment.

Schedule.1- Information for report of thorough examination contains a list of key information which must be recorded.

OFFSHORE SPARROWS

PRE - JOB BRIEFING TOOLBOX TALK RECORD FORM

CLIENT:	LOCATION:	
JOB NUMBER:	DATE:	TOOLBOX TALK NO THIS JOB:
NATURE OF TASK:		

	YES	NO	N/A
SECTION 1 -SITE / INSTALLATION SAFETY INDUCTION			
Site/Installation safety induction and platform orientation completed satisfactorily.			
SECTION 2 - JOB INTRODUCTION, PLAN & METHODS			
Objectives of job discussed and each step of job identified and organised			
Potential hazards/obstructions/conflicting activities identified			
Permit to Work viewed/discussed with all work party members. Posted at job site			
Work party aware of precautions/control measures/PPE to be applied as a result of Risk, COSHH and Manual Handling assessments relevant to the Work Pack			
SECTION 3 - RESPONSIBILITIES			
Group and individual responsibilities identified for each stage of the job			
Each crew member clearly instructed and aware of their role			
SECTION 4 - MANPOWER			
Individual workforce assignments for each step of job identified			
Equipment and tools for job discussed and identified			
Emphasised to work party that duties to be carried out as instructed and no deviation from procedure unless discussion takes place and prior approval given			
SECTION 5 - LIFTING OPERATIONS			
Method for each lifting operation discussed in detail on a step-by-step basis			
Confirmed that members of work party involved in lifting ops have experience to carry out task and are familiar with safe slinging/rigging/lifting principles			
Confirmed that personnel not included in lifting ops are kept clear of area affected			
Confirmed that personnel involved in lifting ops are positioned correctly and have identified suitable escape route in the event that lift goes wrong			
SECTION 6 - HOUSEKEEPING/ACCESS			
Confirmed that all access/work platform scaffold is erected exactly to required specification and has been tagged as safe for use by a competent person			
Emphasised that all cables and hoses must be run neatly and that tools/equipment be stored tidily on job site when not in use, removed to storage when not required			
Instruction given that all debris and combustible material/fluids be removed from site as soon as practicably possible after use. Site tidied at least once per shift			

SECTION 7 - OTHER TOPICS DISCUSSED	
1.	4.
2.	5.
3.	6.

SECTION 8 - ATTENDEE SIGNATURES (ACKNOWLEDGING UNDERSTANDING OF TOOLBOX TALK)	
1.	6.
2.	7.
3.	8.
4.	9.
5.	10.
NAME OF PERSON CONDUCTING BRIEFING/TOOLBOX TALK (BLOCK LETTERS)	
SIGNATURE OF PERSON CONDUCTING BRIEFING/TOOLBOX TALK	

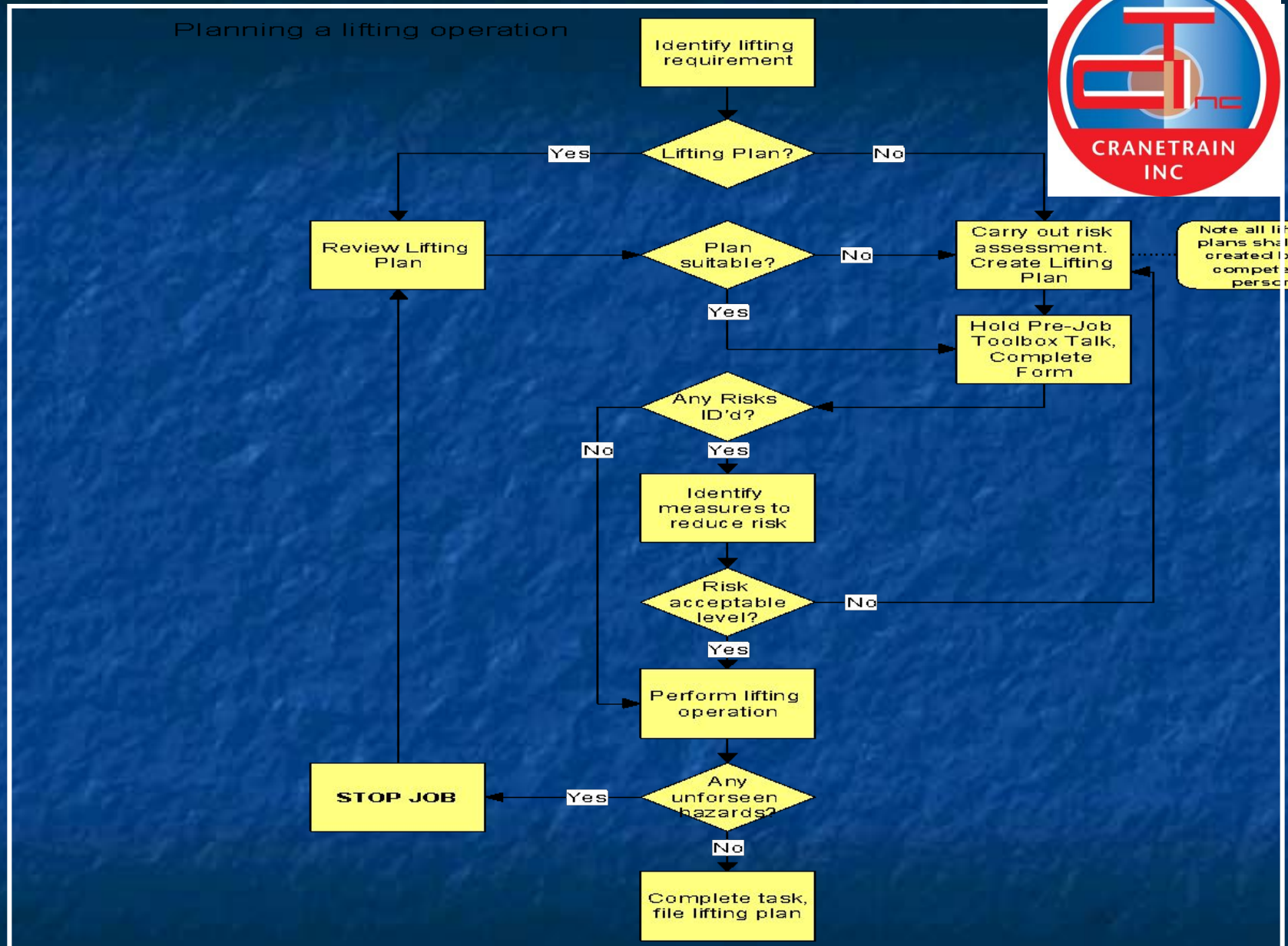
Lifting Operations Flowchart

Requirement for lift identified

Appoint Competent Person(s) to plan and supervise lift.

Assess operation for degree and nature of risk. Identify lift category. Implement control measures.

Categories of lift	Control Measures
ROUTINE	
Routine Crane Operations/Lifting Operation – e.g. Deck operations, boat transfers – Suitable environmental conditions – Load with known and evaluated weight, shape and centre of gravity – Standard rigging arrangements	Carried out by competent personnel e.g. Deck Crew/Crane Op./Riggers Written procedures or Standing instructions, Generic Lifting Plan. Toolbox Talk/TRIC card Rigging & Lifting Handbook
NON- ROUTINE	
Simple or Basic Lifting Operation – Only one item of lifting equipment – Standard rigging arrangement – Stable, known weight with adequate lifting points – Out-with sensitive, difficult or restricted area	Carried out by competent personnel e.g. Riggers, Deck Crew & others who have training in hoisting & lifting/rigging skills Permit to Work Generic Lifting Plan or Written Lifting Plan Toolbox Talk/TRIC card Rigging & Lifting Handbook
Complicated or Standard Lifting Operation – Lifting personnel – Extended duration e.g. More than 1 shift – Use of two or more items of lifting equipment (Tandem lifts) – Within sensitive, difficult or restricted area	Carried out by competent Riggers/Crane Op. Written Lifting Plan. Permit to Work Risk Assessment Toolbox Talk/TRIC card Rigging & Lifting Handbook
Complex or Specialised Lifting Operation – Lifts over live plant – Unknown or difficult to estimate centre of gravity – Use of two or more items of lifting equipment (Tandem lifts) – Environmental conditions liable to affect operations – Non-standard rigging or equipment	Carried out by competent Riggers/Crane Op. Impact/Hazard Study Method statement/Lifting Plan with engineering input required Permit to Work Risk Assessment Toolbox Talk/TRIC card Rigging & Lifting Handbook



CRANETRAIN INC

TRAINING PRESENTATION

CRANETRAIN INC

LIFTING OPERATIONS PLAN

PAGE 1 of 1

Location:	Area:
Permit No.:	Risk Assessment No:
Generic Lifting Plan No: 05	Method Statement No.:

Is Diagram/Sketch Of Lifting Operation Enclosed? YES/NO

Description Of Lifting Operation:

Weight Of Load: ACTUAL / ASSESSED (delete as appropriate)

Lifting Equipment & Accessories To Be Used (specify type,swl & colour code)

All Lifting Operations Require The Following To Be Considered But This List Is Not Exhaustive.

weight, size, shape and centre of gravity of load	working under suspended loads
method of slinging/attaching/detaching the load	overturning/load integrity/need for tag lines
availability of approved lifting points on load	environmental conditions including weather
pre-use equipment checks by operator	experience, competence and training of personnel
proximity hazards, obstructions, path of load	number of personnel required for task
conflicting tasks in area	communication requirements

Task Details (Step By Step)

Method(s) Of Communication To Be Used Radio ☒ Verbal ☐ Hand Signals ☒

Steps Taken To Eliminate Danger To Personnel Involved & Others, Including Barriers Where Appropriate:

De-brief and learning points:

Planned By: Name: Keith Woodall Signature: Date:

Reviewed By: Name: Signature: Date:

CRANETRAIN INC

LIFTING OPERATIONS PLAN

Location: Sparrows Main Yard	Area: Rigging assessment Lifting frame
Permit No:	Risk Assessment No: WE/RA/01
Generic Lifting Plan No: 01	Method Statement No.: N/A
Is Diagram/Sketch Of Lifting Operation Enclosed? YES/NO	N/A

Description Of Lifting Operation: Lift and install spool piece from west side of lifting frame to the east side of lifting frame and install to existing flange on the lifting frame

Weight Of Load: 630 KGs *ACTUAL* / ASSESSED (delete as appropriate)

Lifting Equipment & Accessories To Be Used (specify type,swl & colour code): Red colour code

Minimum of 2 tonne SWL wire rope slings,webbing slings and ton line slings. Minimum of 1500 Kg chainblocks / pullifts

Tirfor machine 1.6 Tonne, 4.7 tonne shackles, 1tonne beamclamps and 2 tonne beam trolleys .M24 Collared eye bolts

All Lifting Operations Require The Following To Be Considered But This List Is Not Exhaustive.

weight, size, shape and centre of gravity of load	working under suspended loads
method of slinging/attaching/detaching the load	overturning/load integrity/need for tag lines
availability of approved lifting points on load	enviromental conditions including weather
pre-use equipment checks by operator	experience, competence and training of personnel
proximity hazards, obstructions, path of load	number of personnel required for task
conflicting tasks in area	communication requirements

Task Details: (Step By Step)

1	Carry out Pre-job brief/toolbox talk.Task based risk assessment with all concerned parties
2	Sling spool piece with suitable and sufficient slings and master link
3	Anchor tirfor to pad eye at east side of lifting frame
4	Reeve tirfor wire through a snatch block which is anchored directly above the load
5	Install beam clamps and beam trolleys at strategic points on both runway beams
6	Attach appropriate lifting equipment to beam clamps and trolleys
7	The spool piece will then be hoisted from the deck using the tirfor to ascertain centre of gravity
8	Transfer the spool piece from tirfor to beam clamp No1
9	Transfer spool piece from beam clamp No1 to beam trolley A
10	Trolley load along runway beam and transfer to beam clamp No2
11	Transfer load from beam clamp No2 to beam clamp No 3 then to beam trolley B
12	Trolley load along runway beam and transfer to beam clamp No4
13	Transfer load from beam clamp No 4 to central padeye situated above existing flange on lifting frame
14	Utilising equipment/accessories from rigging loft manouvere load to mate flanges and bolt down accordingly
15	Strip down lifting equipment and accessories and carry out post use inspection return to rigging loft

Method(s) Of Communication To Be Used: Radio ☐ Verbal ☐ Hand Signals ☐

Steps Taken To Eliminate Danger To Personnel Involved & Others, Including Barriers Where Appropriate:

De-brief and learning points:

Planned By: Name:	Signature:	Date:
Reviewed By: Name:	Signature:	Date:

sparrowsoffshore

LIFTING OPERATIONS PLAN

PAGE 1 of 1

Location: Kittiwake Alpha	Area: Helideck to Pipe deck
Permit No.:	Risk Assessment No: KWA/HLRA/002
Generic Lifting Plan No: 02	Method Statement No.: N/A
Is Diagram/Sketch Of Lifting Operation Enclosed? YES/NO	N/A
Description Of Lifting Operation: Routine use of platform cranes for transfer of cargo from helideck to pipedeck	
Weight Of Load:	ACTUAL / ASSESSED (delete as appropriate)

Lifting Equipment & Accessories To Be Used (specify type, swl & colour code)

Pre-slung containers and cargo baskets with certified lifting bridle and shackles

Installation pedestal cranes / Crane cargo handling pendant

All Lifting Operations Require The Following To Be Considered But This List Is Not Exhaustive.

weight, size, shape and centre of gravity of load	working under suspended loads
method of slinging/attaching/detaching the load	overturning/load integrity/need for tag lines
availability of approved lifting points on load	environmental conditions including weather
pre-use equipment checks by operator	experience, competence and training of personnel
proximity hazards, obstructions, path of load	number of personnel required for task
conflicting tasks in area	communication requirements

Task Details (Step By Step)

1	The lifts are containers and cargo baskets with certified lifting points, and fitted with a certified lifting bridle
2	All personnel associated with lift to review specific risk assessment/lifting flow chart and complete toolbox talk proforma prior to commencing lifting operation
3	Competent Crane Operator to carry out pre-start checks/inspections of Crane and record on PMR proforma
4	Integrity of loads and associated equipment to be checked by deck crew personnel
5	A minimum of 2 competent deck crew to be in attendance throughout lifting operation (with VHF portable radios)
6	Banksman/Crane Op to ascertain environmental conditions are within crane parameters
7	Under the instruction of the banksman position crane boom over load and ensure load line is plumb
8	Ensure no conflicting activities ongoing in surrounding/landing areas and load path is clear of obstructions
9	Attatch master ring of loads lifting bridle onto crane cargo handling pendant
10	Instruct crane operator to take up slack on lifting arrangement and raise load from deck slowly (under instruction)
11	Crane op to raise load to clear any obstructions and follow banksman instructions to transfer load to landing area
12	Deck crew to ensure landing area is clear of personnel and obstacles/conflicting activities
13	Banksman to instruct crane operator to lower load slowly, (ensure load line is plumb) into position on landing area
14	Cargo handler to detach lifting bridle master ring from crane cargo handling pendant
15	Raise empty hook under instruction from banksman and return crane to stowed position

Method(s) Of Communication To Be Used Radio ☑ Verbal ☐ Hand Signals ☑

Steps Taken To Eliminate Danger To Personnel Involved & Others, Including Barriers Where Appropriate:

Vigilant observation

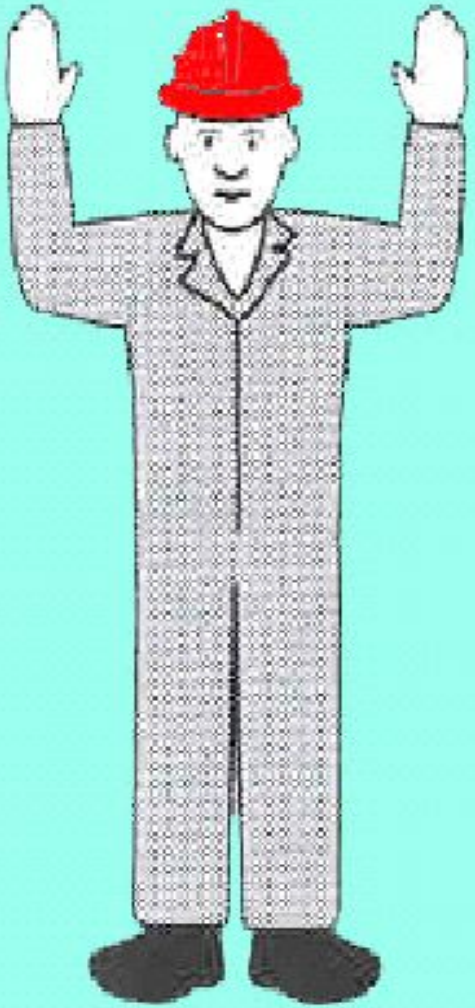
By deck crew and crane operator.

De-brief and learning points:

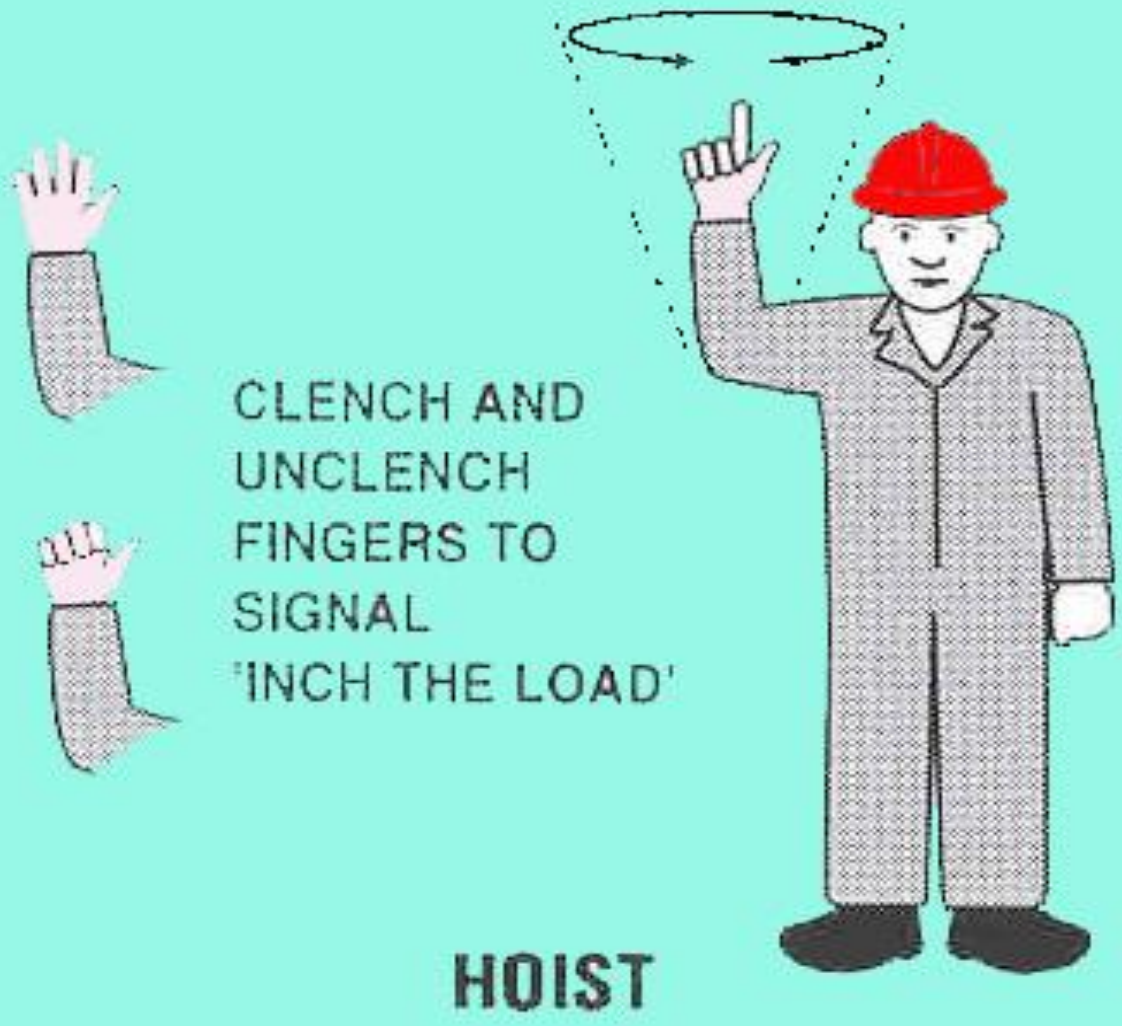
Planned By: Name: C Milne	Signature:	Date:
Reviewed By: Name:	Signature:	Date:

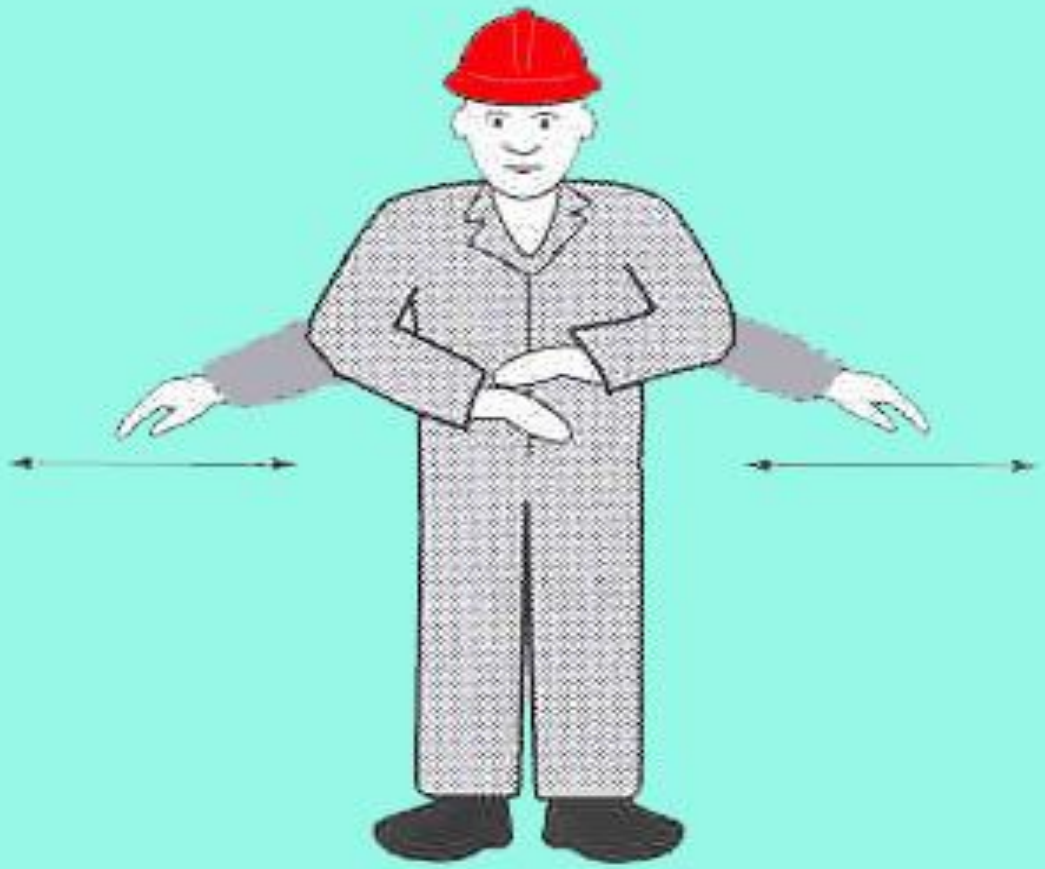
TRAINING PRESENTATION

STOP



EMERGENCY STOP


CLENCH AND
UNCLENCH
FINGERS TO
SIGNAL
'INCH THE LOAD'
HOIST



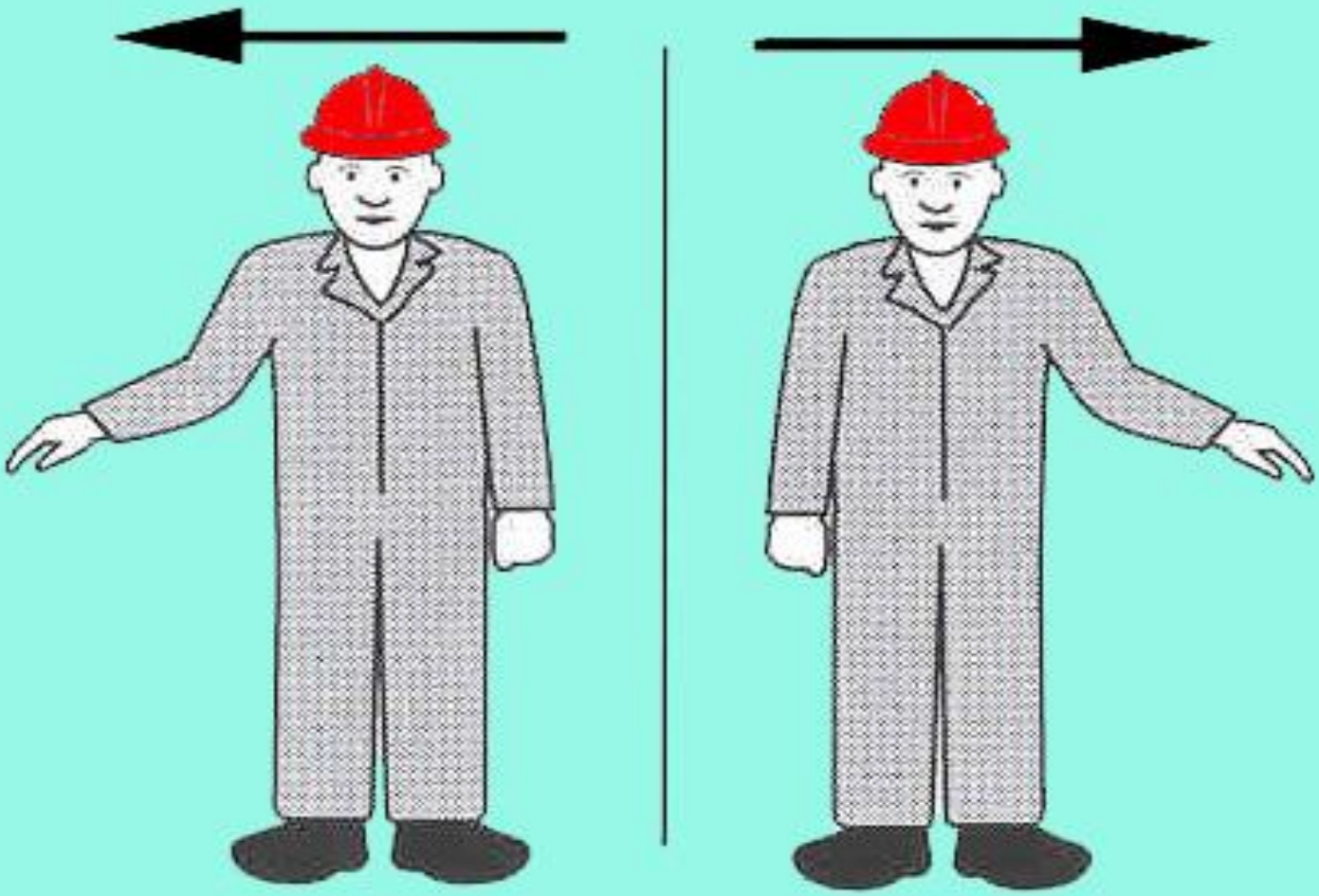
OPERATIONS CEASE

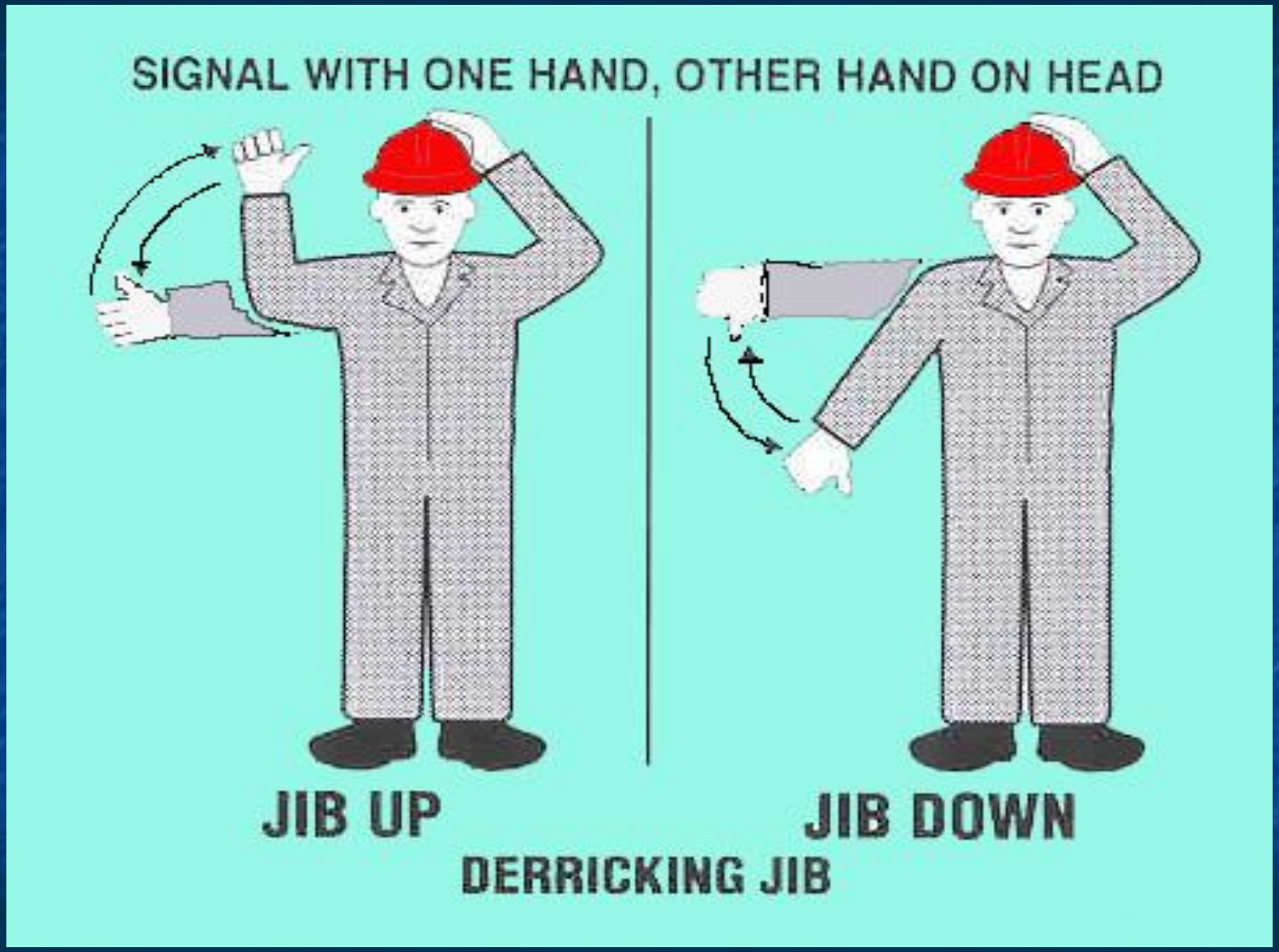
OR CEASE TO FOLLOW MY INSTRUCTIONS

TRAINING PRESENTATION

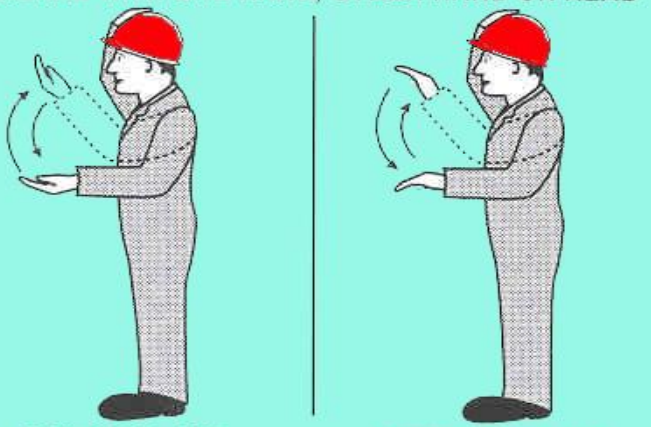
LOWER SLOWLY

LOWER


SLEW IN DIRECTION INDICATED

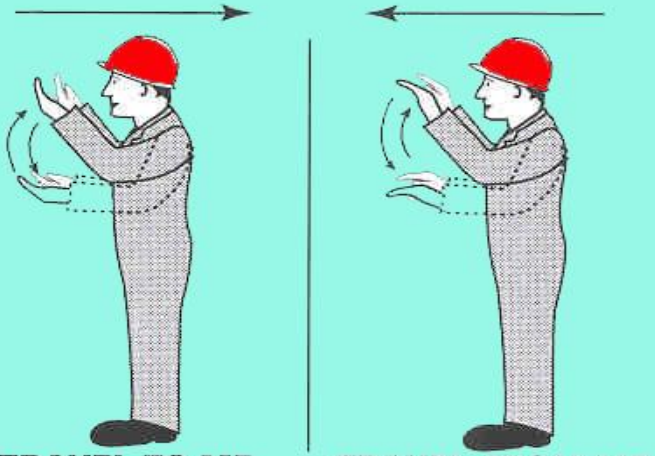

SIGNAL WITH ONE HAND, OTHER HAND ON HEAD
JIB UP
JIB DOWN
DERRICKING JIB

SIGNAL WITH ONE HAND, OTHER HAND ON HEAD



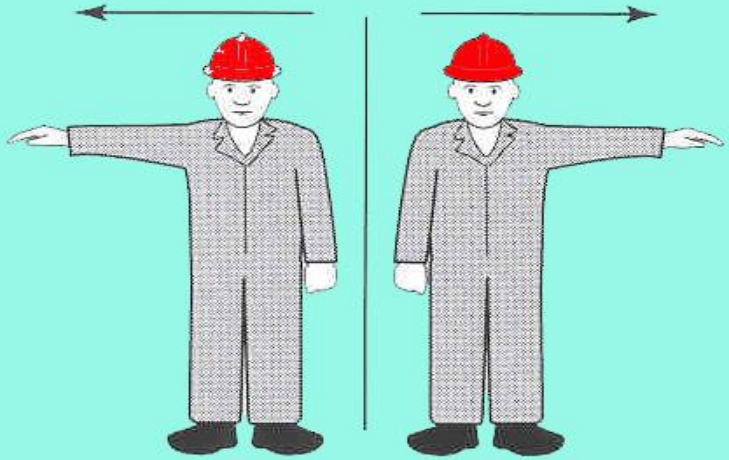
EXTEND JIB RETRACT JIB

TELESCOPING JIB



TRAVEL TO ME TRAVEL FROM ME

SIGNAL WITH BOTH HANDS



TRAVEL IN DIRECTION INDICATED

GUIDELINES FOR SLINGER/BANKSMAN

1. Do everything possible to ensure the safety of personnel and equipment.
2. Be familiar with the crane working range,load radius and boom angle.
3. Know and understand appropriate safe slinging principles.
4. Inspect lifting accessories each time before use.
5. Know the weight of the load and the slinging methodology.
6. Be able to select the correct equipment for the job in hand.
7. Be aware of obstructions and hazards within operating range.
8. Know and understand the method of banksman hand signals.
9. Give clear and precise hand signals.
10. Use correct protocol during radio communication.

GUIDELINES FOR SLINGER/BANKSMAN

11. Warn personnel in the area of the movement of the load.
12. Never lift a load over personnel.
13. Never stand beneath a load or allow other personnel to do so.
14. Ensure hands are clear from lifting gear prior to lifting loads.
15. Always ensure an escape route is available prior to lifting loads.
16. Always use tag lines especially for awkward loads.
17. Ensure a minimum of **3** personnel is deployed for each lifting operation. I.E. Crane operator,Banksman and slinger.
18. If anything out of the ordinary occurs - **STOP and CHECK.**
19. Be aware of potential snagging points in the vicinity of the load whilst hoisting/lowering in restricted areas.
20. Be aware of wind speed and direction which could affect the lifting operation.

BANKSMAN

CRANETRAIN INC

5 SIMPLE RULES FOR A BANKSMAN

1. Know the weight of the load.
2. Use the right Lifting equipment for the job.
3. Attach it correctly to the load, ensuring that the hook is over the C of G of the load.
4. Before lifting ensure that hands are clear of the slings.
5. Lift slowly and carefully. Ensure all personnel are clear of the load.

CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

PROTOCOL FOR THE USE OF TWO WAY RADIO COMMUNICATIONS

- Call signs should be set up and adhered to.
- Call signs must be used at all times in order to establish the authenticity of commands or directions.
- At the end of an instruction or enquiry,the transmitting operator should indicate the end of the message by the command ‘over’.
- The receiving operator should indicate understanding of the dialogue by the response “roger”.
- Under no circumstances should the transmitting operator assume understanding without the acknowledgement I.E. “roger”.
- If any dubiety exists regarding the message, the receiving operator must not acknowledge but repeat the message as he understands it and ask for confirmation, or simply request the transmitting operator to repeat.

CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

PROTOCOL FOR THE USE OF TWO WAY RADIO COMMUNICATIONS

- At the close of communications the transmitting operator should indicate the end on transmission by the command "over and out".
- Bearing in mind the broadcasting legislation, under no circumstances should profane language be used while transmitting.
- Bearing in mind that these radios are transmitting at a high output, should the antenna ever become damaged exposing the central core, the antenna must be immediately replaced in order to maintain not only optimum performance but to ensure user safety.

CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

GENERAL INFORMATION ON THE USE OF TWO WAY RADIO COMMUNICATION

- The Crane Operator and Banksman should establish a clear understanding and line of communication prior to the commencement of any lifting operation. Radio messages should reflect work requirements only. General conversation should not be carried out over the air waves.

- Always ensure that you fully depress the transmission button before speaking into the microphone. Speak clearly at all times. Do not release the button until a few seconds after completing your message.

CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

GENERAL INFORMATION ON THE USE OF TWO WAY RADIO COMMUNICATION

- When banking the crane ensure that any accompanying colleagues' radios are switched off. When more than one radio is switched on in close proximity, it is inevitable that interference and/or distortion of the signal will take place when an instruction is transmitted.

- When you have established a clear line of communication with the crane operator ensure that if you move position you re-establish that he is still receiving your message clearly.

- During high winds ensure that the area of the microphone you speak into is not exposed to direct contact with the wind. Otherwise the background noise created may distort the transmission.

CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

GENERAL INFORMATION ON THE USE OF TWO WAY RADIO COMMUNICATION

- During 'blind' lifts where the load is being hoisted or lowered for a long time (eg shaft/leg work) do not maintain the transmission button in the depressed position for the duration of the lift. Likewise do not give an instruction at the commencement of the lift and then cease communication until the lift has almost reached its destination.

  Give the initial instruction and then talk to the Crane Operator every 10-15 ft to reassure him that your line of communication is still active and that you are maintaining control of the lift.

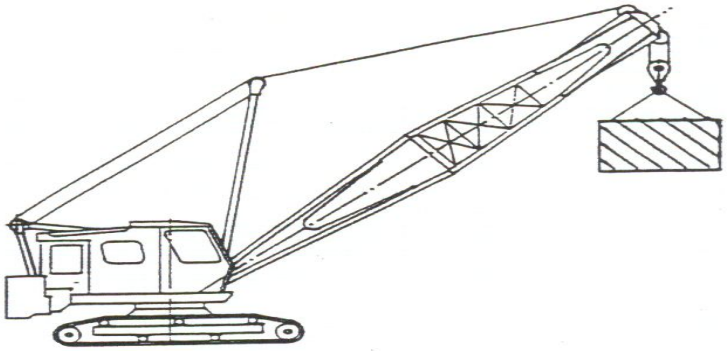
CONTROLLING CRANE OPERATIONS BY TWO WAY RADIO COMMUNICATION

CONTROLLING CRANE OPERATIONS
BY TWO WAY RADIO COMMUNICATION

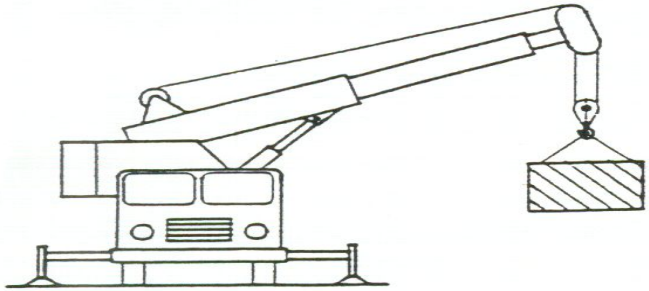
- Ensure the radio microphone is not exposed to rain. If a plastic carrying case offering full protection of the radio is not available, a simple precautionary measure such as a small plastic bag or a piece of cling film around the microphone will ensure it is maintained in a dry condition.

- Do not carry radios in pockets. Always ensure they are carried in protective holsters attached to the body by either should lanyard or waist belt, quite apart from maintaining the integrity of the radio this measure will also ensure that you are not exposing other personnel to danger should the radio be dislodged from your pocket or dropped from hand when working at height or climbing ladders.

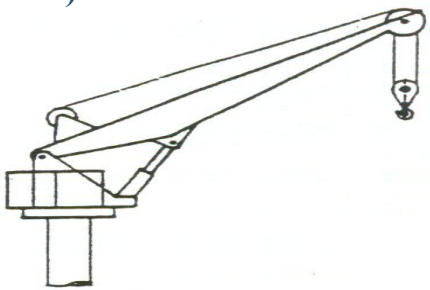
CRANES AND BOOM TYPES



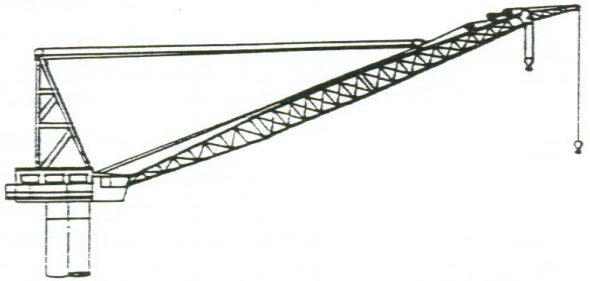
CRAWLER MOUNTED LATTICE (STRUT) BOOM



TRUCK MOUNTED TELESCOPIC



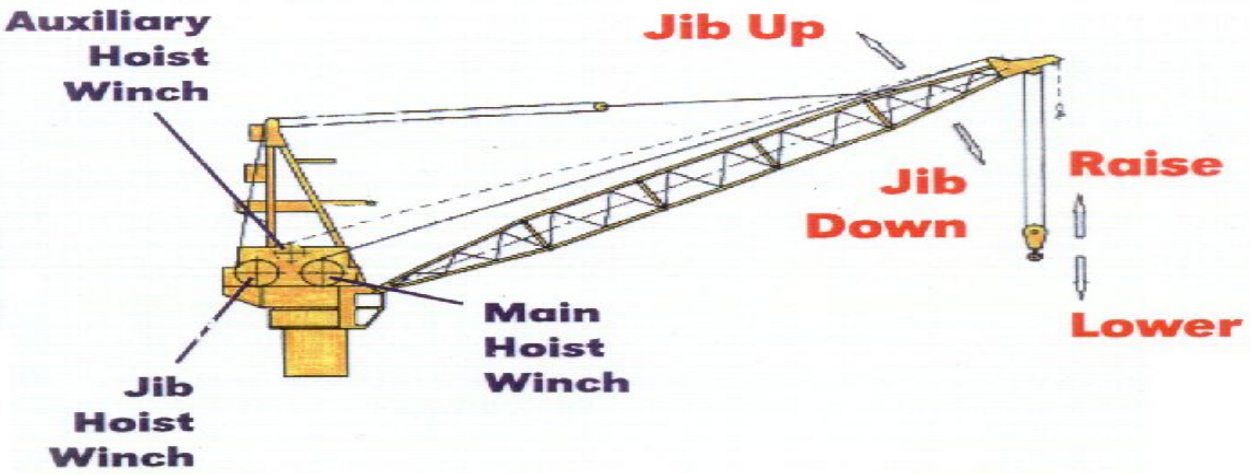
PEDESTAL MOUNTED FIXED BOX

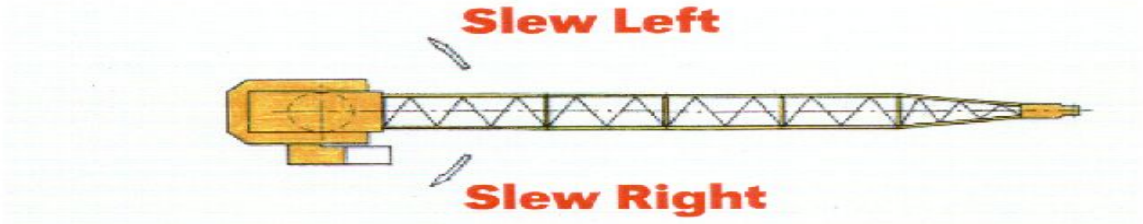


PEDESTAL MOUNTED LATTICE (STRUT) BOOM

TRAINING PRESENTATION

Crane functions





STABILITY

STABILITY BASE CRAWLER CRANE

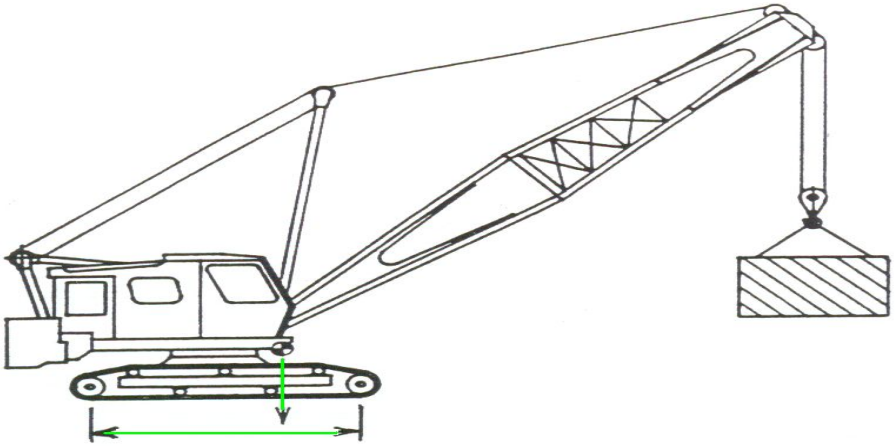
CENTRE OF GRAVITY

NO LOAD

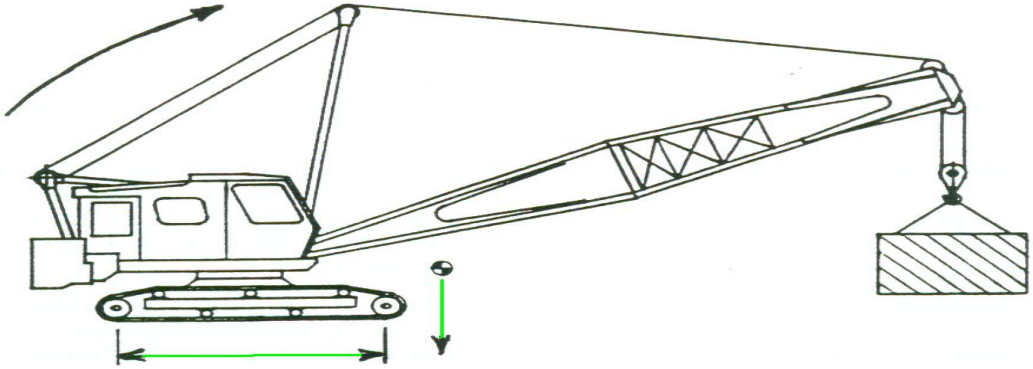
WITHOUT OUTRIGGERS

WITH OUTRIGGERS

STABILITY

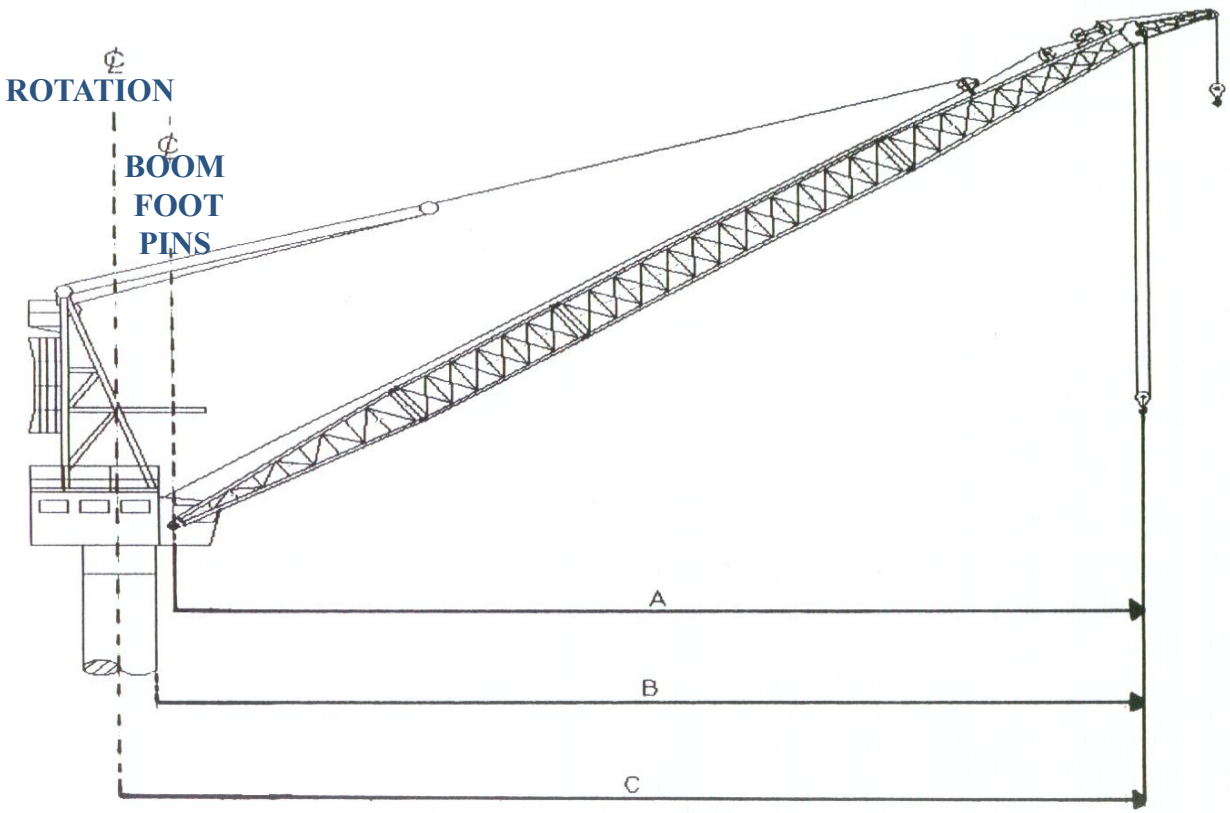


SAFE LOAD - CENTRE OF GRAVITY SUPPORTED



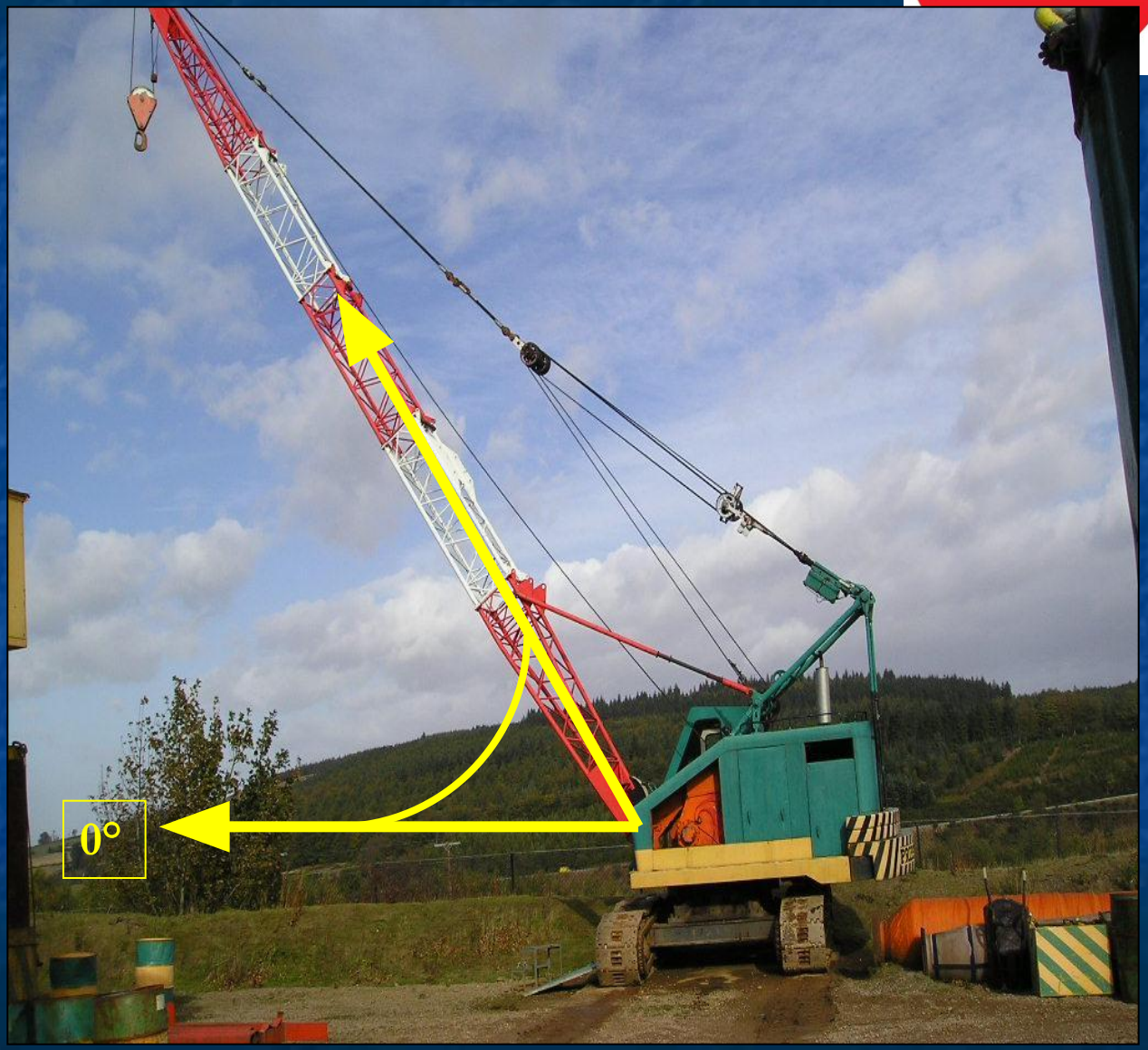
OVER LOAD - CENTRE OF GRAVITY UNSUPPORTED
CRANE MUST TIP

RADIUS MEASUREMENT



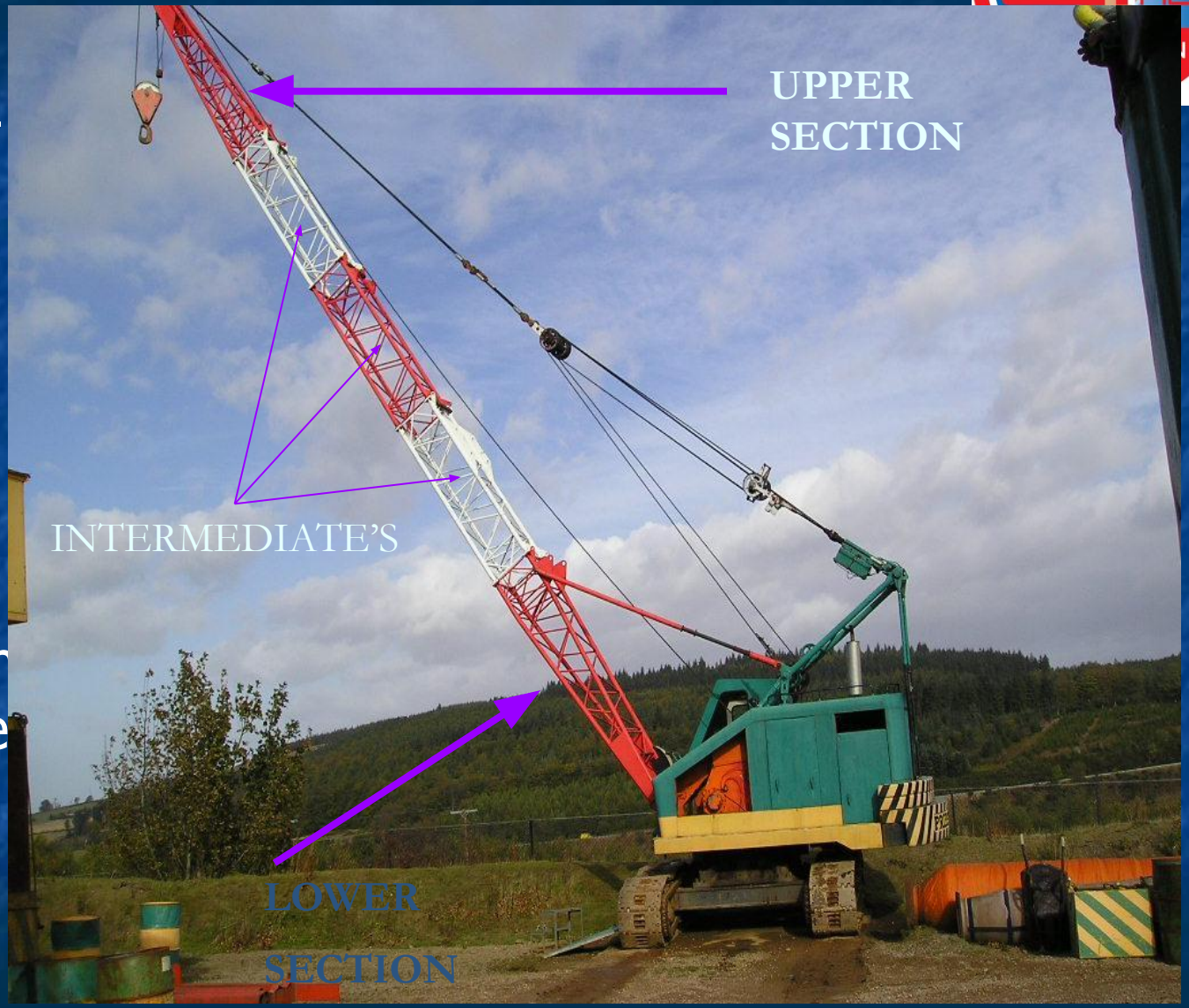
Angle Boom
Boom Angle

The angle from the horizontal (0°) at which the boom rests.



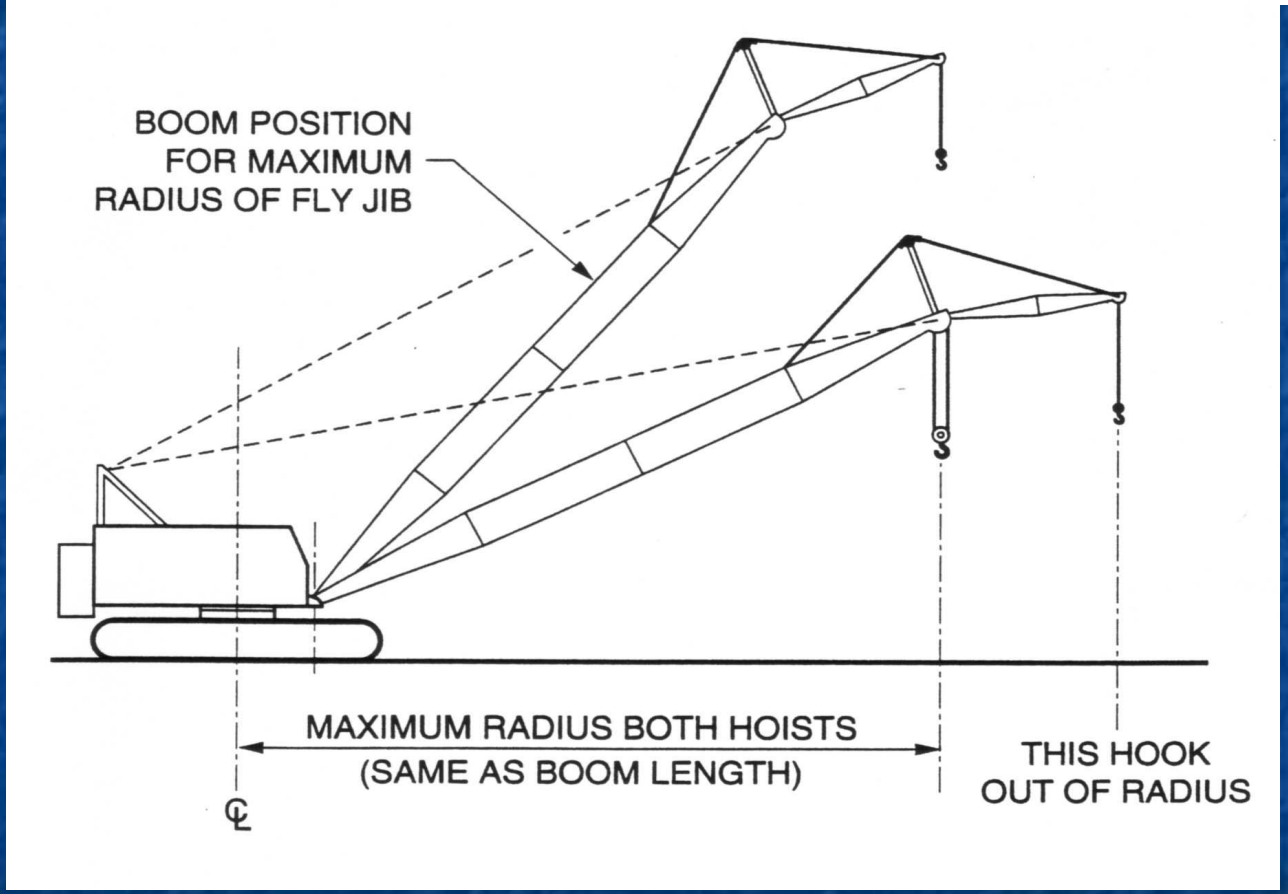
Boom Sections

A crane boom is usually in two sections: Upper and Lower. It may be lengthened by the insertion of one or more intermediate sections.



Fly Jib

An extension fitted to the main boom/jib over which a secondary hoist system is fitted.(Usually has its own suspension ropes. Also called Auxiliary Jib

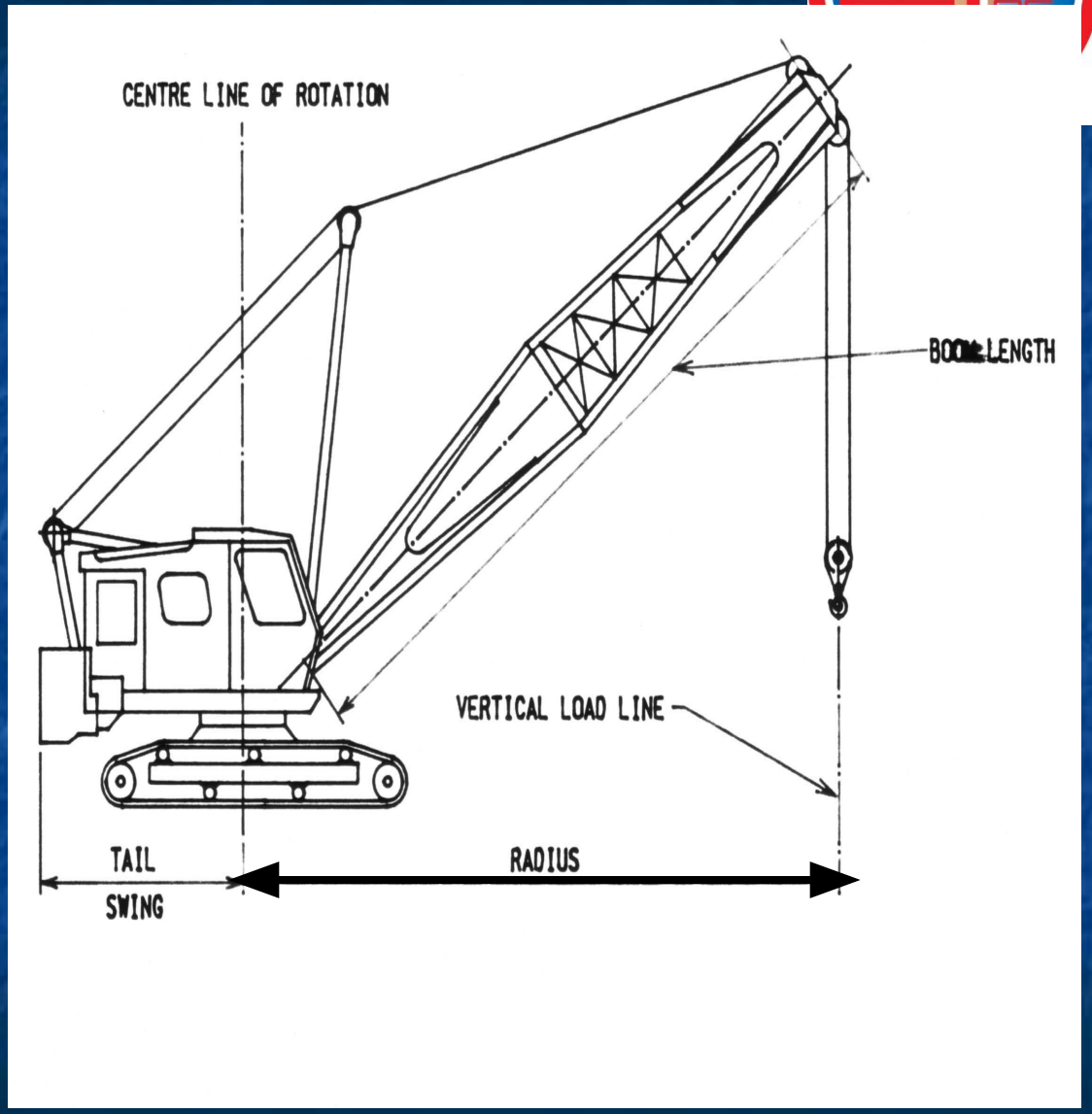


Outrigger

Auxiliary equipment for extending the effective base of a crane to increase its stability.

Radius of Load /Operating Radius:

The horizontal distance from the centre of rotation to a vertical line measured through the suspension point of a load on the hook.



Tail swing or Tail:

Radius The distance from centre of rotation to furthermost point of

Mobile crawler

Mobile (Truck Mounted) Telescopic

tice boom

Articulated (knuckle-boom)

Fixed Box

GLOBAL DYNAMICS

The effect of global dynamics will be significantly influenced by parameters such as:-

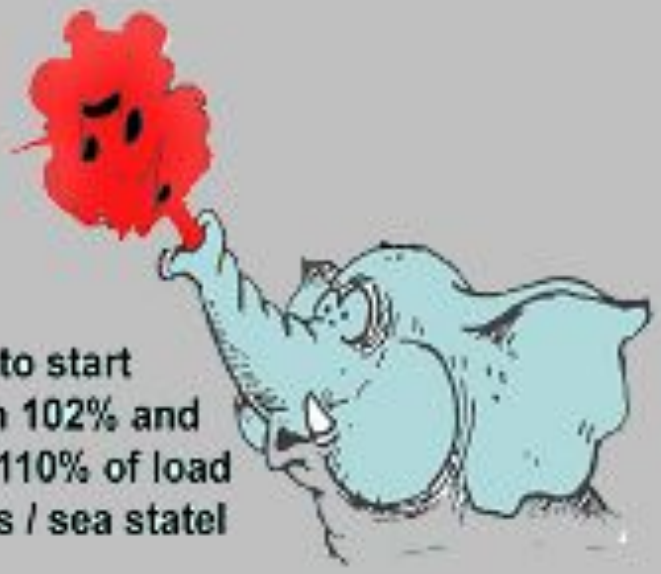
- The environmental conditions
- Rigging arrangement
- Type of crane vessel
- Stiffness of crane boom and lifting appliances
- Type of cargo vessel
- Weight of lifted object
- Lifting procedures

OVERLOAD WARNING

CRANE CAB

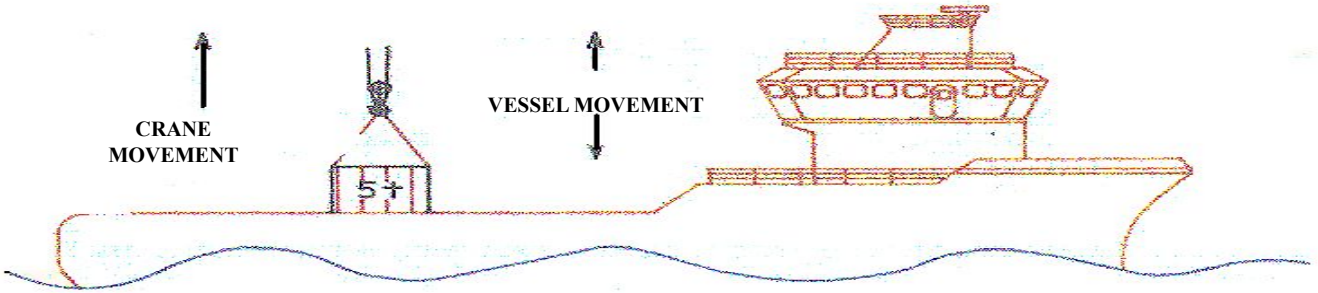
Standard Overload Protection System gives visual and audible alarms at a preset load level

FLASHING LIGHT
Visual alarm to start at not less than 90% and not more than 97.5% of load for given radius / sea state

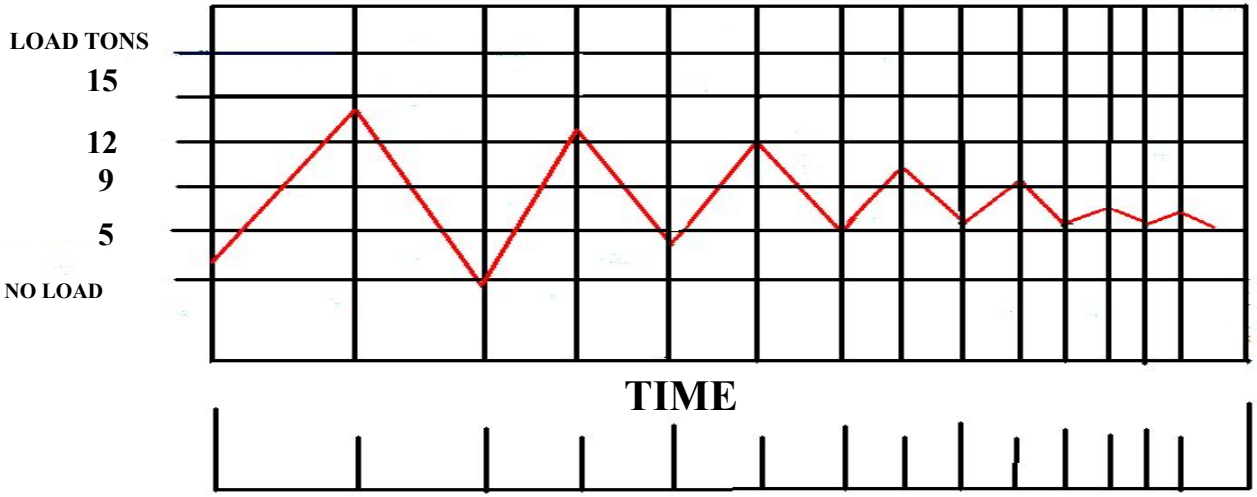


Audible Alarm to start at not less than 102% and not more than 110% of load for given radius / sea statel

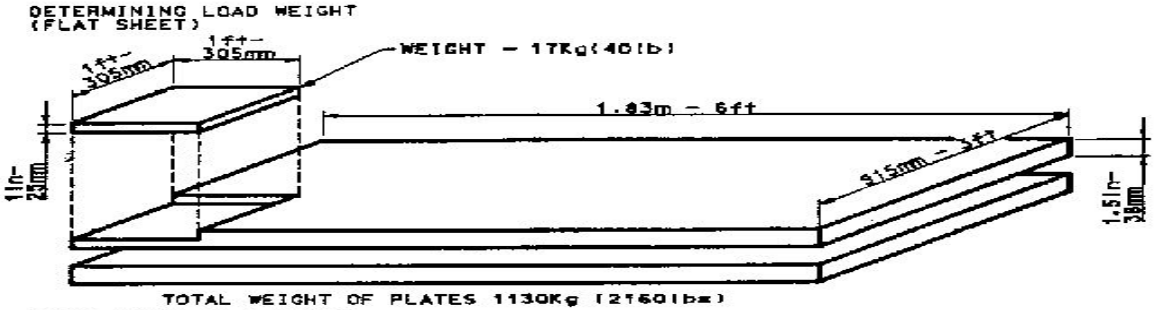
SHOCK LOADING

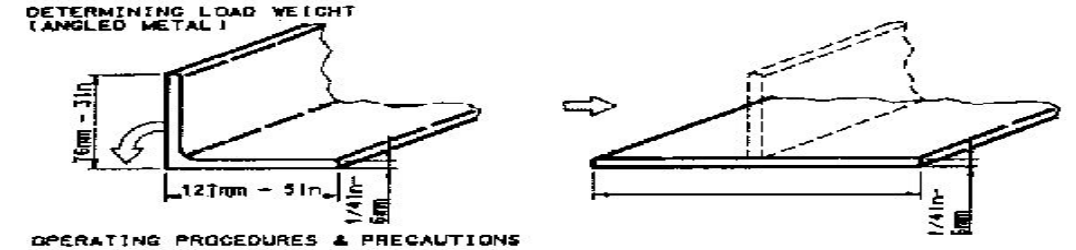


EFFECTS OF SHOCK LOAD ON CRANE.(ILLUSTRATION ONLY)

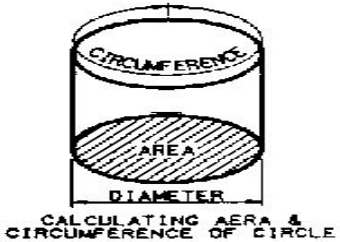


GRAPH SHOWS THE EFFECT OF A 5 TON LOAD COMING ONTO THE CRANE AT A SPEED OF APPROXIMATELY 2 METRES PER SECOND.

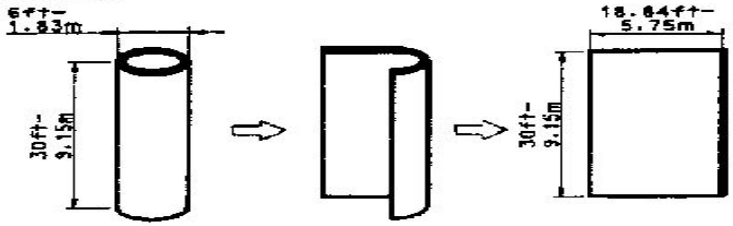




OPERATING PROCEDURES & PRECAUTIONS



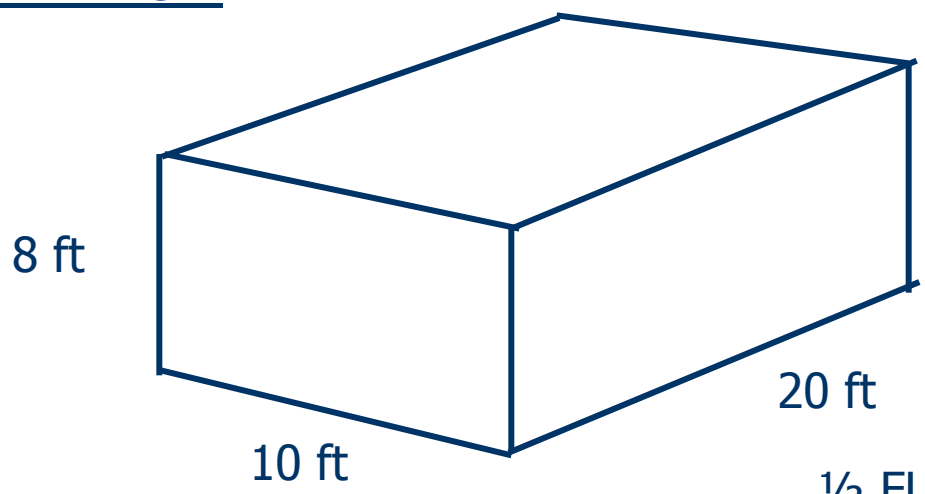
CALCULATING AERA & CIRCUMFERENCE OF CIRCLE



DETERMINING LOAD WEIGHT (CYLINDER)

WEIGHT ESTIMATION

 # REMEMBER TO ADD 25% TO TOTAL



½ THICK STEEL

½ FULL OF FRESH WATER

WEIGHT OF CONTAINER

20 X 8 = 160

20 X 10 = 200

10 X 8 = 80

440

X 2 (Sides) 880 ▫FT

X 20 Lbs 17600 lbs Dead wt

WEIGHT OF WATER

(L x B x H) 20 x 10 x 8

= 1600 ▫ft

÷ 2 = 800 ▫ft

X 62 lbs = 49600 lbs

17600 lbs

67200 lbs

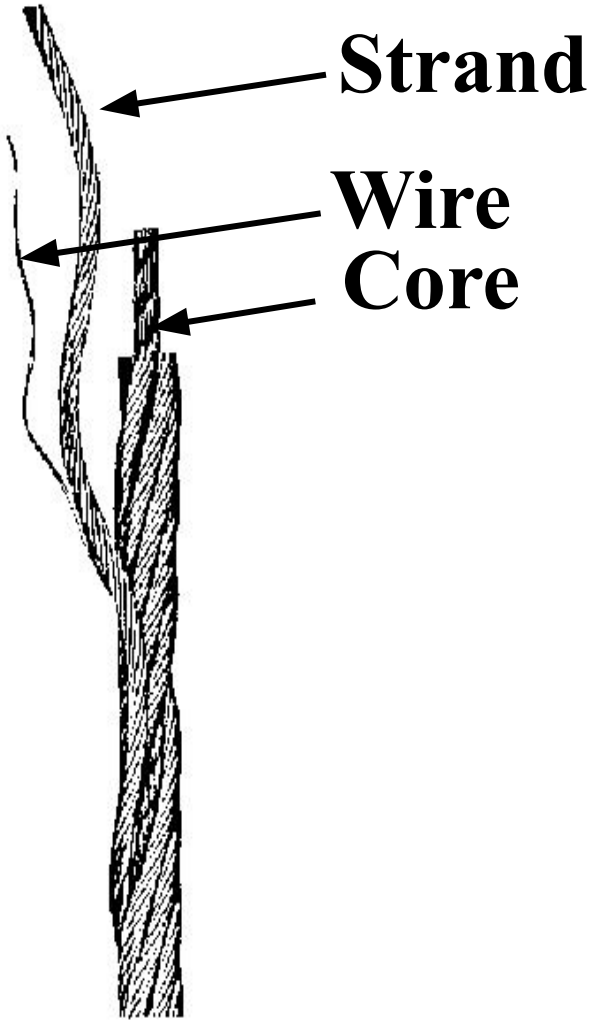
+ 25% = 16800 lbs

Total Est weight: 84000 lbs

END OF DAY ONE

WIRE ROPES

WIRE ROPE CONSTRUCTION



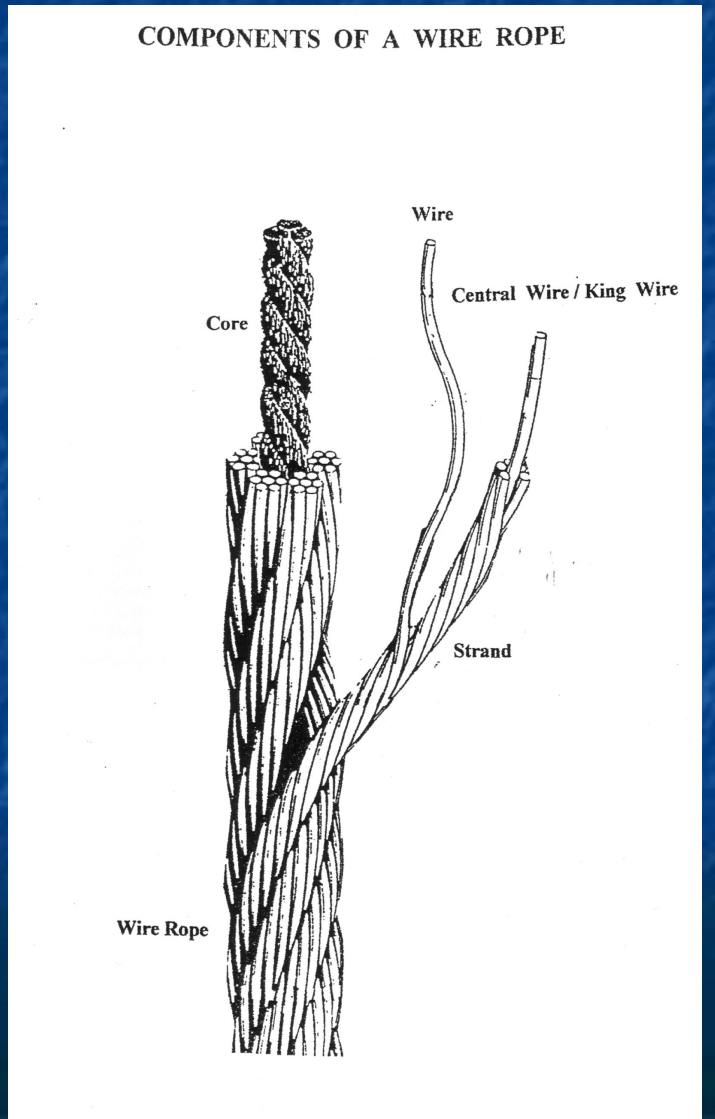
Generally speaking,
all ropes nowadays are
PREFORMED
in manufacture and there are a great many different rope constructions, each one having its own particular use.

- There are three main things to observe when examining the construction:
  - (a) Number of wires in each strand
  - (b) Number of strands in the rope
  - (c) Direction in which wires and strands lay (spiral) in the rope

- CORE

  The core of a wire rope can be
  - Fibre (FC),
  - Wire Steel (WSC),
  - or an Independent Wire Rope Core (IWRC)

- STRANDS Depend on classification of Rope but usually consists of Wires spiralling around a Central Core Wire



WIRE ROPE LAYS

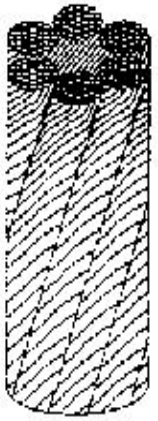
WIRE ROPE LAYS
THIS TERM HAS THREE MEANINGS.

(1) TO DESCRIBE THE DIRECTION OF ROTATION OF THE INDIVIDUAL WIRES AND STRANDS.

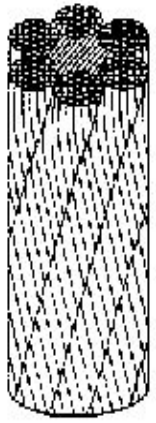
(A) REGULAR/ORDINARY LAY IS THE TERM USED WHEN THE WIRES ARE SPUN IN THE OPPOSITE DIRECTION TO THE STRANDS IN THE ROPE. THE VISIBLE WIRES ARE PARALLEL TO THE ROPE AXIS. THIS LAY OFFERS GREATER RESISTANCE TO CRUSHING ON DRUMS THAN LANG`S LAY. THIS LAY SHOULD ALWAYS BE USED ON A SINGLE FALL OR WHEN ONE END OF THE ROPE IS FREE TO ROTATE.

(B) LANG`S LAY IS THE TERM USED WHEN THE WIRES IN EACH STRAND ARE SPUN IN THE SAME DIRECTION AS THE STRANDS OF THE ROPE.THE VISIBLE WIRES ARE AT AN ANGLE TO THE ROPE AXIS ARE MUCH LONGER. LENGTH`S OF INDIVIDUAL WIRES ARE EXPOSED. ROPES MANUFACTURED WITH THIS LAY ARE SLIGHTLY MORE FLEXIBLE AND OFFER GREATER RESISTANCE TO ABRASION THAN REGULAR/ORDINARY LAY. ONLY APPLICATIONS WHERE BOTH ENDS ARE FIXED, ARE SUITABLE FOR LANG`S LAY ROPES. THESE ROPES SHOULD NEVER BE ATTACHED TO A SWIVEL TYPE FITTING.

(b) LANGS lAY



(a) Regular Lay/ Ordinary lay



WIRE ROPE LAYS

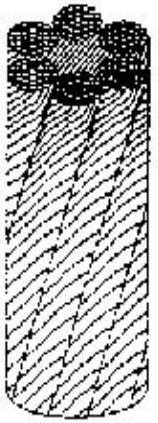
WIRE ROPE LAYS CONT`D

(2) TO DEFINE THE MEASUREMENT OF A "LAY LENGTH" THE LENGTH OF ONE COMPLETE REVOLUTION OF A STRAND AROUND THE LONGITUDINAL AXLE OF THE ROPE. THIS CAN BE INFLUENCED BY THE ROPE'S APPLICATION.

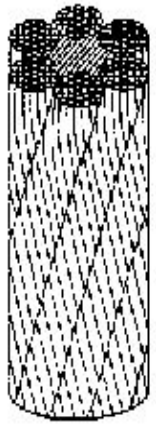
(3) HOW THE WIRES ARE LAID UP IN EACH STRAND - I.E. CROSS LAID OR EQUAL LAID.
A WIRE ROPE IS DESCRIBED AS EQUAL LAID WHEN ALL THE WIRES IN A STRAND HAVE THE SAME PITCH OR LENGTH OF LAY. THEREFORE EACH WIRE IN EACH LAYER LIES EITHER IN A BED FORMED BY THE `VALLEYS` BETWEEN THE WIRES OF AN UNDER LAYER OR ALTERNATIVELY ALONG THE CROWN OF AN UNDER LYING WIRE.

TWO CRITICAL POINTS OF INTERNAL WEAR IN A WIRE ROPE ARE ELIMINATED IN AN EQUAL LAY ROPE- LOCALISED CRUSHING AND CROSS NICKED (SECONDARY BENDING). EQUAL LAID ROPES HAVEA HIGHER BREAKING LOAD THAN THOSE OF CROSS LAID CONSTRUCTION.

(b) LANGS lAY



(a) Regular Lay/ Ordinary lay



FACTORS OF SAFETY

General purpose wire rope slings > 5:1

Polyester slings > 7:1

Alloy steel shackles > 6:1

Chain slings (Grade 80) > 4:1

Running wire ropes > 5:1

Eyebolts > 5:1

Open wedge sockets (UK) > 5:1

NOTE:>Equipment used for personnel lifting appliances,E.G. personnel work baskets, carriers etc,
Have a minimum safety factor of 10:1

WIRE ROPE REJECTION CRITERIA

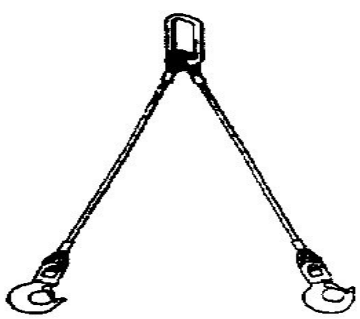
- Consider which regulations apply to your work location and apply the relevant criteria as applicable.
- Recognise the removal criteria. - 9 points to consider

(BRITISH STANDARDS)

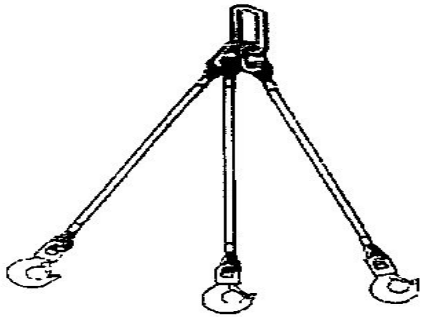
1. Number,nature,type and position of visible broken wires in a length equal to 10 times the rope diameter a maximum 5% of total number of wires in the rope.
2. Local groups of visible broken wires-a maximum of 3 in one or adjacent strand.
3. Deterioration in the vicinity of the termination or terminal damage any wire breaks within 6mm of the termination.
4. Core deterioration-abrupt loss in diameter.
5. Wear-Maximum reduction in diameter-10% from nominal diameter. (6&8 strand) (3%from nominal -Multistrand).
6. Internal corrosion - reject rope if internal corrosion is confirmed.
7. External corrosion - corrosion causes very high losses in rope breaking load.Reject rope if corrosion causes wire slackness.
8. Deformations.
9. Thermal damage.

WIRE ROPE SLINGS

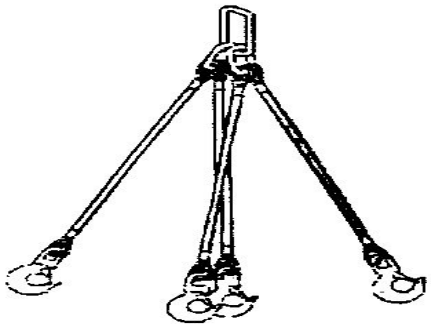
- **MULTI LEG SLINGS**



Two Leg



Three Leg



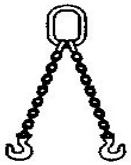
Four Leg

- **DISCARD CRITERIA**
  - **Random broken wires in one lay length not to exceed 6.**
  - **Number of broken wires in one strand over one lay length not to exceed 3.**
  - **Number of broken wires in ten diameters not to exceed 5% of total.**
  - **No broken wires permitted where rope enters termination.**
  - **Wear must not exceed 10% of the original diameter in a 6 strand rope and 3% in a multi strand rope.**

TYPICAL SLING CONFIGURATIONS

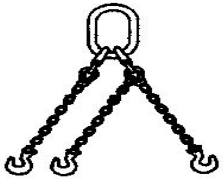
SINGLE LEG

ENDLESS

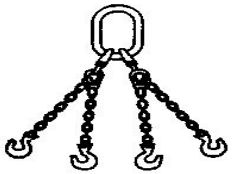


DOUBLE LEG

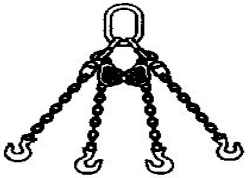
WITH CLUTCHES



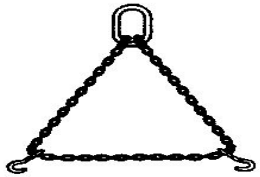
THREE LEGS



FOUR LEG



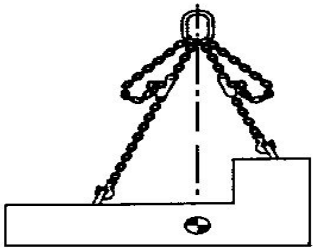
WITH CLUTCHES



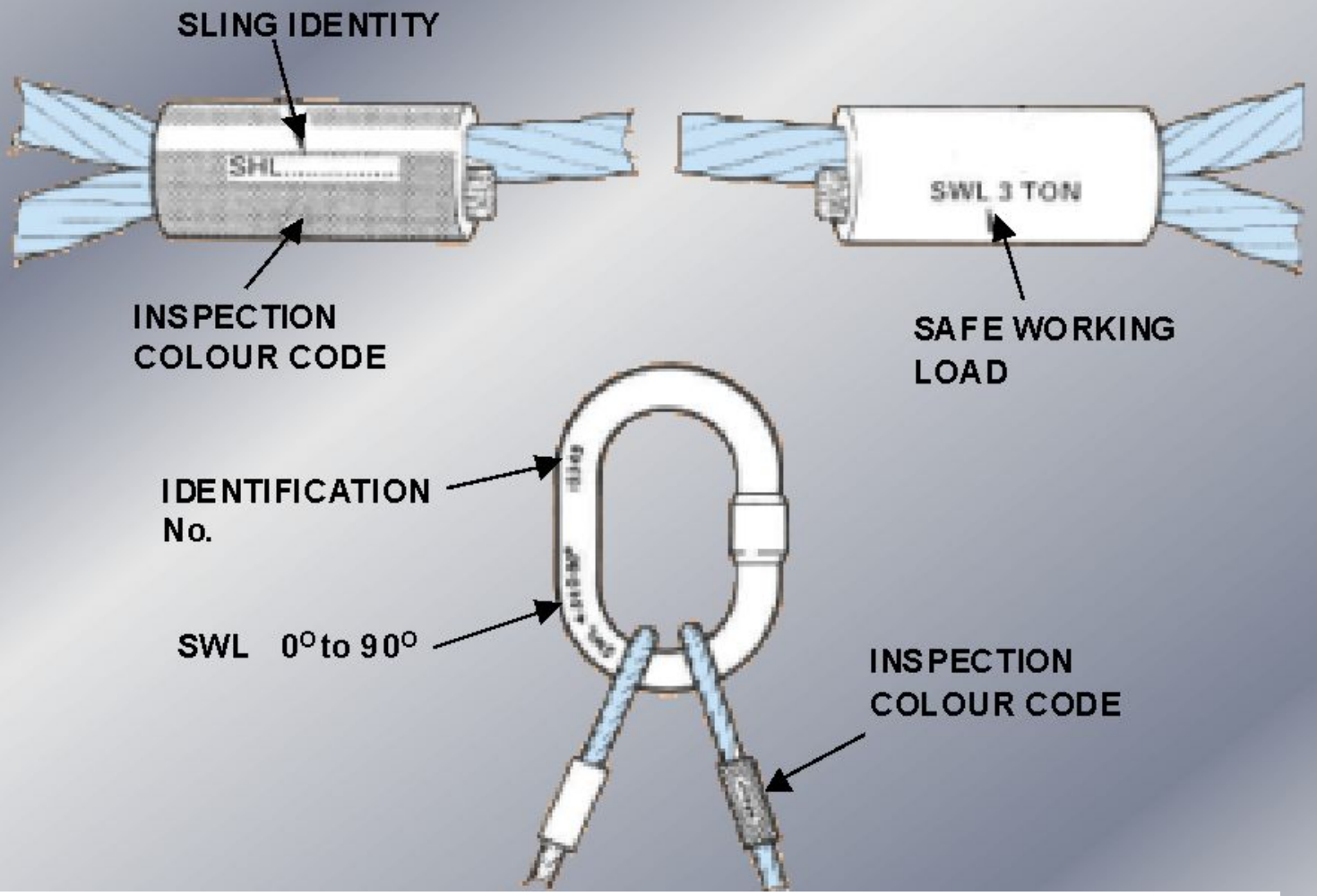
BARREL SLING

WHERE THE SLINGS ARE TO BE FITTED WITH HOOKS,THE DESIRED TYPE FOR SAFETY IS THE BK TYPE.

CHAIN SLINGS FITTED WITH SHORTENING CLUTCHES ARE IDEAL FOR LIFTING LOADS WITH AN OFFSET CENTRE OF GRAVITY AS THE LEG LENGTH CAN BE ADJUSTED TO POSITION THE LIFTING RING DIRECTLY OVER THE CENTRE OF GRAVITY.THIS ALLOWS THE LOAD TO BE LIFTED LEVEL



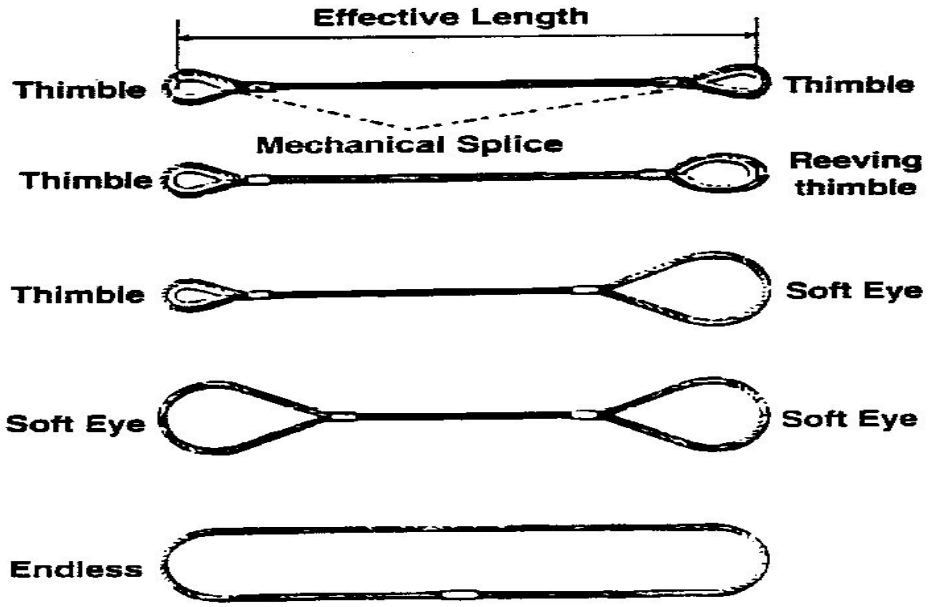
WIRE ROPE SLINGS



THE SAFE USE OF WIRE ROPE SLINGS

WIRE ROPE SLINGS ARE GENERALLY MANUFACTURED FROM WIRE WITH A TENSILE STRENGTH OF 180 KG/MM2 (KNOWN AS 180 GRADE). TERMINATIONS BEING FORMED BY MECHANICAL SPLICING COMMONLY KNOWN AS TALURITS OR FERRULES. THE EYES OF THE SLING CAN BE FITTED WITH OR WITHOUT THIMBLES ACCORDING TO IT`S PURPOSE. FOR GENERAL USE , SOFT EYE SUPERLOOP SLINGS ARE PREFERRED. THE EYES OF WHICH ARE CONSTRUCTED BY SPLICING THE WIRE AND PRESSING ON A STEEL FERRULE TO SECURE THE SPLICE.(ALSO KNOWN AS FLEMISH EYES). TRANSIT SLINGS ARE MANUFACTURED USING STANDARD TALURIT FITTINGS.

WIRE ROPE SLINGS ARE BY FAR THE MOST COMMONLY USED AS THEY ARE VERSATILE AND COMPARITAVELY LIGHTWEIGHT IN RELATION TO THEIR STRENGTH.



OFFSHORE SPARROWS Training Centre

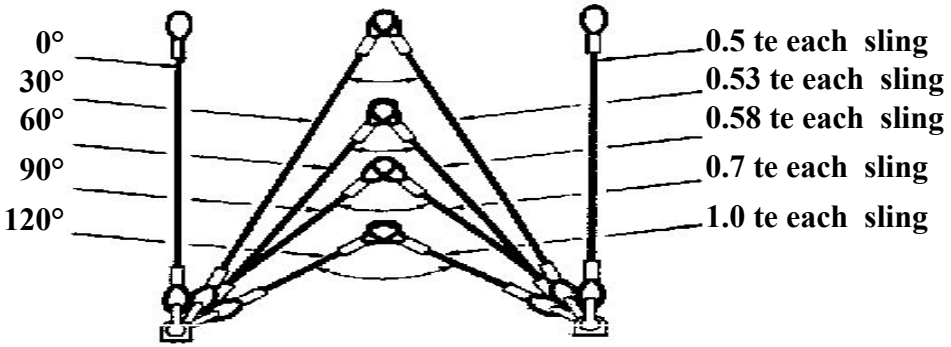
WIRE ROPE SLING CHART

6 X 19 6 X 36 GROUPS FIBRE CORE

ROPE DIAMETER	SAFE WORKING LOAD					MINI BREAK LOAD	PROOF LOAD PER LEG @ 0°
	SINGLE LEG	LEG ANGLE 0 - 90°		LEG ANGLE 90 - 120°			
		2 leg	3 & 4 leg	2 leg	3 & 4 leg		
mm	tonne	tonne	tonne	tonne	tonne	tonne	tonne
5	0.278	0.389	0.584	0.278	0.417	1.39	0.556
6	0.400	0.560	0.840	0.400	0.600	200	0.800
8	0.762	1.1	1.6	0.762	1.1	3.81	1.52
9	0.964	1.3	2.0	0.962	1.4	4.82	1.93
10	1.2	1.7	2.5	1.2	1.8	5.95	2.4
11	1.4	2.0	3.0	1.4	2.2	7.21	2.8
12	1.7	2.4	3.6	1.7	2.6	8.57	3.4
13	2.0	2.8	4.2	2.0	3.0	10.1	4.0
14	2.3	3.2	4.9	2.3	3.5	11.6	4.6
16	3.0	4.3	6.4	3.0	4.6	15.3	6.0
18	3.9	5.4	8.1	3.9	5.8	19.3	7.8
19	4.3	6.0	9.0	4.3	6.5	21.5	8.6
20	4.8	6.7	10.0	4.7	7.2	23.9	9.6
22	5.8	8.1	12.1	5.8	8.6	28.8	11.6
24	6.9	9.6	14.4	6.9	10.3	34.3	13.8
26	8.1	11.3	16.9	8.1	12.1	40.3	16.2
28	9.3	13.1	19.6	9.3	14.0	46.7	18.6
32	12.2	17.1	25.6	12.1	18.3	61.0	24.4
35	14.6	20.4	30.7	14.6	21.9	73.0	29.2
36	15.4	21.6	32.4	15.4	23.2	77.2	30.8
38	17.2	24.1	36.1	17.1	25.8	85.9	34.4
40	19.1	26.7	40.0	19.1	28.6	95.3	38.2

THESE TABLES ARE COMPILED IN COMPLIANCE WITH BS.1290 1983 AND BS.302 PT 2 1987
UNIFORM LOAD METHOD CALCULATION USED THROUGHOUT
SWLs OF LESS THAN 1.0T ARE NORMALLY CITED IN KILOGRAMS

SLING ANGLES



1.0 Tonne

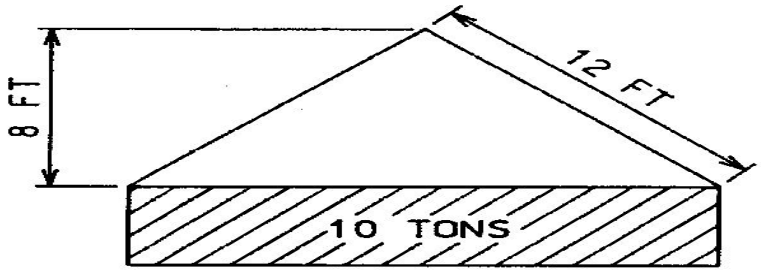
The SWL of a pair of single slings decreases as the angle between them increases.

0°-SWL=SWL of one sling x 2
30°-SWL=SWL of one sling x 2 x 0.966
60°-SWL=SWL of one sling x 2 x 0.866
90°-SWL=SWL of one sling x 2 x 0.707
120°-SWL=SWL of one sling x 2 x 0.5

0°-SWL=SWL of one sling x 2
30°-SWL=SWL of one sling x 1.93
60°-SWL=SWL of one sling x 1.73
90°-SWL=SWL of one sling x 1.414
120°-SWL=SWL of one sling only.

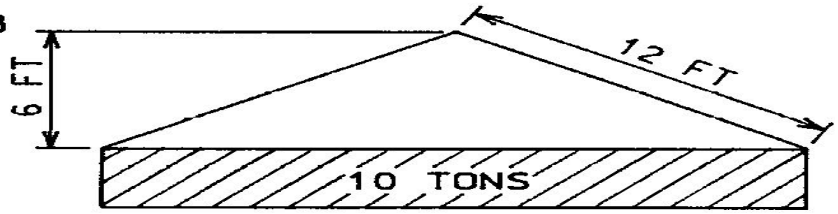
TENSION

EXAMPLE A

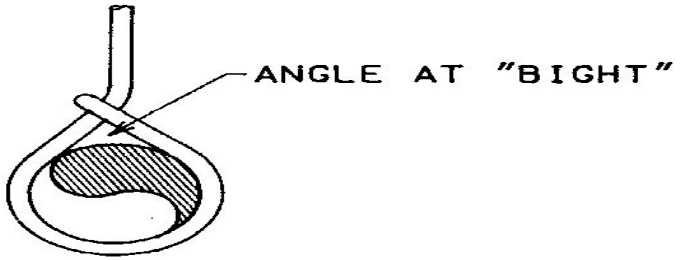


$$\frac{10 \times 12}{2(\text{SLINGS}) \times 8} = \frac{120}{16} = 7.5 \text{ TONS IN EACH LEG}$$

EXAMPLE B

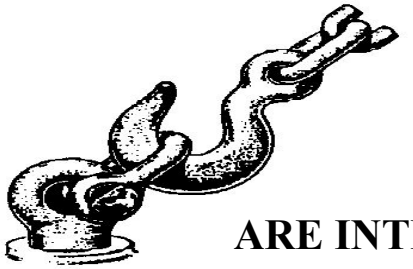


$$\frac{10 \times 12}{2(\text{SLINGS}) \times 6} = \frac{120}{12} = 10 \text{ TONS IN EACH LEG}$$

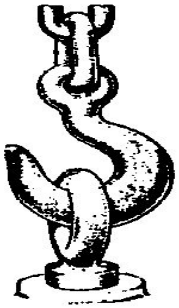


EYEBOLTS-(BS 4278)

COLLAR EYEBOLT

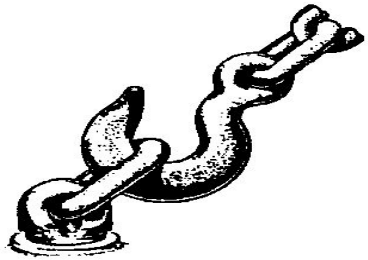


ARE INTENDED FOR PERMANENT ATTACHMENT TO HEAVY PIECES OF EQUIPMENT AND ARE USUALLY FITTED IN PAIRS



DYNAMO EYEBOLT

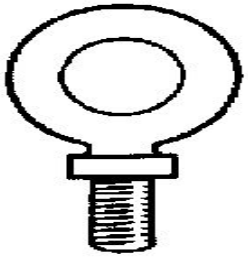
SHOULD BE USED FOR VERTICAL LIFTS OR Oº ONLY



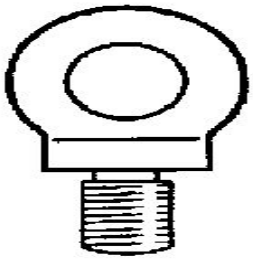
EYEBOLT WITH LINK

INTENDED FOR GENERAL LIFTING

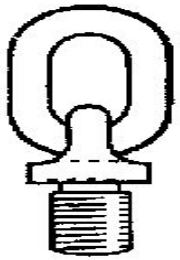
EYEBOLTS



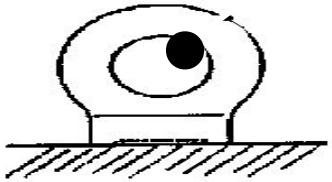
DYNAMO



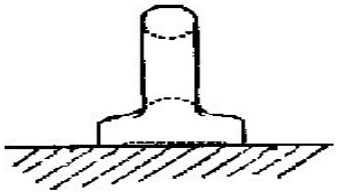
COLLAR



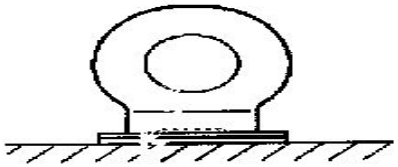
COLLAR WITH LINK



SAME PLANE
CORRECT



AGAINST PLANE
INCORRECT



SHIM TO CORRECT
ORIENTATION

Eyebolts – (BS 4278)

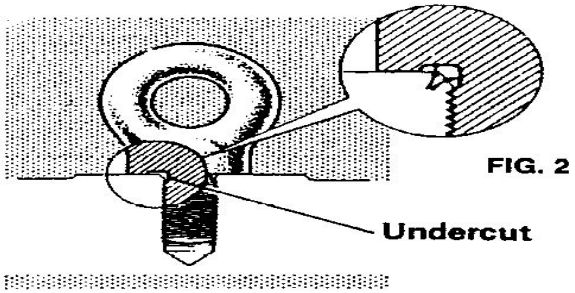


FIG. 2

CORRECT METHOD OF FITTING

INCORRECT METHODS OF FITTING

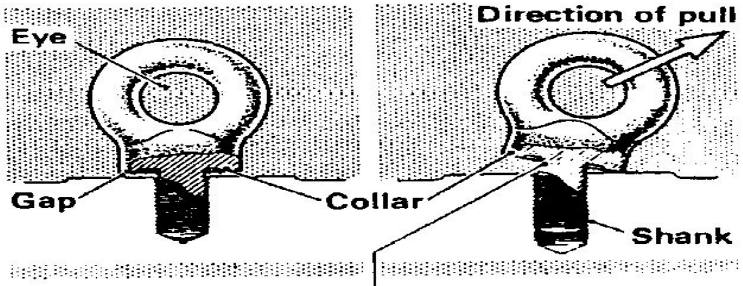
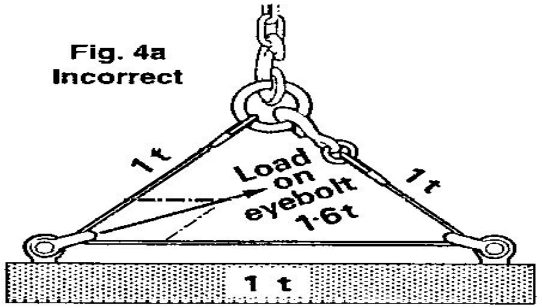
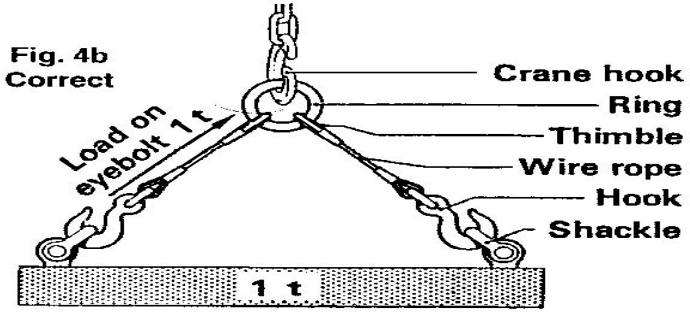


FIG. 3

CORRECT/INCORRECT METHOD OF SLINGING WHEN USING PAIRS OF SLINGS

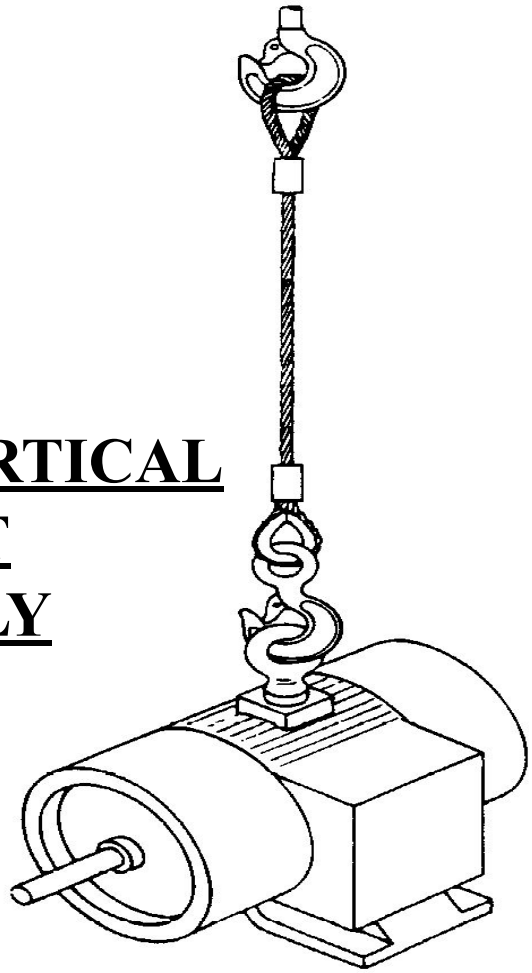




NOTE:- INCREASE IN LOAD ON EYEBOLT WITH INCORRECT METHOD OF SLINGING.

DYNAMO EYEBOLT

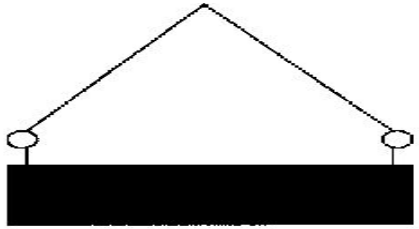
SINGLE VERTICAL LIFT
0º ONLY



EYEBOLT CHART

RECOMMENDED

S.W.L. LOADS



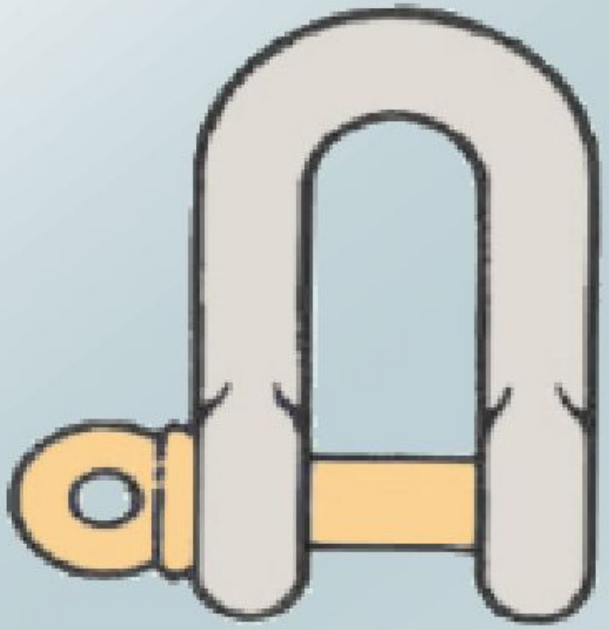
MAXIMUM LOAD W TO BE LIFTED BY A PAIR OF EYEBOLTS WHEN THE ANGLE BETWEEN THE SLING LEGS IS 0°

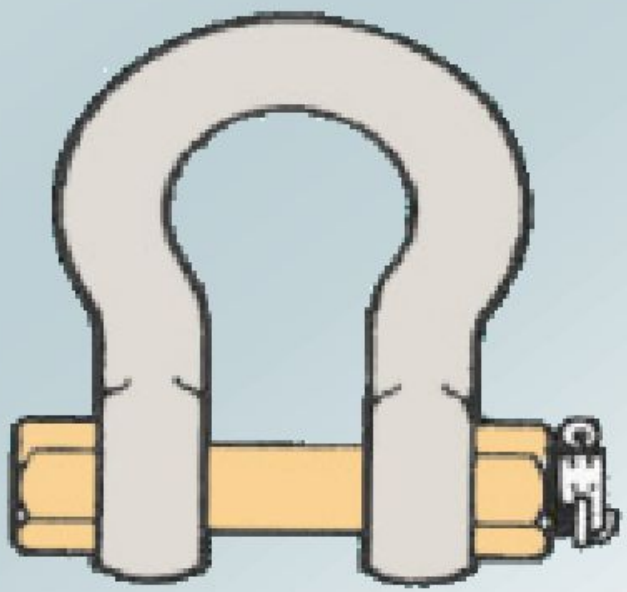
SAFE WORKING LOADS OF PAIRS OF EYEBOLTS

SINGLE VERTICAL	PAIR VERTICAL	0°>30°	30°>60°	60°>90°
1.0	2.0	1.3	800KGS	500KGS
1.25	2.5	1.6	1.0	630KGS
1.6	3.2	2.0	1.25	800KGS
2.0	4.0	2.5	1.6	1.0
2.5	5.0	3.2	2.0	1.25
3.2	6.4	4.0	2.5	1.6
4.0	8.0	5.0	3.2	2.0
5.0	10.0	6.3	4.0	2.5
6.3	12.6	8.0	5.0	3.2
8.0	16.0	10.0	6.3	4.0
10.0	20.0	12.5	8.0	5.0
12.5	25.0	16.0	10.0	6.3
16.0	32.0	20.0	12.5	8.0
20.0	40.0	25.0	16.0	10.0
25.0	50.0	32.0	20.0	12.5
REDUCTION FACTOR		0.63	0.4	0.25

SHACKLES

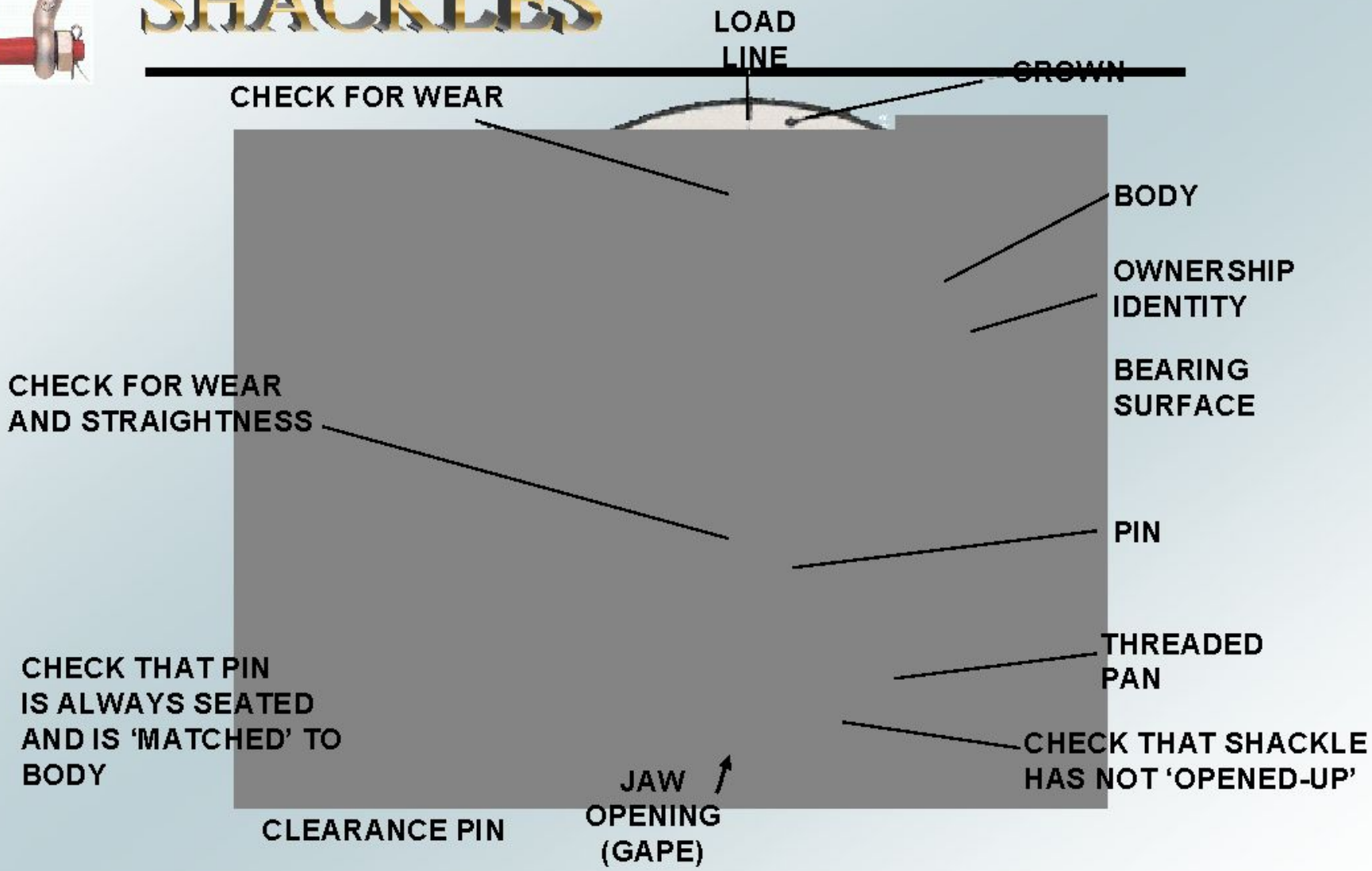
DEE TYPE SHACKLE
(With screw pin)





BOW TYPE SAFETY SHACKLE
(With round bolt & safety pin)

SHACKLES


LOAD LINE
CROWN
CHECK FOR WEAR
BODY
OWNERSHIP IDENTITY
BEARING SURFACE
CHECK FOR WEAR AND STRAIGHTNESS
PIN
THREADED PAN
CHECK THAT PIN IS ALWAYS SEATED AND IS 'MATCHED' TO BODY
CHECK THAT SHACKLE HAS NOT 'OPENED-UP'
JAW OPENING (GAPE)
CLEARANCE PIN

SHACKLES
PRE - USE INSPECTION

- Select correct type shackle for the job in hand.
- Ensure the shackle is correctly colour coded.
- Check the safe working load of the shackle before use - no SWL - quarantine .
- Check shackle pin for excessive wear-if wear is 1/10th or more of original diameter quarantine.
- Make sure the pin is free-but not loose in the tapped hole(s) of the shackle.
- Threads on pin and shackle should be undamaged and without appreciable wear.

SHACKLES
PRE - USE INSPECTION (CONT`D)

- Check alignment of pin holes - the untapped hole should not be worn or oversized.
- Only properly fitted pins shall be used in shackles.
- Home made or modified shackles must never be used.
- Check jaws and pin of shackle for distortion. Check body of shackle for pitting,cracks or corrosion.
- To test shackle suspend and tap lightly with a hammer or the shackle pin - "SOUND" shackles should have a "clear" ring or "ping"

SAFE WORKING LOADS OF ALLOY SHACKLES (U.S.FEDERAL SPEC.)

ANCHOR SHACKLE WITH SCREW PIN

SAFETY ANCHOR BOW TYPE

CHAIN SHACKLE SCREW PIN

SAFETY CHAIN BOW TYPE

DIA BOW MM	MM	DIA PIN WIDTH MM	TYPE MM	INSIDE CHAIN TYPE MM	ANCHOR	OF BOW MM	SWL	WIDTH
13	16	22	43	51	2.0t	32		
16	19	26	51	64	3.25t	43		
19	22	31	59	76	4.75t	51		
22	26	36	73	83	6.5t	58		
26		28	43	85	95	8.5t	68	
28	32	47	90	106	9.5t	75		
32	35	51	94	115	12.5t	83		
35	38	57	115	133	13.5t	92		
38	42	60	127	146	17.0t	99		
45		52	74	149	178	25.0t	126	
52	58	83	171	197	35.0t	146		
64	70	105	203	254	55.0t	185		
76	82	127	230	330	85.0t	190		
90	96	146	267	381	120.0t	238		

END OF DAY TWO

WEBBING

SLINGS

TRAINING PRESENTATION

SUBSTANCES

OFFSHORE SPARROWS

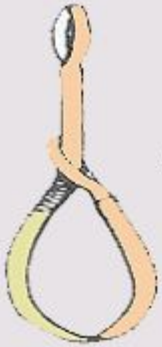
SUBSTANCE Net Rope Material	ACIDS	ALKALIS	ORGANIC SOLVENTS (Xylene, Toulene, Tric, Petrol, White Spirit ETC)	OILS
Natural Fibres (Manilla&Sisal)	Very Susceptible To Attack	Very Susceptible To Attack	Susceptible To Attack Become Embritled	Susceptible ToAttack
NYLON	Susceptible ToAttack	*Highly Resistant To Attack	*Highly Resistant To Attack	*Highly Resistant To Attack
POLYESTER (TERYLENE)	*Highly Resistant To Attack	Susceptible ToAttack	*Virtually Unaffected	Virtually Unaffected
POLY ETHELENE	*Highly Resistant To Attack	*Highly Resistant To Attack	Susceptible To Attack Particularly If Solvent Hot	*NotAffected
POLY PROP YLENE	*Highly Resistant To Attack	*Highly Resistant To Attack	Attacked by some solvents E.G. Xylene and Toulene	*Not Affected

MODE FACTORS

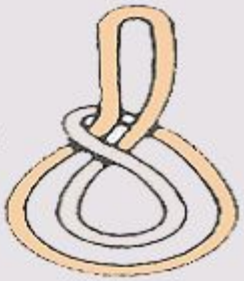
FLAT WEBBING SLINGS

ROUND SLINGS

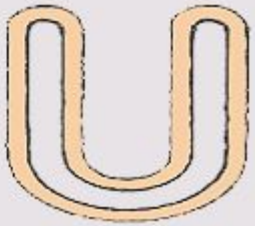
STRAIGHT LIFT - MODE FACTOR = 1
(eg FOR 1 TONNE SLING, SWL = 1 TONNE)



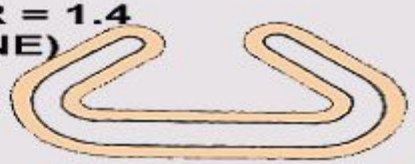
CHOKED LIFT - MODE FACTOR = 0.8
(eg FOR 1 TONNE SLING, SWL = 0.8 TONNE)



BASKET HITCH - PARALLEL, MODE FACTOR = 2
(eg FOR 1 TONNE SLING, SWL = 2 TONNE)

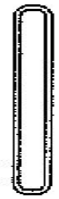
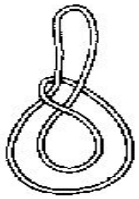
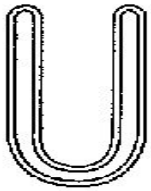


BASKET HITCH - 90 DEGREE, MODE FACTOR = 1.4
(eg FOR 1 TONNE SLING, SWL = 1.4 TONNE)



SAFE WORKING LOADS OF MAN-MADE FIBRE SLINGS

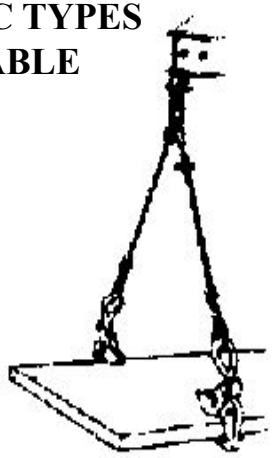
ROUND SLINGS

CAPACITIES				
				
VERTICAL	**CHOKER**	**BASKET**	**BASKET 90°**	**BASKET 120°**
1.0t	800kg	2.0t	1.4t	1.0t
1.5t	1.2t	3.0t	2.1t	1.5t
2.0t	1.6t	4.0t	2.8t	2.0t
3.0t	2.4t	6.0t	4.2t	3.0t
4.0t	3.2t	8.0t	5.6t	4.0t
6.0t	4.8t	12.0t	8.4t	6.0t
8.0t	6.4t	16.0t	11.2t	8.0t
12.0t	9.6t	24.0t	16.8t	12.0t

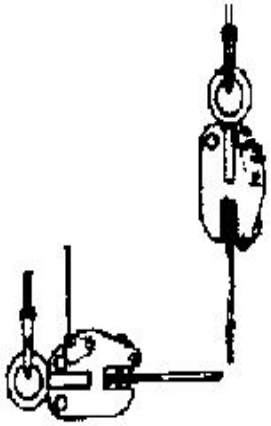
WIDTH mm	CAPACITIES				
	VERTICAL	CHOKE	BASKET	BASKET 90°	BASKET 120°
50	1.0t	800kg	2.0t	1.4t	1.0t
75	1.5t	1.2t	3.0t	2.1t	1.5t
100	2.0t	1.6t	4.0t	2.8t	2.0t
150	3.0t	2.4t	6.0t	4.2t	3.0t
200	4.0t	3.2t	8.0t	5.6t	4.0t
250	5.0t	4.0t	10.0t	7.0t	5.0t
300	6.0t	4.8t	12.0t	8.4t	6.0t

PLATE CLAMPS

•TWO BASIC TYPES AVAILABLE



Horizontal clamps



Universal clamps (vertical)

Locking mechanism

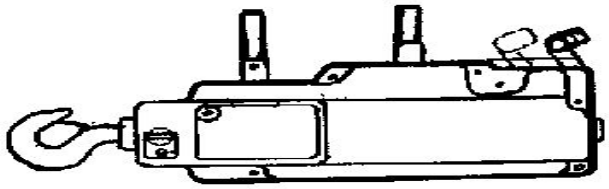
Plate

•Horizontal clamps can only be used in pairs.

•Universal clamps can be used individually.

•When using Universal clamps in pairs you must use a spreader beam.

WIRE ROPE HOISTS



STANDARD ROPE HOIST

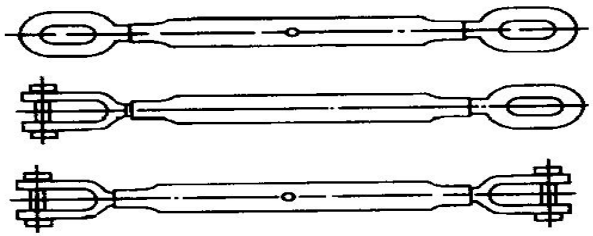
TWO TYPES OF APPLICATION

- **LIFTING APPLICATION**
- **PULLING APPLICATION**

CAPACITY OF HOISTS DEPENDING ON APPLICATION

S W L (LIFTING)	S W L (PULLING)
800KG	1200KG
1600KG	2500KG
3200KG	5000KG

SWL OF TURNBUCKLES/ RIGGING SCREWS



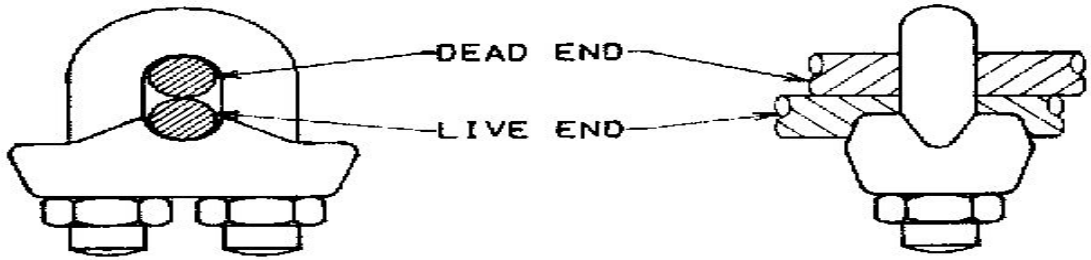
BS 4429

DIA (mm)	SWL
10	300KG
12	500KG
16	750KG
20	1.25t
22	2.0t
27	3.0t
30	4.0t
33	5.0t
39	6.0t
42	7.5t
48	10.0t
56	15.0t
64	20.0t
72	25.0t
76	30.0t
85	40.0t
100	50.0t

U.S. FED. SPEC

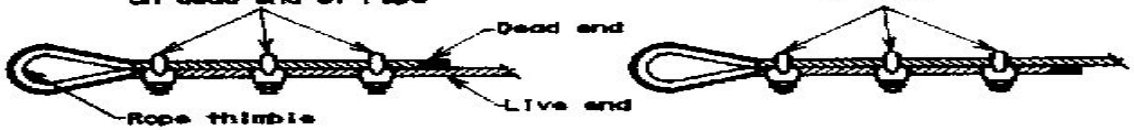
DIA (ins)	WLL
3/8	545KG
1/2	1.00t
5/8	1.59t
3/4	2.36t
7/8	3.27t
1	4.55t
1 1/4	6.90t
1 1/2	9.73t
1 3/4	12.13t
2	16.82t
2 1/2	27.27t
2 3/4	34.09t

WIRE ROPE CLIPS (BULLDOGS)



CORRECT
"U" bolt of all clips on dead end of rope

INCORRECT
"U"bolts on live end of rope

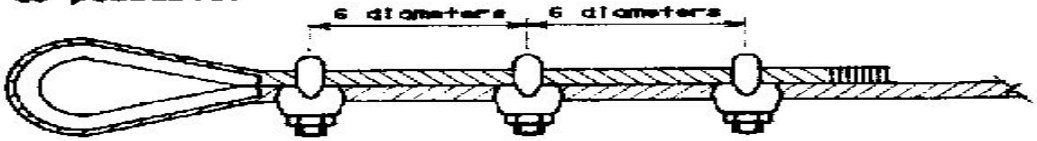


Use of rope grips

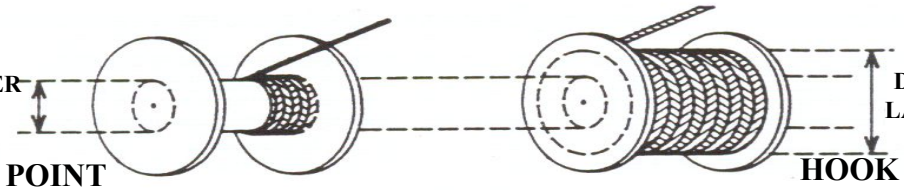
Up to and including 20mm diameter	–	3 grips
Over 20mm up to and including 30mm	–	4 grips
Over 30mm up to and including 40mm	–	5 grips
Over 40mm up to and including 50mm	–	6 grips
Over 50mm	–	7 grips

The bulldog grips should be properly fitted with the "U" bolt on the short end (the "dead" end) of the rope, and they should be spaced at a distance equal to six rope diameters.

The first grip should be fitted as close to the thimble as possable.



LINE SPEED AND LINE PULL



HOOK AT LOW POINT
ROPE OFF WINCH
SMALLER DIAMETER
LINE SPEED SLOWER
LINE PULL HIGHER

HOOK AT HIGH POINT
ROPE ON WINCH
LARGER DIAMETER
LINE SPEED FASTER
LINE PULL LESS

THE SAME PRINCIPLE APPLIES TO BOOM HOIST WINCH

TYPICAL HYDRAULIC CRANE HOIST WINCH
SINGLE LINE PERFORMANCE

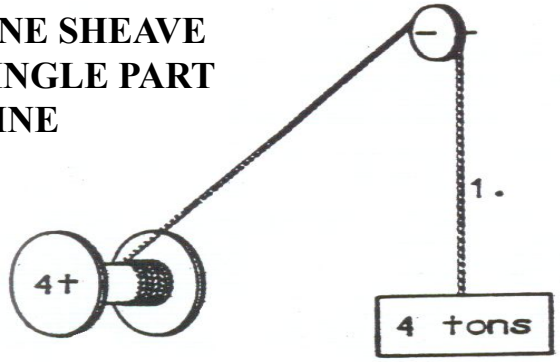
LAYER OF ROPE	LINE PULL TONS	LINE SPEED FT PER MIN
1	7.95	117
2	7.16	197
3	6.51	216
4	5.96	236
5	5.50	256
6	5.11	275
7	4.75	295
8	4.47	315

NEVER EXCEED THE RATED LINE PULL OF A WINCH. THIS IS ESPECIALLY IMPORTANT WITH PLATFORM AND RIG CRANES WHICH USE LONG ROPES. IT IS POSSIBLE THAT A LOAD MAY BE LIFTED FROM A SUPPLY VESSEL, BUT CANNOT BE LIFTED TO DECK LEVEL. IF A CRANE HAS A TWO SPEED LIFTING SYSTEM, IT WILL USUALLY HAVE DIFFERENT CAPACITIES IN HIGH AND LOW SPEEDS.

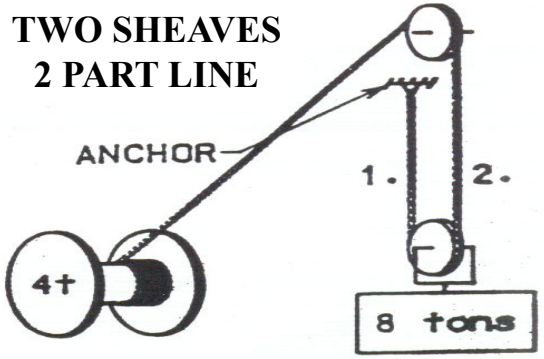
REEVING

WINCH WITH SINGLE LINE PULL OF 4 TONS

ONE SHEAVE SINGLE PART LINE

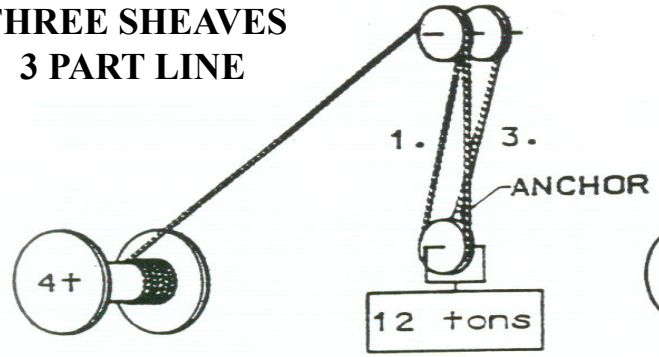


TWO SHEAVES 2 PART LINE

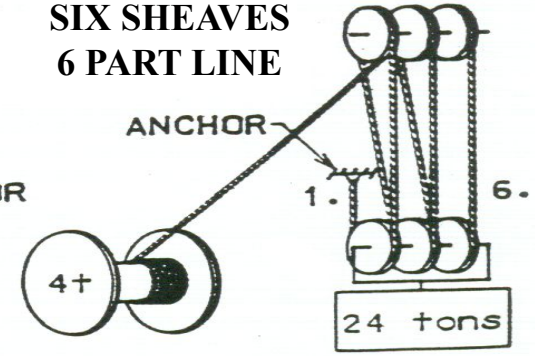


LOAD=LINE PULL + THE NUMBER OF PARTS OF LINE

THREE SHEAVES 3 PART LINE

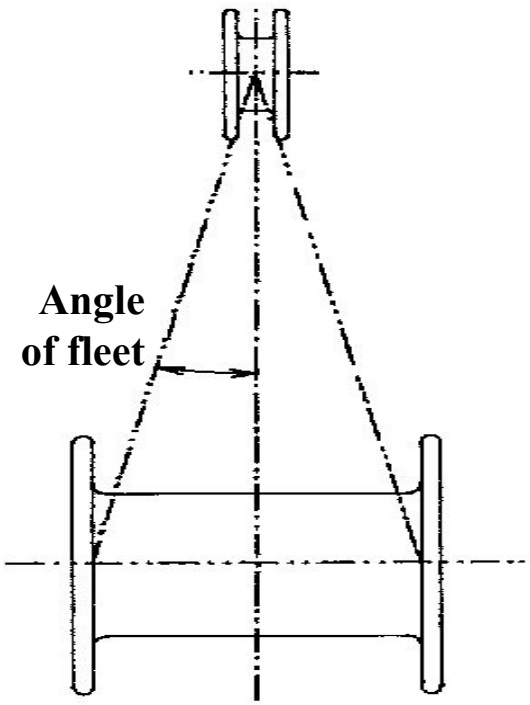


SIX SHEAVES 6 PART LINE



HOOK SPEED=LINE SPEED DIVIDED BY PARTS OF LINE

FLEET ANGLES



The fleet angle is the angle formed between a line drawn from the centre of the pulley to the centre of the drum, and a line from the centre of the pulley to the inside edge of the drum flange.

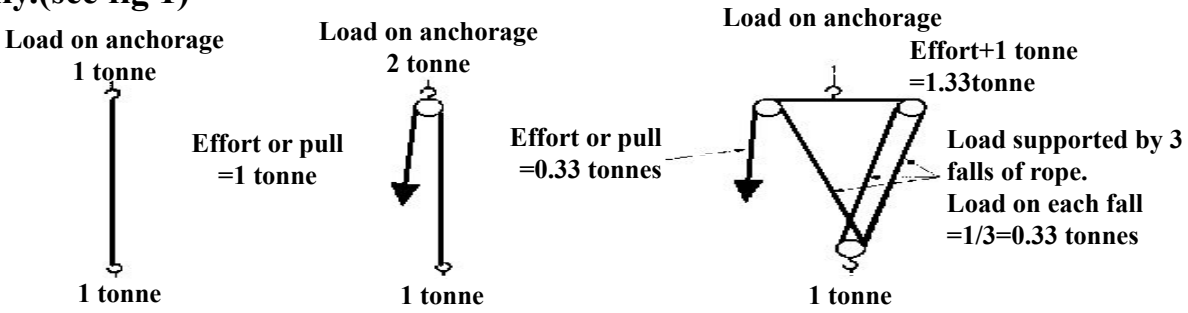
This angle should not exceed 1.5°in the case of smooth drums,and 2°for grooved drums to ensure the minimum amount of side wear of rope against the adjacent warp in the case of smooth faced drums,and against the side of the grooves on grooved drums.

A safe angle can be obtained by allowing at least 24ft(7.3m) of lead for each 2ft (0.7m)of drum width when the lead pulley is mounted on the centre line of the drum.

ROPE BLOCKS

Where excessive manual effort is likely to be necessary,and other means are not available,rope blocks may be used in conjunction with a power winch to carry out a lifting operation.The pull required at the winch is determined by the reeving arrangements as shown below.

A weight of 1 tonne suspended from a hook subjects the hook to a load of one tonne only.(see fig 1)



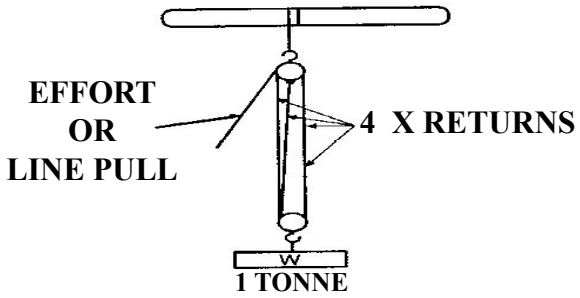
If a rope passes through a block suspended from a hook (see fig 2) the rope supports the tonne weight on one side of the pulley and there is an equal pull of one tonne on the other side.The block is subjected to both the weight and the pull (effort) I.e. a total of 2 tonnes.

If a tackle consisting of a double and single block reeved together is used to support 1 tonne(see fig 3) the load is equally distributed over the three falls: I.e. the tension in each fall =0.33tonnes. Since the tension on the operating rope must equal the tension in each fall,the effort required to raise the load will also be0.33tonnes.It can be said that if more falls are used,the rope tension and effort required to raise the load will be reduced.

ROPE BLOCKS

CONT`D

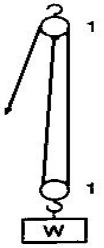
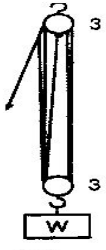
HOWEVER,IN CALCULATING THE EFFORT REQUIRED TO LIFT THE LOAD AND THE LOAD APPLIED AT THE ANCHORAGE,AN ALLOWANCE MUST BE MADE FOR FRICTION. IT HAS BEEN FOUND BY EXPERIMENT THAT IF 10%OF THE LOAD IS ADDED FOR EACH SHEAVE USED,THIS WILL ADEQUATELY COMPENSATE FOR THE WEIGHT OF THE TACKLE USED AND THE FRICTION IN THE SHEAVES.THE TOTAL LOAD ON THE SUPPORT MAY BE CALCULATED BY ADDING A 10th OF THE WEIGHT OF THE LOAD BEING LIFTED AND THE EFFORT ON THE OPERATING ROPE TO THE LOAD.



LOAD TO BE LIFTED = = = = 1.0 TONNE
ALLOWANCE = 1/10 OF LOAD FOR EACH OF 4 SHEAVES
= 1/10 OF 1 TONNE X 4
= 0.1 X 4 = = = = 0.4 TONNES
LOAD PLUS ALLOWANCE = = = 1.4 TONNES

EFFORT = LOAD PLUS ALLOWANCE DIVIDED BY NUMBER OF RETURNS = 1.4 TONNES DIVIDED BY 4= = 0.35 TONNES
WEIGHT ON SUPPORTING STRUCTURE
= LOAD + ALLOWANCE + EFFORT = = 1.75 TONNES

TABLE LOADINGS

ARRANGEMENT	SINGLE	2 SINGLE	DOUBLE AND SINGLE	2 DOUBLE	DOUBLE AND TREBLE	2 TREBLE
THE FIGURE AGAINST THE BLOCK INDICATES THE NUMBER OF SHEAVES						
MECHANICAL ADVANTAGE	1TO 1	2TO 1	3TO 1	4TO 1	5TO 1	6TO 1
LOAD (TONNES)	1.00	1.00	1.00	1.00	1.00	1.00
ALLOWANCE OF 10% PER SHEAVE	0.10	0.20	0.30	0.40	0.50	0.60
EFFORT =LOAD + ALLOWANCE	1.10	0.60	0.43	0.35	0.30	0.27
WEIGHT ON ANCHORAGE = LOAD +ALLOWANCE + EFFORT	2.10	1.80	1.73	1.75	1.80	1.87

The preceding table shall be used to find the effort required on the operating rope and the load on the support.The table is based on calculations for lifting 1 tonne.When lifting any weight other than 1tonne,multiply the appropriate figure in the table by the weight to be lifted in tonnes.Example:To find the effort required and load on support,using and treble blocks to lift 7 tonnes.

Pull or effort for 1 tonne lift = 0.3 tonnes

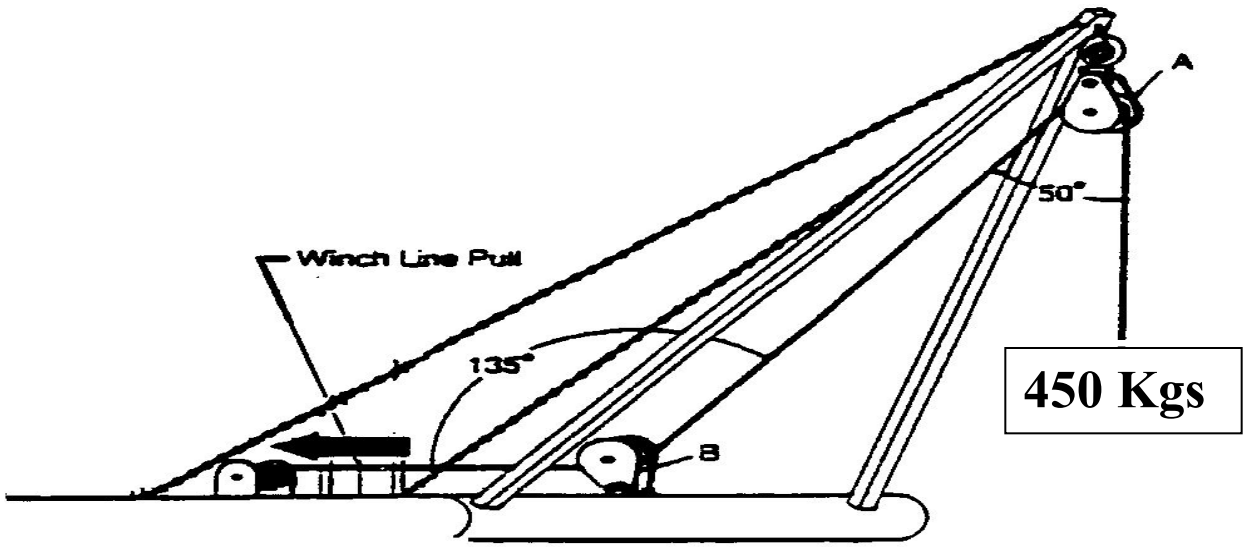
So for a 7 tonne lift,effort = 0.3 x 7 = 2.1 tonnes

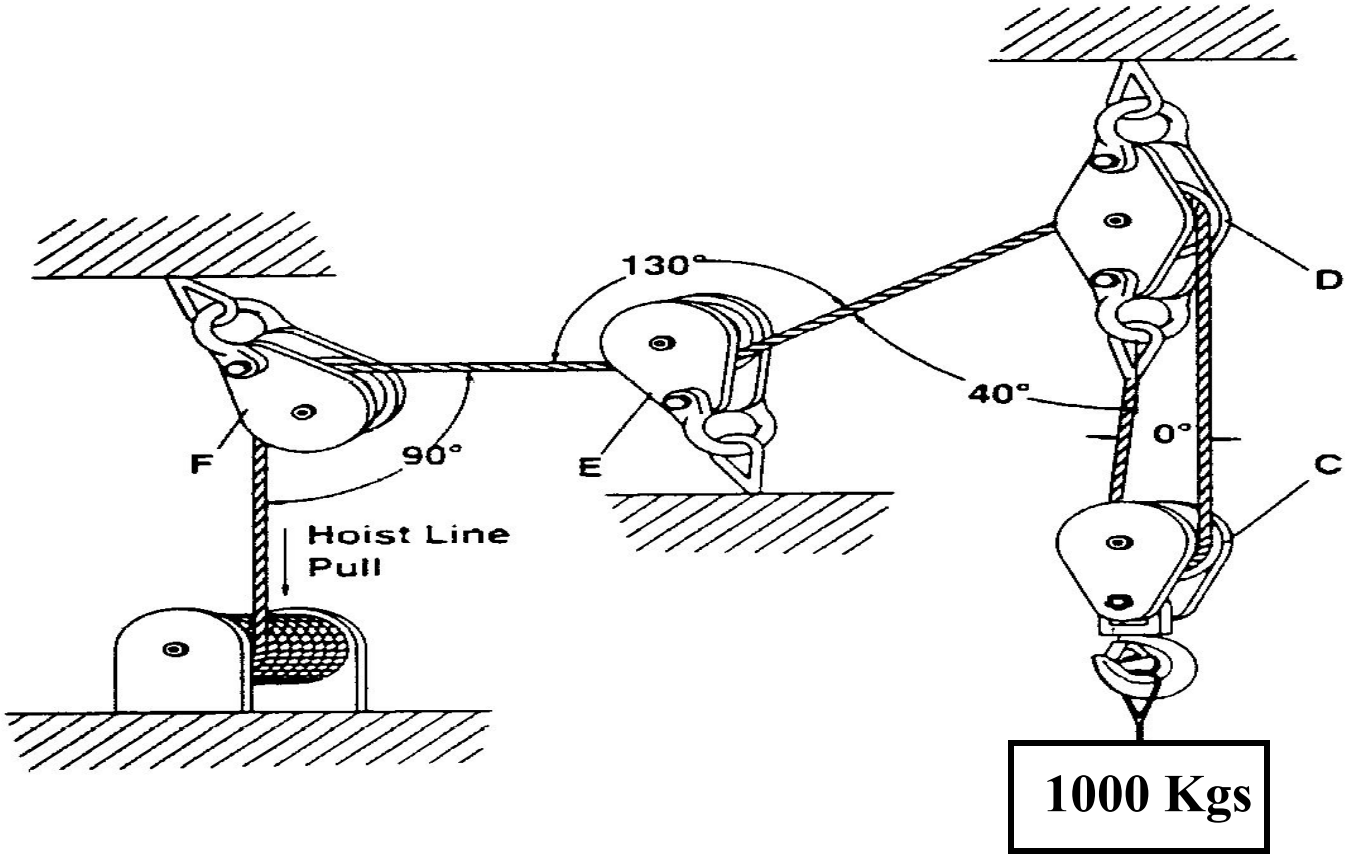
Load on support for 1 tonne = 1.8 tonnes

So for a 7 tonne lift.load on support = 1.8 x 7 = 12.6 tonnes.

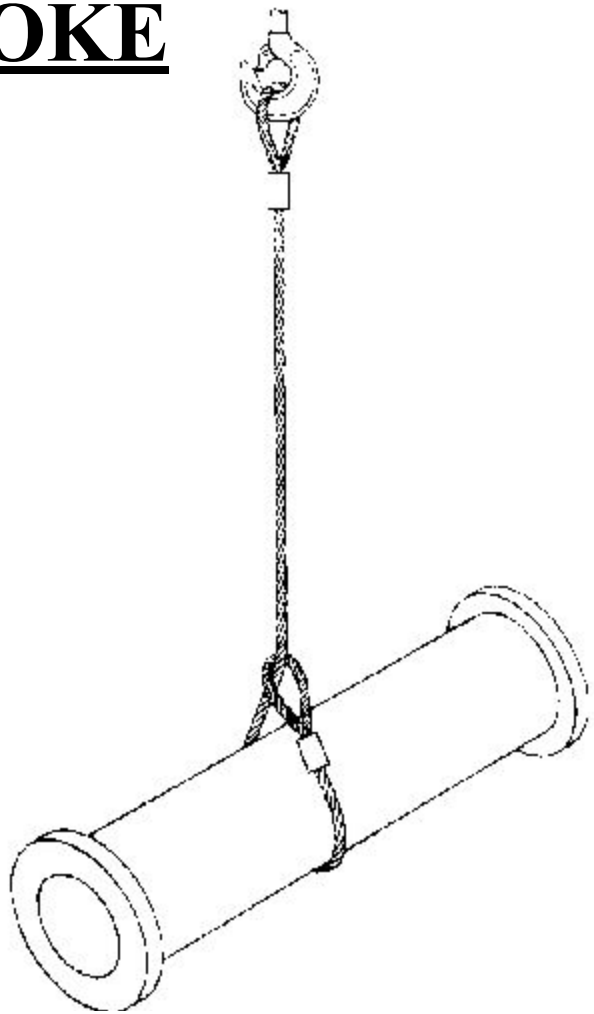
THE FOLLOWING CHART INDICATES THE FACTOR TO BE MULTIPLIED BY THE LINE PULL TO OBTAIN THE TOTAL LOAD ON THE BLOCK.

ANGLE FACTOR MULTIPLIERS			
ANGLE	FACTOR	ANGLE	FACTOR
0º	2.00	100º	1.29
10º	1.99	110º	1.15
20º	1.97	120º	1.00
30º	1.93	130º	.84
40º	1.87	135º	.76
45º	1.84	140º	.68
50º	1.81	150º	.52
60º	1.73	160º	.35
70º	1.64	170º	.17
80º	1.53	180º	.00
90º	1.41	-----	-----

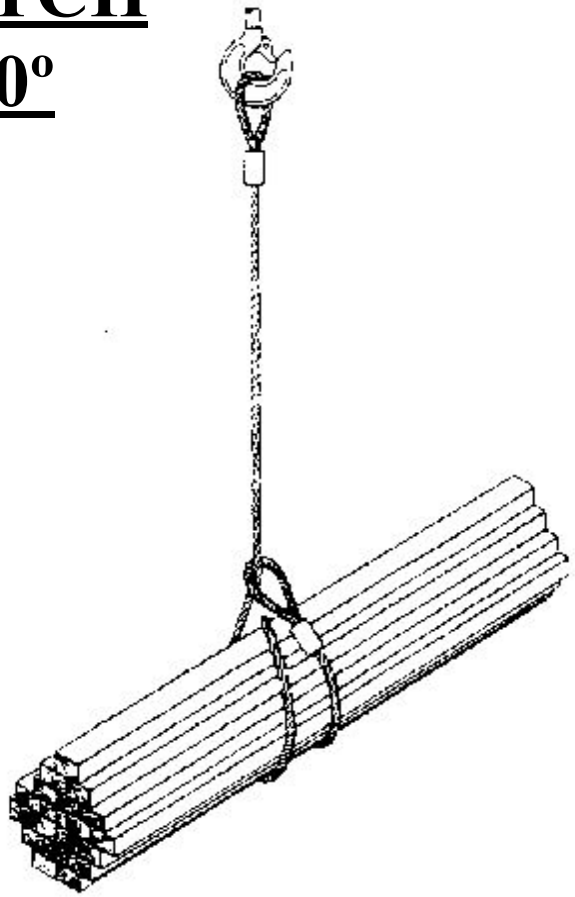

A
50°
Winch Line Pull
135°
B
450 Kgs


130°
40°
0°
90°
D
C
F
E
Hoist Line
Pull
1000 Kgs

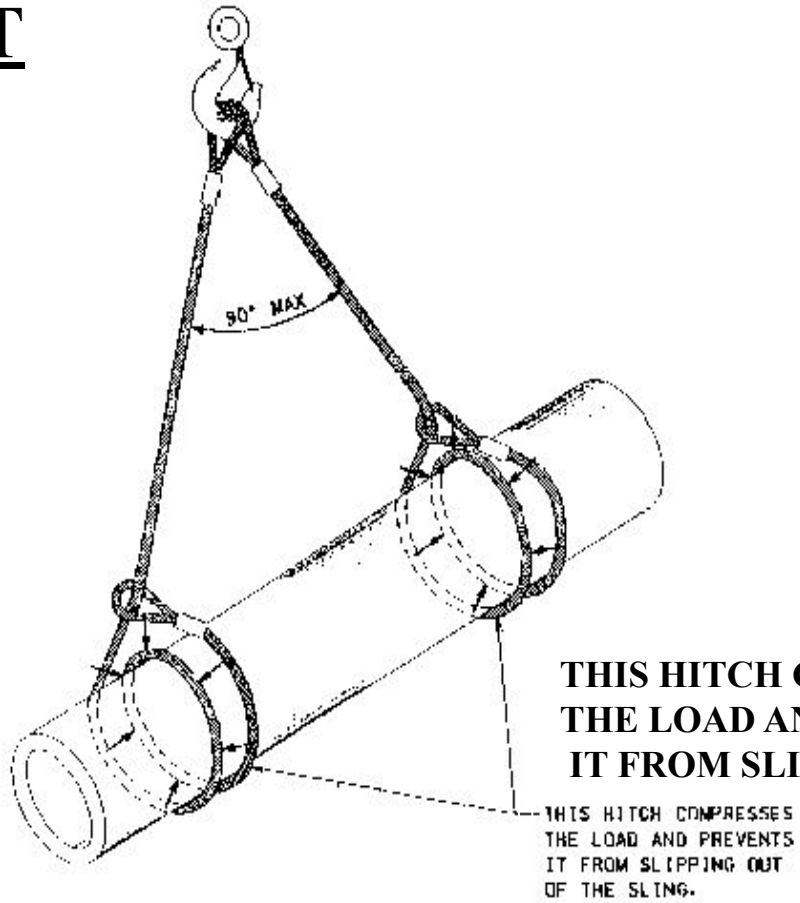
SINGLE VERTICAL CHOKE



DOUBLE WRAP CHOKE HITCH 0º



DOUBLE WRAP CHOKE HITCH AT 90º

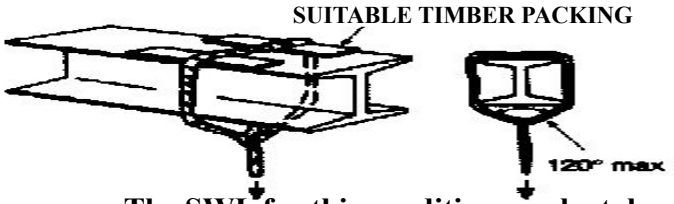


THIS HITCH COMPRESSES THE LOAD AND PREVENTS IT FROM SLIPPING OUT.

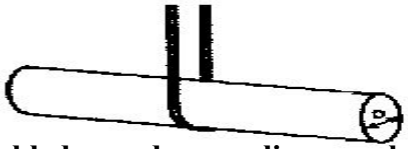
NOTE: THE TOTAL LOAD THAT MAY BE LIFTED WHEN THE INCLUDED ANGLE DOES NOT EXCEED 90°IS 1.4 X THAT MARKED ON THE SINGLE SLING.

FURTHER EXAMPLES THAT SHOW INCREASED LOADING EFFECTS ON ROPES

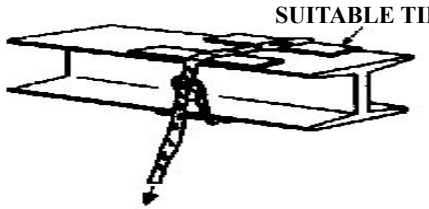
A rope doubled round a shackle or similar small diameter connection is only as strong as the single rope



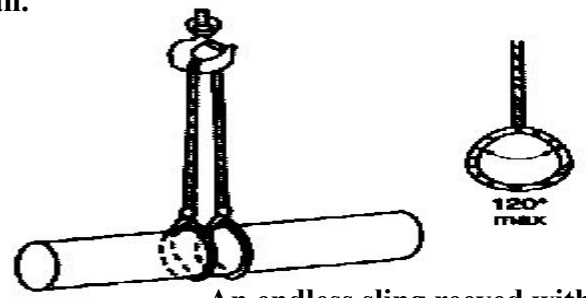
The SWL for this condition can be taken from table two single sling reeved



A rope doubled round an appliance or load with a diameter(D) equal to at least 6 times the rope diameter will carry a load, on each leg,equal to the SWL of a single fall.

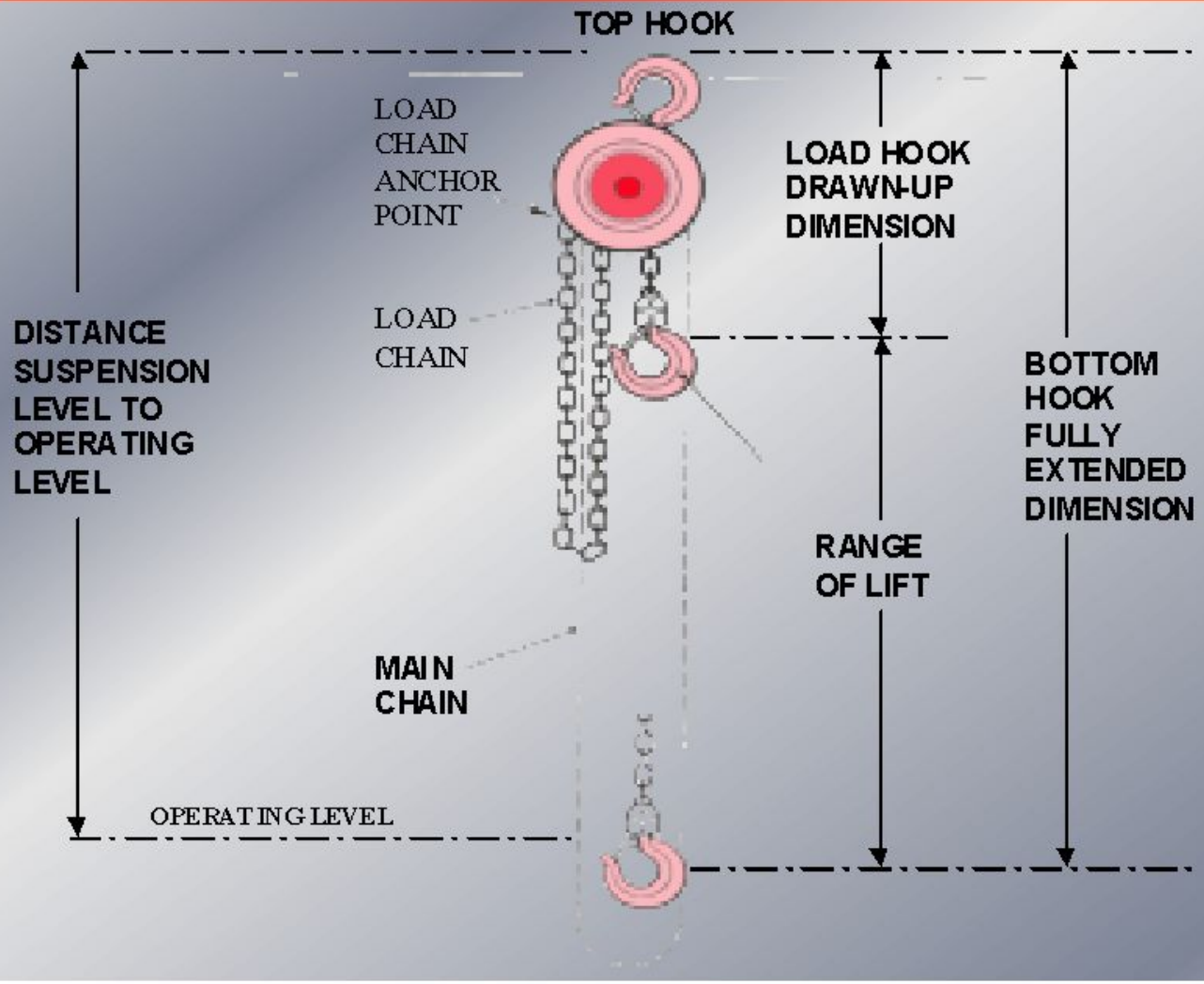


This method is not recommended for general lifting, but may be used for light loads such as placing blocks. The rope will only carry half it`s normal load because of doubling through the eye.



An endless sling reeved with a choke angle up to 120°will carry twice the load of a single sling reeved.

CHAIN BLOCKS



CHAIN BLOCK OPERATING HEIGHT DIMENSION & TERMINOLOGY

Selection of chain hoists

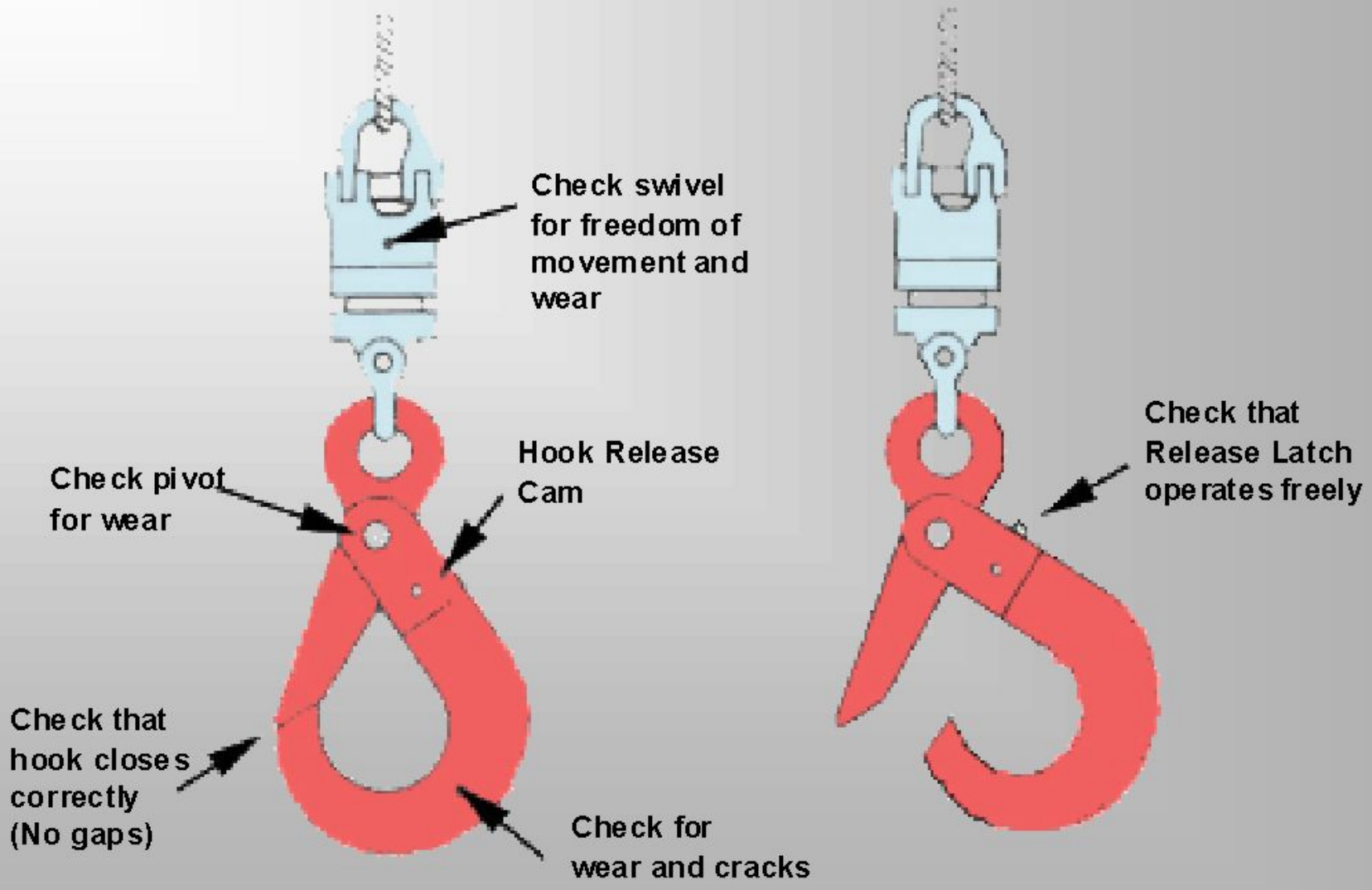
The three main considerations are:

- **SWL (Safe Working Load)**
  - = weight to be lifted and weight of rigging etc

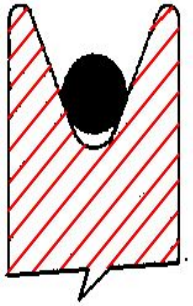
- **Headroom**
  - = amount of space available between load to be lifted and support steelwork

- **H.O.L. (Height Of Lift)**
  - = distance you wish to raise or lower the load

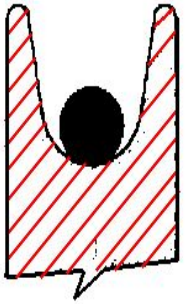
GUNNEBO HOOKS



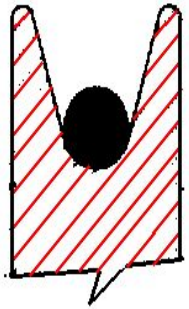
RIGHT AND WRONG PULLEY GROOVES



WRONG
PULLEY GROOVE
TOO NARROW



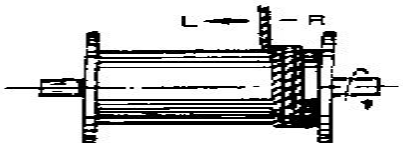
WRONG
PULLEY GROOVE
TOO WIDE

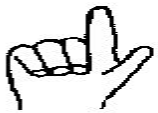


RIGHT
PULLEY GROOVE
CORRECT.
120º OR 1/3rd OF ROPE
IS SUPPORTED

ROPE ANCHORAGE LOCATION
PLAIN DRUM

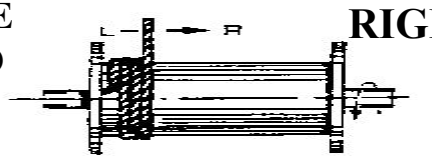
START ROPE AT
RIGHT FLANGE
RIGHT HAND





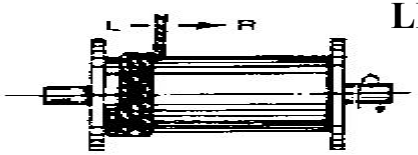
RIGHT HAND LAY ROPE
UNDERWIND

START ROPE AT
LEFT FLANGE
RIGHT HAND

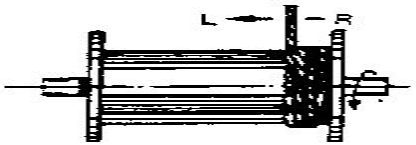


RIGHT HAND LAY ROPE
OVERWIND

LEFT
HAND



LEFT HAND LAY ROPE
UNDERWIND



LEFT
HAND

LEFT HAND LAY ROPE
OVERWIND

NOTE:- Thumb indicates side of rope anchorage

ROPE CHANGEOUT

When spooling wire rope from a wooden drum onto the winch drum, avoid reverse bending which is detrimental to the lay of the rope.

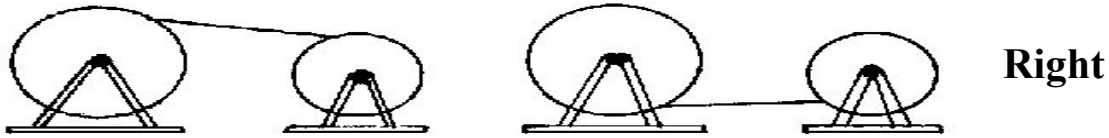
Never reel from top to bottom or bottom to top.

Wrong

Wrong

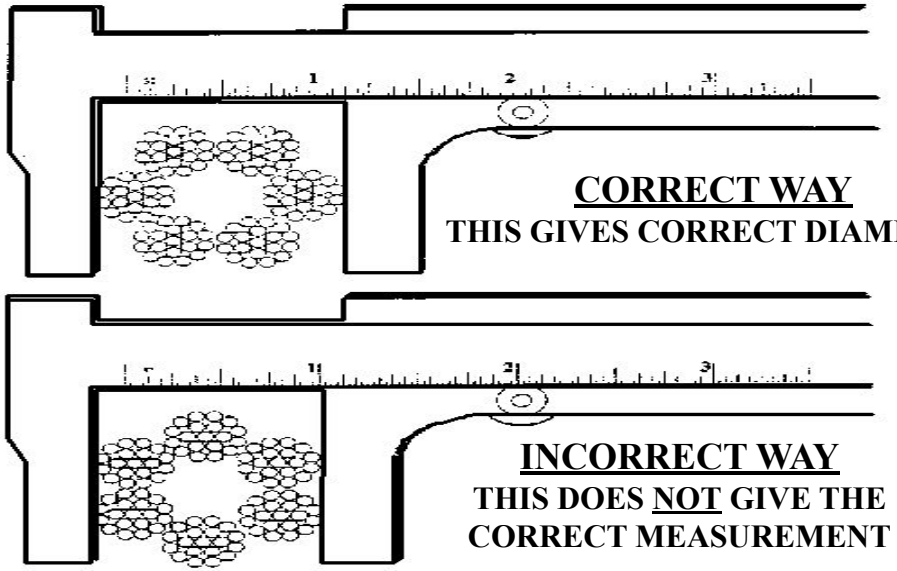
Always reel from top to top or bottom to bottom

Right



Right

MEASUREMENT OF ROPE DIAMETERS



CORRECT WAY
THIS GIVES CORRECT DIAMETER

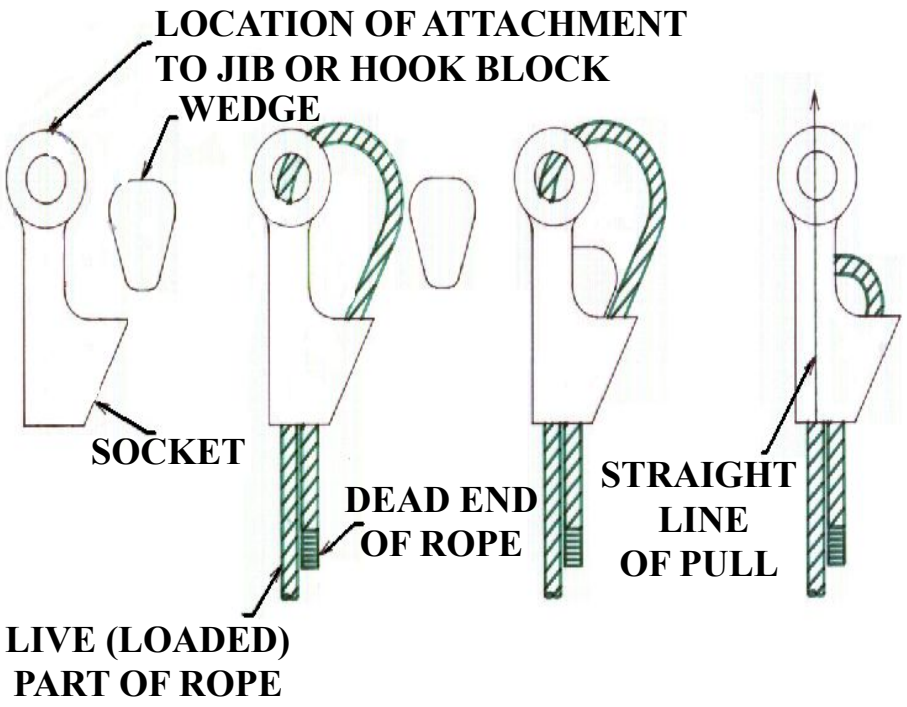
INCORRECT WAY
THIS DOES NOT GIVE THE CORRECT MEASUREMENT

DIAMETER TOLERANCES

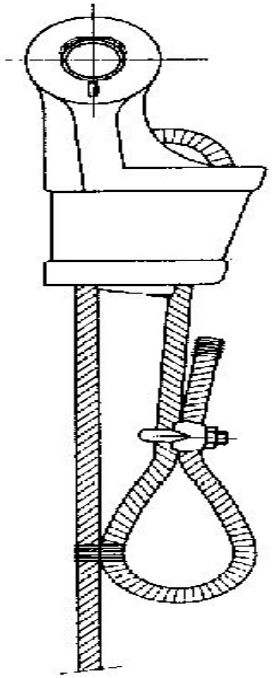
Nominal rope Diameter (inches)	Oversize (inches)
0-3/4	+1/32
1 3/16-1 1/8	+3/64
1 3/16-1 1/2	+1/16
1 9/16-2 1/4	+3/32
2 5/16-UP	+1/8

WEDGE AND SOCKET

ASSEMBLY AND SET UP

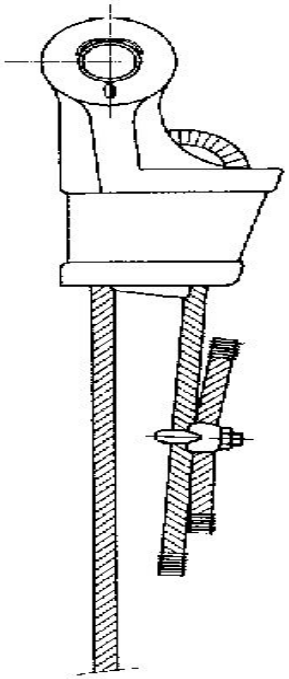


RECOMMENDED ROPE TERMINATION TO BS 7166

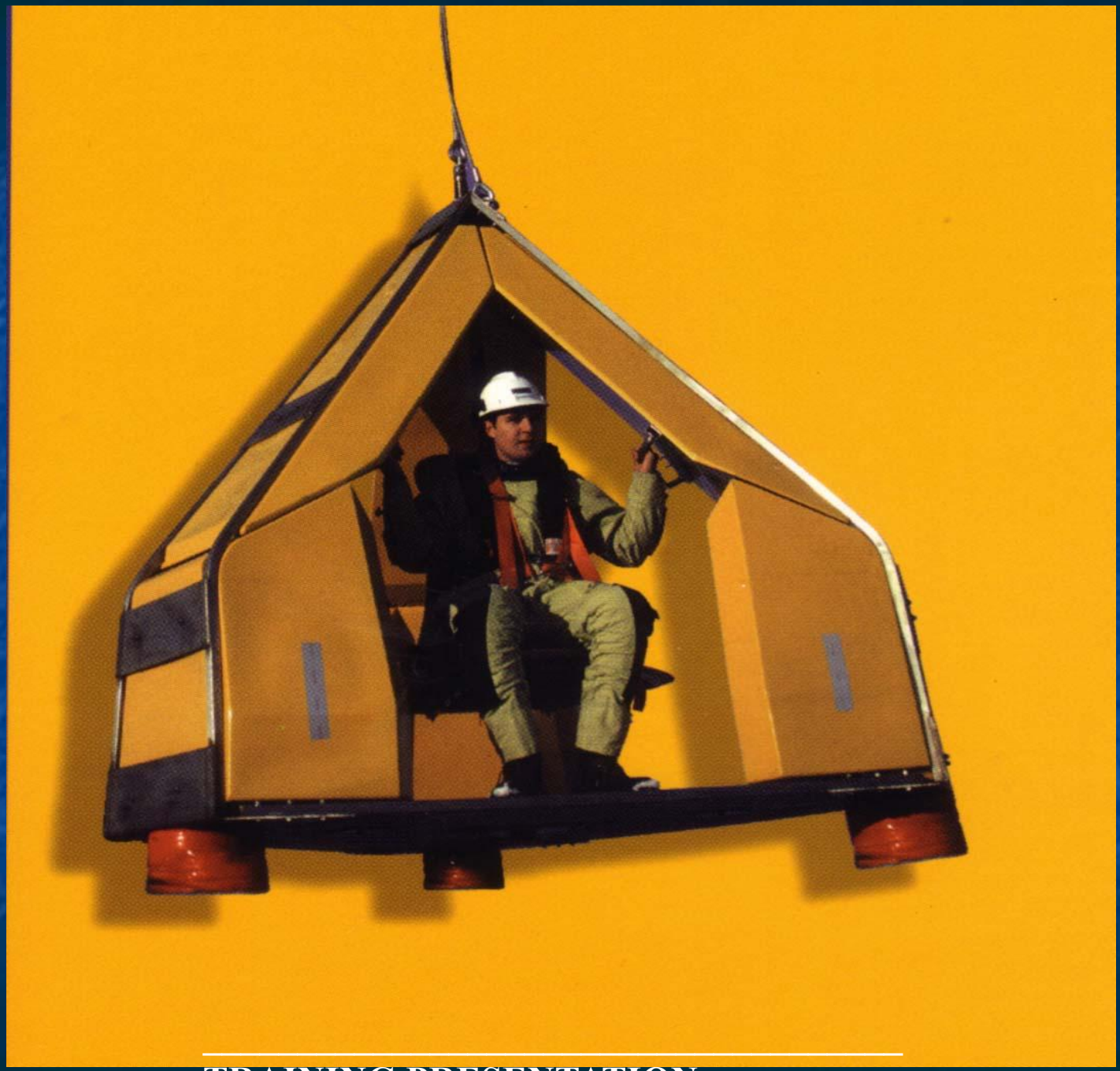


THE DEAD END IS LOOPED BACK ON ITSELF & SECURED WITH A BULLDOG CLIP & SOFT WIRE AS SHOWN.

OR



A SHORT SECTION OF ROPE CAN BE ATTACHED TO THE END OF THE ROPE WITH A BULLDOG CLIP AS SHOWN.



TRAINING PRESENTATION

OPERATIONAL ENVELOPE

The FROG has been designed to ensure passengers safely even when operating in relatively arduous conditions. Passengers are protected during vertical impacts on a vessel deck of up to 4.0 m/s by the properties of the feet and spring mounted seat. Passengers are also protected from impacts up to 2 m/s by the frame work and seat harness. During 2m/s lateral impact the FROG will sustain damage to the central column. It is important that the equipment is inspected after any impact. The unit has a low centre of gravity and a tripod base, providing stability on uneven surfaces or on a pitching/rolling vessel. The FROG has already been used in weather conditions in the region of Gale Force 6 and 2m high seas and also has been reported to be stable and perform well in relatively high winds (when used in conjunction with non-rotating wire rope forerunner and swivel). However, for all routine (non-emergency) operations it is important that the operating parameters are taken into account prior to any transfer.

TRANSFER LOG

As for most potentially hazardous operations carried out in the offshore Environment, the safety of personnel can be greatly improved by careful And systematic pre-job planning.

Preparation should include:-

- Identification and assessment of the principal hazards.
- Inspection of the equipment.
- Proper briefing of personnel.
- Clear allocation of responsibility for the safe conduct of the operation.

Reflex recommend that operators properly log all marine transfers.

FROG OPERATING INSTRUCTIONS

PRE-TRANSFER

1. Supervisor - Conduct Pre-transfer hazard analysis
   : Conduct Inspection of equipment prior to use
   : Brief all persons

i. Crane operator

ii. Deck crew

iii. Passengers

iv. Vessel - Master, Deck crew

4. Passengers - Wear recommended P.P.E. (Personal Protective Equipment), P.F.D. (Personal Floatation Device), and Survival suit where applicable. Note: Send P. F D. to vessel prior to transfer to avoid rush

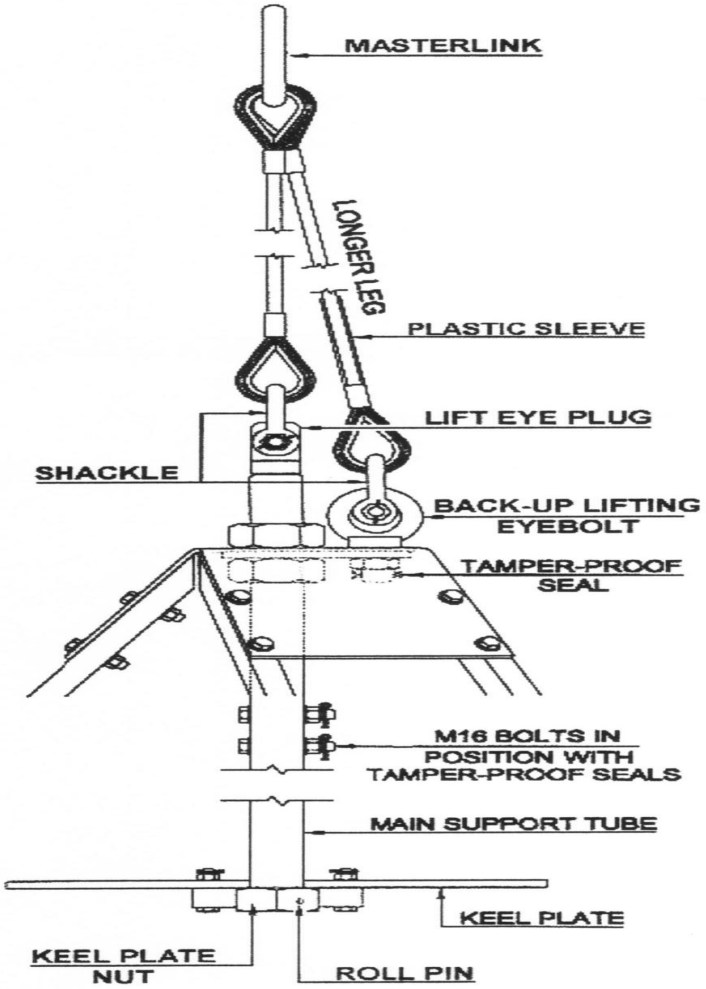
LIFT-OFF

Deck Crew - Hook-up Master link and Safety Loop
2. Deck Crew - Signal to Passengers to enter Capsule when safe to do so.
3. Passengers - Ensure Luggage is secure in designated area.
4. Passengers - Strap-in, do not rush - Loosen Belt, Tighten lower straps, then upper straps
5. Passengers - Signal to Deck crew when Seat belt secure by holding hand up/ thumbs up
6. Deck Crew - Ensure Passengers are strapped in.
7. Deck Crew - Ensure Taglines, where applicable, and Sling are not snagged
8. Deck Crew - Signal Lift to Crane operator

LANDING

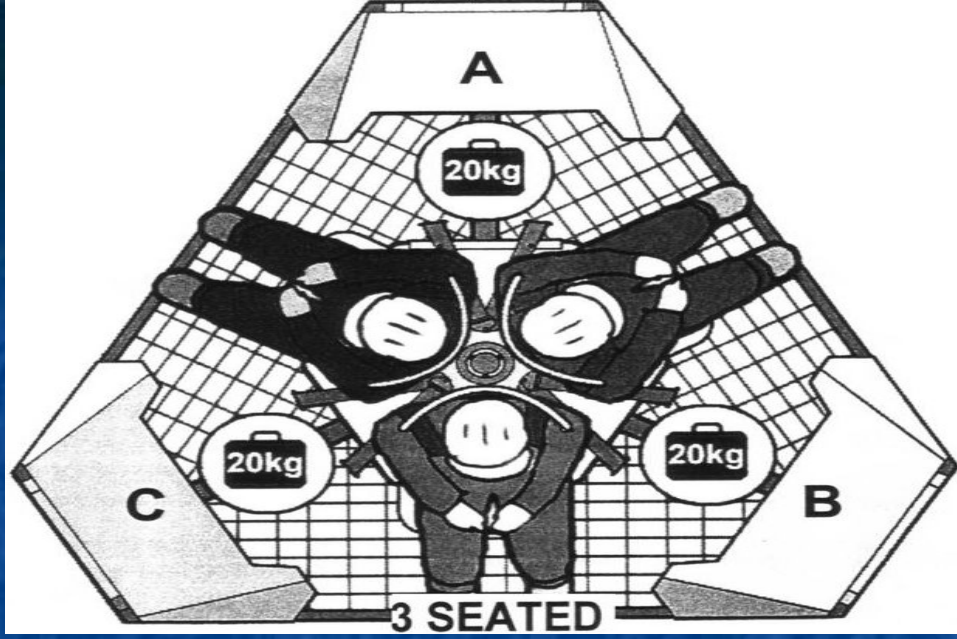
1. Crane Op. - All raising and lowering must be over water
2. Crane Op. - Guide Capsule into clear landing area
3. Deck Crew - Keep safe position if handling unit - Do not stand between Frog and Rail
4. Deck Crew - If Taglines are used beware of specific risks.
5. Crane Op. - Crane operator to release slack when Frog has landed
6. Crane Op. - Crane operator to put Sling down-weather
7. Deck Crew -Ensure Sling is not hazard for exiting Passengers
8. Deck Crew - When Frog securely on Deck. Signal “All clear” to Passengers
9. Passengers - Remain seated until given “All clear” by Deck-crew
10. Passengers - Collect Luggage
11. Passengers -Move away from Capsule towards safe area

INSPECTION PRIOR TO USE



1. Check **LOAD TEST PLATE** and all **CERTIFICATION** are in order.
2. Check all Frog **FITTINGS, FRAMEWORK and BUOYANCY** are in good order.
3. Check **SLINGS** are correctly attached and in good order. Check the **SPLIT PINS** are fitted to shackles. Slings should be in the **HIGH VISIBILITY COVER**.
4. Check **LIFT EYE PLUG** is fully engaged (the machined shoulder should rest on the top of the threaded main lifting column).
5. Check **M16 BOLTS** are secure and Split Pins and Tamper-Proof Seals in position.
6. Check **BACK-UP LIFTING EYEBOLT**, Nut and Tamper-Proof Seal are fitted correctly and in good order.
7. Check **SEAT HARNESSES** operate properly and attachment points are secure.
8. Check **KEEL PLATE NUT and ROLL PIN** are in position.

TAG LINES



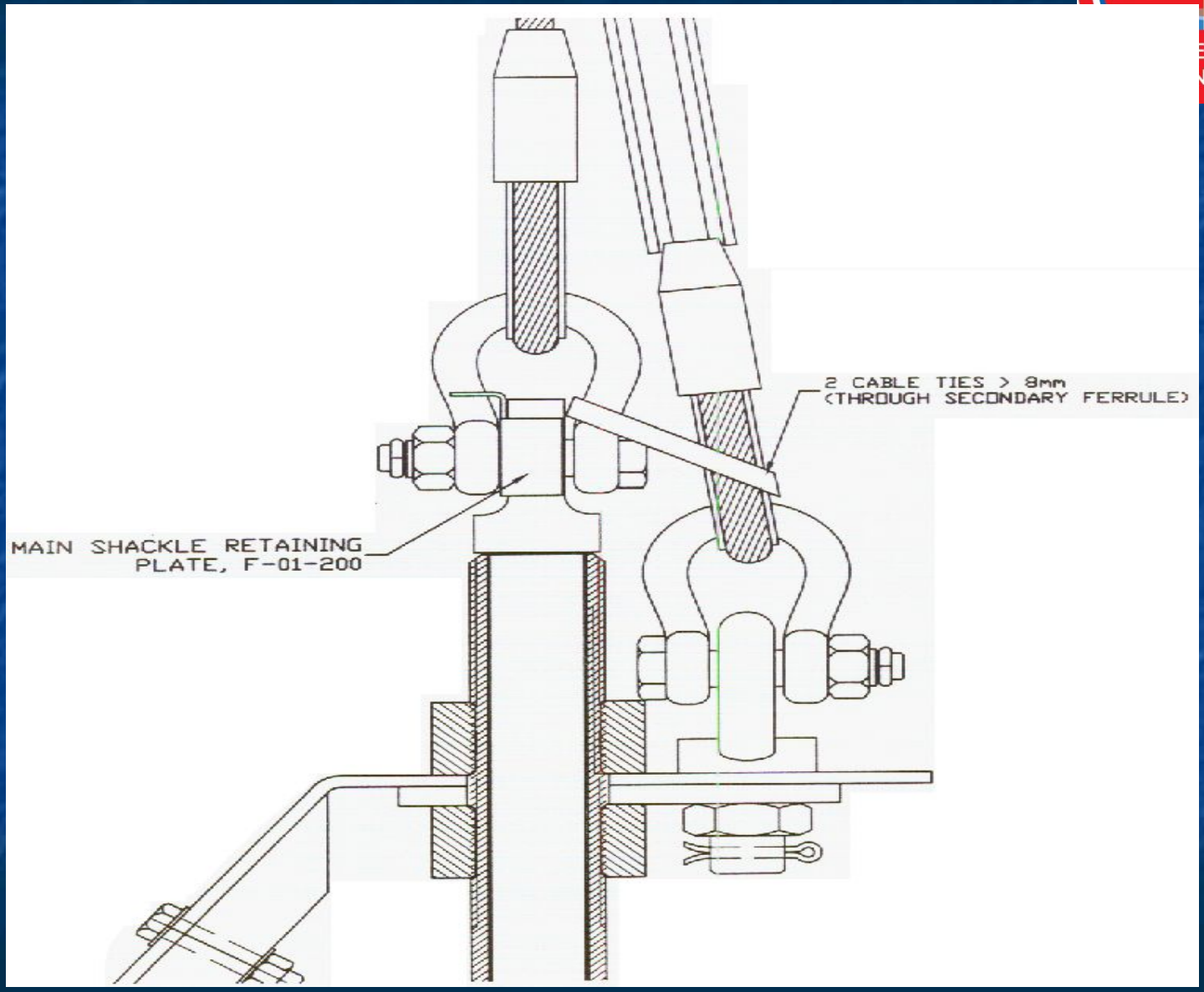
Tag lines (hand line) are not supplied with the FROG. However if users wish to use tag lines for handling the FROG The following should be considered:-

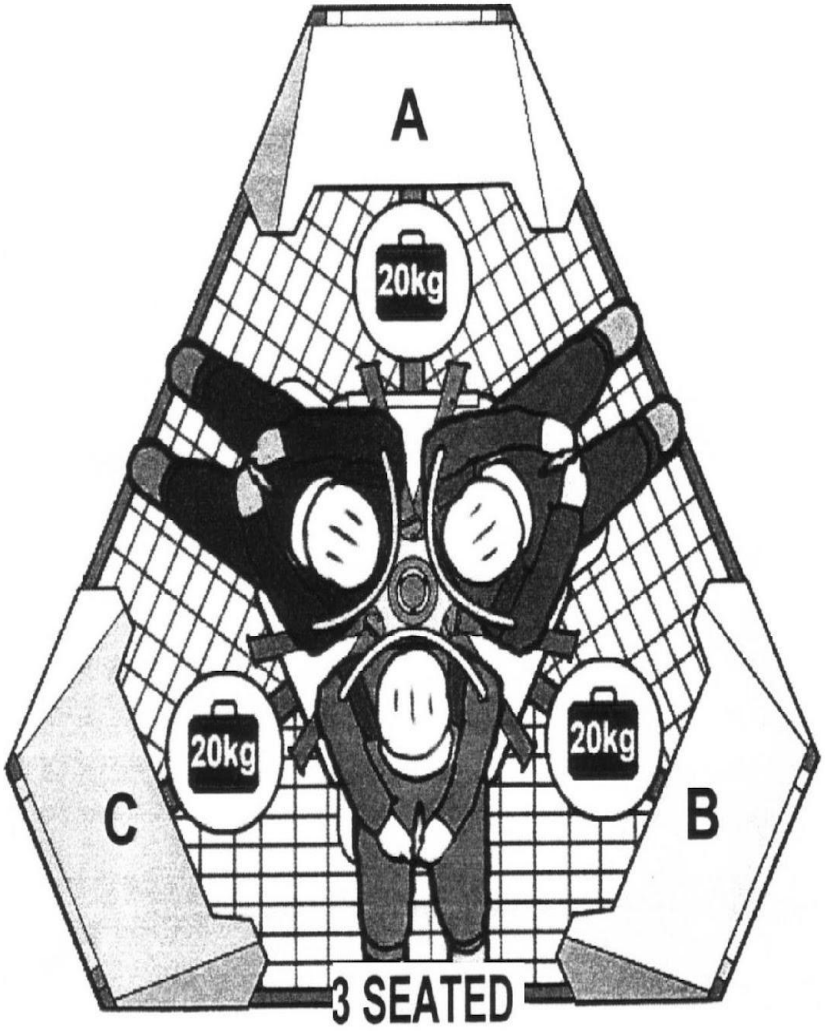
Tag lines should be attached to the floor grating and 30 x 30 brace at the end of the doorway. (See Above)

Reflex marine suggest one or two 3m lines are practicable for handling the FROG, However length of line used is at the discretion of the deck crew.

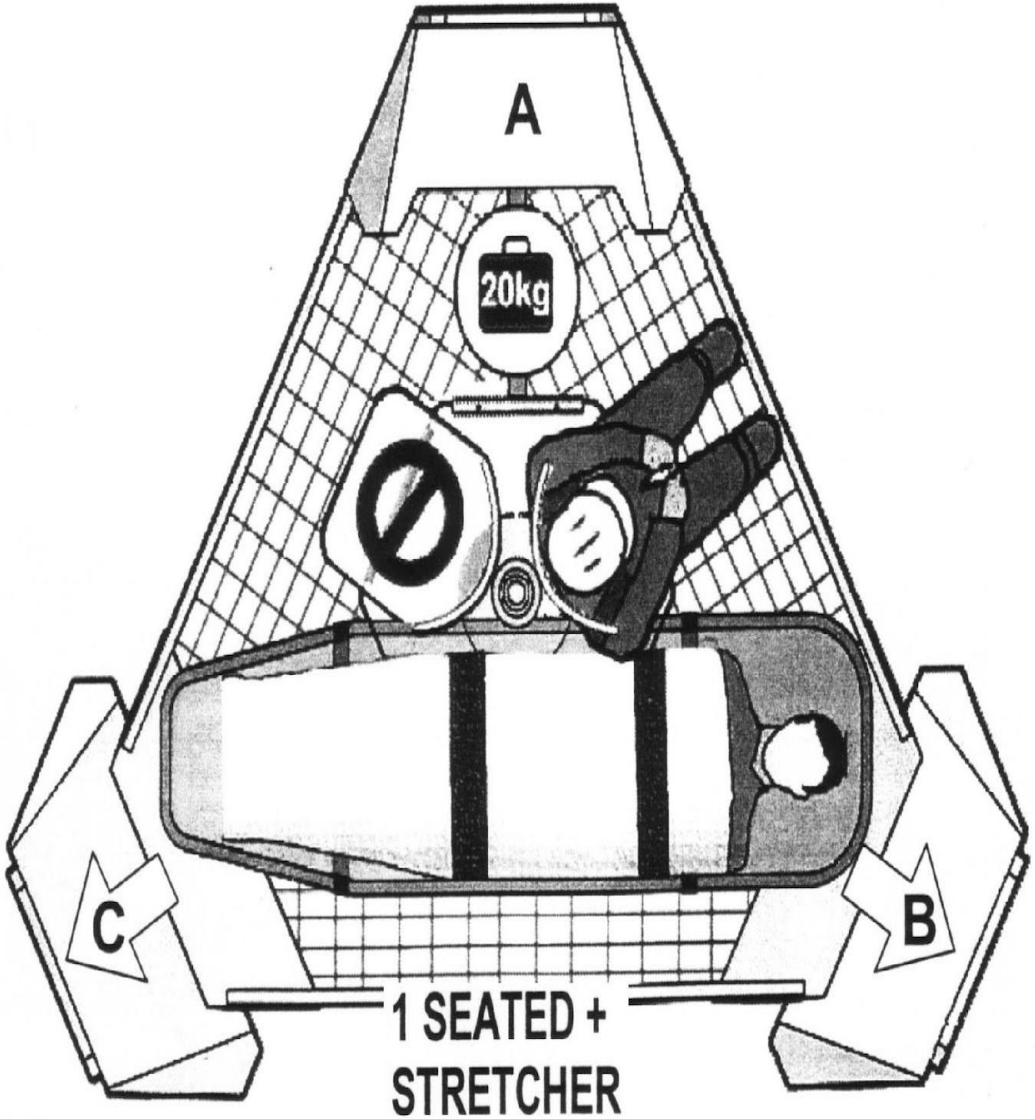
Be aware of the specific risks arising from the use of tag lines:-

- Deck crew using tag lines will be standing closer to the FROG during landing, which increases the risk of impact or caught in between.
- Ensure tag lines are not tied or caught on any adjacent equipment or structures.
- Ensure tag lines are clear of knotting and deck crew have suitable hand and eye protection.


2 CABLE TIES > 8mm
(THROUGH SECONDARY FERRULE)
MAIN SHACKLE RETAINING
PLATE, F-01-200



3 SEATED



1 SEATED +
STRETCHER

OFFSHORE BOAT TO RIG (MODEL BE-870)

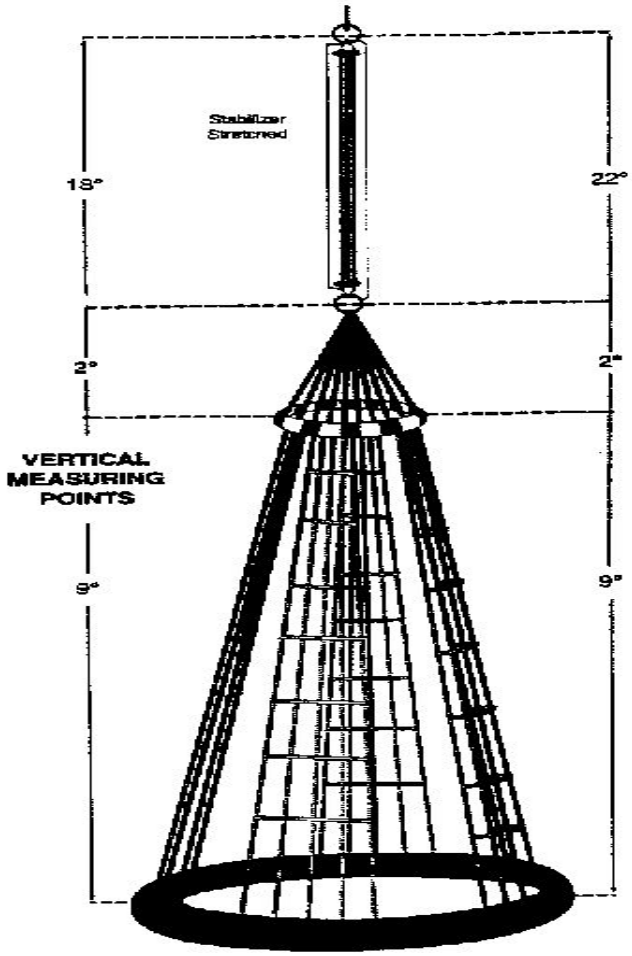
SPECIFICATIONS:

- API Specification 2C Third Edition, March 1983, Section 5.4 (d). SWL R2500LGS with Design factor of 10.
- Lifting Ring – 7/8" forged steel.
- Hand-spliced eyes.
- Safety Load Line – 1/2" (request only)
- Stabilizer Unit is covered with canvas. This must be kept on for weather protection of rubber components.
- Netting lines are 3/4" polypropyene, 6,500 lbs. test each.
- Top Ring – 30" padded.
- Bottom Ring overall dimensions 72" with padding.
- Padding is shock absorbing, synthetic flotation material.
- Buoyancy is enough to float (5) five men.
- 9 feet from bottom to top ring.
- Overall vertical length 29 feet.
- Four entrances to net.
- Bottom of net – 5 rubber chafe pads.

ROUGH SEAS NET (MODEL BE-871)

SPECIFICATIONS:

- Same as Model BE-870 except length is 33' instead of 29'.
- Model BE-871 is designed to operate in much rougher seas.
- Achieved by extending the stabilizer and the load line.
- The cost is the same as Model BE-870.



ARE THERE ANY QUESTIONS?

END OF PRESENTATION