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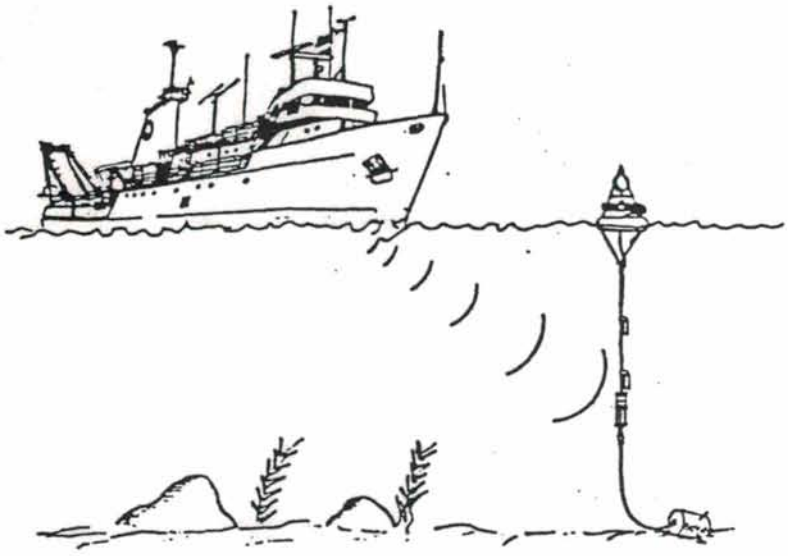

University-National Oceanographic Laboratory System

RESEARCH VESSEL OPERATORS COMMITTEE NEWSLETTER

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15 April 1991
Volume 16, No. 1

EDITOR'S NOTE

This is the first of two Newsletters planned for 1991. The next edition will be in the mail August 30, 1991. Please send any input to me prior to August 15, 1991. An updated RVOC Operators Directory is included with this Newsletter. If the information listed for your institution is incorrect, please let me know. Happy Spring.....
Bruce Cornwall

ANNUAL RVOC MEETING

The 1991 Annual RVOC Meeting will be hosted by the Institute of Ocean Science (IOS), Sidney, B.C., Canada. Meeting dates are September 10-12, 1991.

Dale Gibb, IOS, who looked into the hotel situation for us in Victoria, has blocked out a group of rooms at the EMPRESS. According to Dale, the EMPRESS is a heritage hotel, part of the original Canadian Pacific Railroad System. It is directly on the inner harbor and close to all Victoria amenities. The current rate for a single is 90 dollars per night Canadian (76.50 USD), government rate.

Look for information concerning hotel reservations and social activities to be posted in the future on telemail. Complete information will accompany the August Newsletter.

SMALL BOAT OPERATIONS FROM RESEARCH VESSELS

During the RVOC meeting in New Orleans, Tim Askew chaired a discussion which addressed the five questions posed in the Final Report of the Workshop in Shipboard Scientific Diving Safety, pp 32-35, "Small Boats and Small Boat Operators: Are There Adequate Rules and Guidelines for the Use of Small Boats Launched from Research Vessels?" After some debate, a panel was formed to accomplish several objectives concerning the small boat operation issue.

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One of the panel's objectives was to develop a common set of guidelines for small boats and their operators. The "straw man" guidelines which follow were developed by panel member Tim Askew, HBOI, and are provided for general information and comment. Tim welcomes any thoughts you might have on this issue.

RESEARCH VESSEL OPERATORS COUNCIL
(STRAWMAN)
SMALL BOAT OPERATIONS FROM RESEARCH VESSEL

Boat Operators

In order to become a qualified boat operator, a person must meet the following requirements:

1. Certification (i.e., U.S.C.G. Auxiliary course in Basic Seamanship, institutional, or other approved courses).
2. Successful completion of an examination administered by Marine Ops staff.
3. At sea check-out for operator consisting of launch and recovery, radio operation, emergency procedures, tending divers, approaching another vessel, etc.
4. Show proficiency in establishing relative position of the boat by using available navigational aids (e.g., use of charts, compass, LORAN, etc.)
5. Demonstrate proficiency with all pertinent operational and safety equipment.
6. Demonstrate ability to use and negotiate expected environmental features (e.g., negotiate kelp beds and coral reefs, read water colors and depths).
7. Demonstrate landing and launching small boats through the surf.
8. Demonstrate expertise in following divers (e.g., following diver bubbles, float lines, etc.)
9. Boat operator should be certified in basic first aid/CPR.

Boat Equipment

All USCG required equipment must be in the boat when in operation. The following equipment is required:

1. One life jacket per person (including divers) (Institution may substitute buoyancy compensators, wet suits and dry suits as substitutes for life jackets. Not recognized as PFD by USCG)
2. At least one throwable floatation device (seat cushion)
3. Oars
4. Anchor and line
5. Bailer
6. Distress signals (flares/rockets)
7. Horn
8. Fire extinguisher (must be readily accessible)
9. Copy of Registration Certificate
10. Running lights when operating at night
11. VHF radio (not USCG required for small boats but should be institutional requirement)

The following equipment is recommended, but not required:

1. Fathometer
2. Portable radar reflector
3. VHF radio with RDF (radio direction finder)
4. Strobe lights
5. Mylar Balloons
6. EPIRBs (emergency position indicating radio beacons)

Operational Procedures

Required:

1. The operator shall wear a PFD at all times.
2. Engine shall be secured when divers entering/exiting the water. (Unless propeller is protected by a guard)
3. Divers will remove gear prior to exiting water.
4. Boat operator will report to bridge watch via VHF radio when divers submerge and resurface.
5. Boat operator will report to bridge watch via VHF radio when something looks amiss.
6. Boat operator will report status on a predetermined schedule.
7. Boat operator shall use check list to ensure boats operational status and presence of safety equipment.
8. Boat operator shall check weather report and/or status including sea conditions.

Optional:

1. Passengers shall wear PFDs at all time. (If passengers are divers, they must wear wet/dry suits or BCs during transit).
2. Diving equipment in boat during launch and recovery.
3. Operator in boat during launch and recovery. (If so, tackle must be man rated).
4. Boat operator fills out and has approved by Master a float plan prior to leaving the mother ship.
5. Diver in charge fills out and has approved by the Diving Supervisor and Master a dive plan which replaces a float plan when boat is used for diving.

Special:

1. Boat operator shall be familiar with blue water diving procedures.
2. Boat operator shall be familiar with cold water diving procedures.
3. If boat is being operated out of site of the mother ship, operator shall report status via VHF radio more frequently. (Frequency determined by Master).
4. If boat is being operated in low visibility conditions, such as fog, haze, night operations, or any other condition that may reduce or hinder line of sight visibility, operator shall report status via VHF radio more frequently. (Frequency determined by Master).

Emergency:

1. Boat operator should have a means of recalling divers to surface in an emergency. (Portable Underwater Recall System, Lubell Underwater Loud Speaker or mechanical means of sending a predetermined signal).
2. Boat operator may be required to administer first aid/CPR to a passenger or injured diver.
3. Boat operator should be familiar with disabled boat procedures. (Deploy sea anchor, deploy proper signal flare, radio communications with mother ship).
4. Boat operator should be familiar with loss of communications procedures. (Recall divers, signal mother ship).

WIRE AND CABLE LUBRICATOR

B & C Wireline, LTD of Medicine Hat, Alberta, Canada has developed and is marketing a new type of cable lubricator. The "Core-Lube" is a recycling lubricator which was developed for use in Canada's Oil Patch. It differs from the Brooke Ocean Technology "Cable Maintenance System" in that it uses an air pressure rather than a mechanical seal. "Core-Lube" consists of a compact, lightweight, self-cleaning housing and a lubricant supply and filtering system with an air driven pump. B & C claims the single chamber device will clean by displacement as well as lubricating. Total cost of a unit and an assortment of liners and bushings is about $3500 (US), about half that of the BOT system. OSU plans to conduct an evaluation of this new device over the next few months and provide a report, with recommendations, by RVOC 91. If your needs are more urgent call Ron Chisholm at B & C, 403-529-9645.

"Evaluation of Lubricants to Increase Wire Rope Life" by Freely and Anderson provided courtesy of B & C Wireline, LTD.

THE FOLLOWING PAGES OF THE NEWSLETTER ARE DEVOTED TO CLIPPINGS, FORMS AND OTHER INFORMATION THAT MIGHT BE OF INTEREST TO RVOC MEMBERS.

RVOC OPERATORS DIRECTORY

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Quentin Lewis	Duke	(919)728-2111	(919)728-2154	DUKE.UNC
Don Newman	USC	(213)830-4570	(213)830-6328	R.PIPER
Waddy Owen	U of Delaware	(302)645-4320	(302)645-4006	W.OWEN
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Steve Rabalais	LUMCON	(504)851-2800	(504)851-2874	LUMCON
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Jim Williams	SIO, UCSD	(619)534-1643	(619)534-1635	SCRIPPS.MARFAC
Don Gibson	U of Texas	(512)749-6735	(512)749-6777	T.WHITLEDGE

EVALUATION OF LUBRICANTS TO INCREASE WIRE ROPE LIFE

by Jack E. Fraley[1] and Grant L. Anderson[2]

ABSTRACT

The Bureau of Mines, U.S. Department of the Interior, determined that the life of hoist ropes can be increased by regular application of selected lubricants to decrease internal corrosion and wear, thus reducing rope replacement expenses. Lubricant effectiveness is determined by nondestructive testing (NDT) at intervals throughout the rope life. A rope is passed through a sensor head that determines the loss of metallic area (LMA) and the local faults (LF) such as broken or missing wires. The LMA and LF are presented as traces on a strip chart. The nondestructive testing method provides advantages over a visual rope inspection because it allows determination of the structural integrity of the internal rope parts and requires less interruption of the hoisting for testing. This report discusses the observable trends in the LMA and LF traces, which indicate that thin, penetrating synthetic lubricants extend rope life.

INTRODUCTION

Wire ropes used in mine hoisting operations often have greatly shortened service lives because of excessive internal corrosion and wear. However, the service lives can be increased by regular field applications of lubricants to reduce the corrosion and wear.

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[1]Chemical engineer.
[2]Structural engineer.
Spokane Research Center, Bureau of Mines, U.S. Department of the Interior, Spokane, WA.

The traditional method of evaluating lubricant effectiveness has been to perform several laboratory tests[3] to compare desirable lubricant properties such as corrosion resistance, viscosity, and adhesion. Wire rope consists of a core, strands, and wires (figure 1). As a rope is loaded during hoisting operation, the strands and wires rub against each other and against the core, which makes the rope behave as a machine with several moving parts. The laboratory tests often do not evaluate a rope under load. Consequently, they are not able to determine the extension of rope life with proper lubricant usage.

A better method of evaluating lubricant effectiveness is to test a rope by the NDT procedure at periodic intervals throughout its service life. The rope is passed through a sensor head that determines the rope's loss of metallic area (LMA) and local faults (LF) such as broken or missing wires. The NDT method, while not eliminating the visual rope inspection, provides advantages in that it allows determination of the structural integrity of the internal rope parts and requires less downtime for testing. Researchers at the Bureau of Mines Spokane Research Center evaluated NDT data on various ropes by comparing the LMA and LF and noting the trends.

ACKNOWLEDGEMENTS

Thanks are given to Mr. Dave Hall of Halkin Services Inc., Denver, Colorado, for providing to the Bureau NDT data on in-service ropes.

DESCRIPTION OF A HOIST ROPE SYSTEM

One arrangement of hoist ropes in a molybdenum mine consists of five ropes: (1) the service cage rope, (2) the service cage counterweight rope,

[3]Critical Assessment of the State of the Art of Lubrication for Mine-Hoist Ropes, final report, Contract J0377011, Battelle Columbus Laboratories, Columbus, Ohio, July 1978.

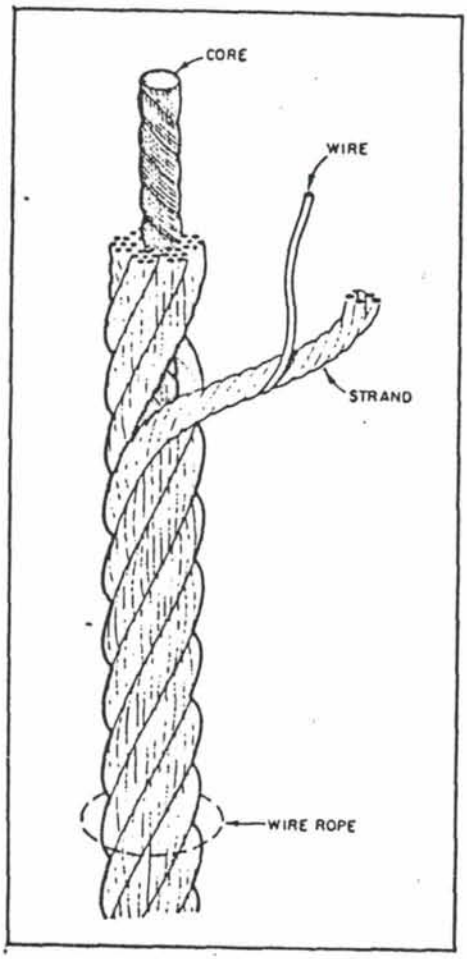


Figure 1.- Three parts of a wire rope.

(3) the small cage rope, (4) the south waste hoist rope, and (5) the north waste hoist rope. All of these ropes were subjected to similar environmental conditions. A side view of the rope arrangement is shown in figure 2; a plan view is shown in figure 3.

The south and north waste hoist ropes were evaluated for the effects of lubricants on rope life. These ropes are 6 X 27 FS FC RLL, 1-3/8 inches in diameter and 1,150 feet long. The ropes are exposed to 0 to 90 degrees Fahrenheit in an acidic environment having over 50% relative humidity. They are raised and lowered with an 8 foot diameter double-drum hoist. Both ropes pass over 8 foot diameter sheaves. The average rope load is 10 tons at a rope speed of 850 feet/minute.

South Waste Hoist

Figure 4 shows the LMA portions of the strip charts for the south waste hoist. The first LMA trace (separated from the others) is for a rope retired from service after 19 months; the other LMA traces are for the replacement rope. Two rope reterminations are indicated. The second rope retermination cut off the maximum LMA of the rope that was read from the strip charts, requiring that the LMA be read at a second chart location.

As figure 4 shows, the LMA increased as the replacement rope aged but at a much slower rate than for the retired rope. The lubricants are shown in figure 4 along with the rope age and the LMA.

Figure 5 illustrates how the LMA is read from the strip charts. The uppermost portions of the LMA trace normally represent those sections of the rope with the least metal loss. The horizontal dotted line (0% LMA line) assumes that there is no metal loss from the best rope sections (which is not always the case). The NDT instrument is calibrated so that each of the 10 major vertical divisions on the strip chart represents a 1% LMA. The maximum

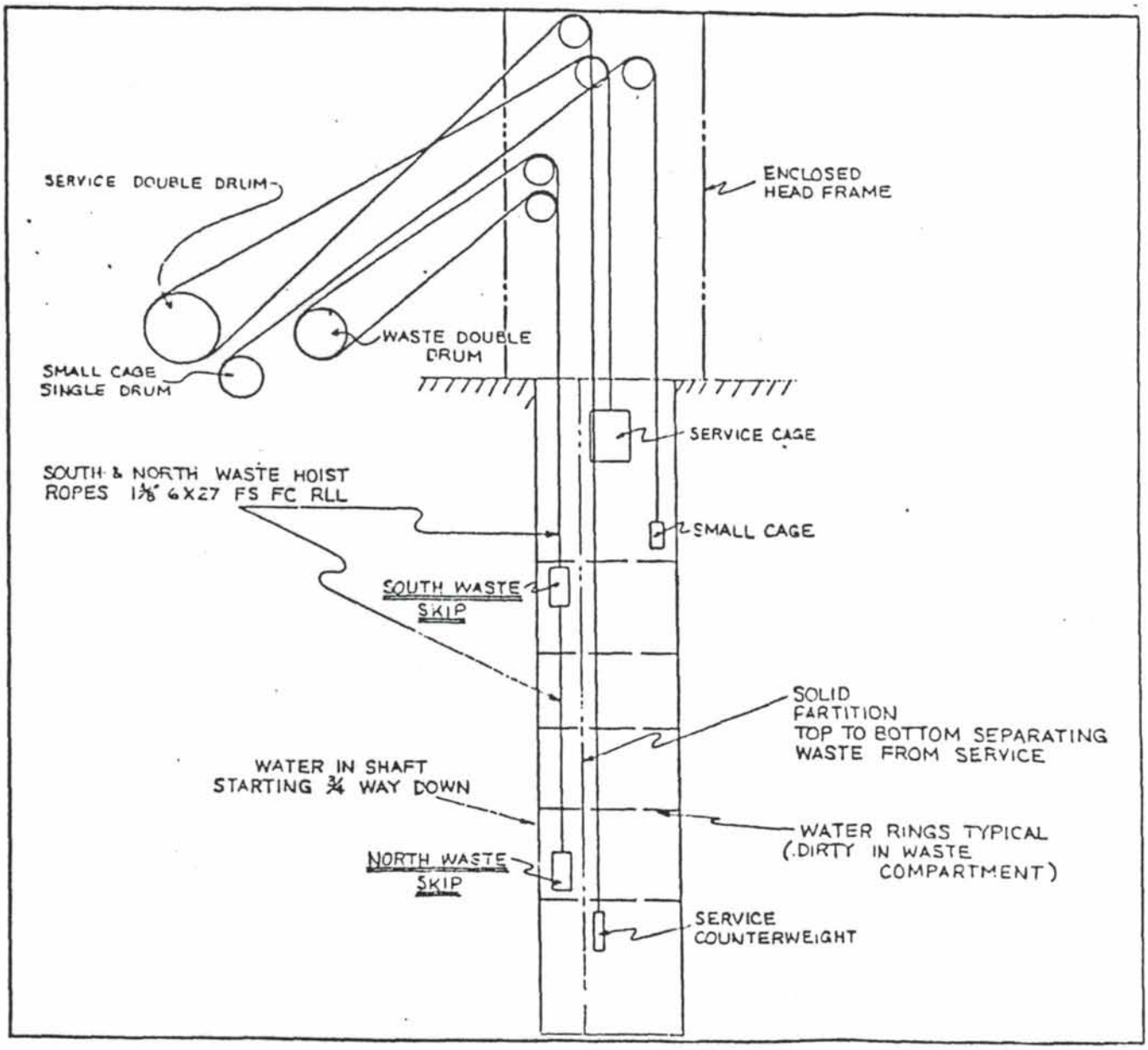


Figure 2.- Hoist rope arrangement.

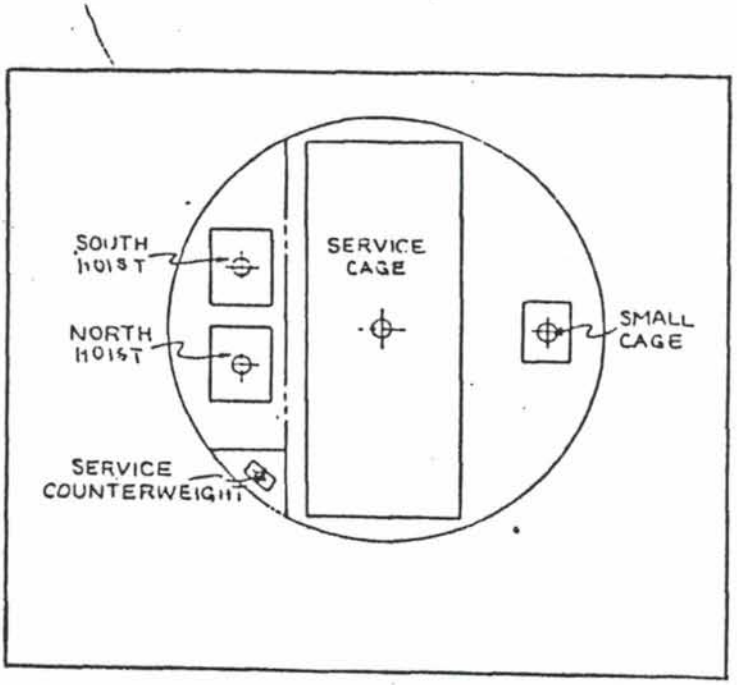
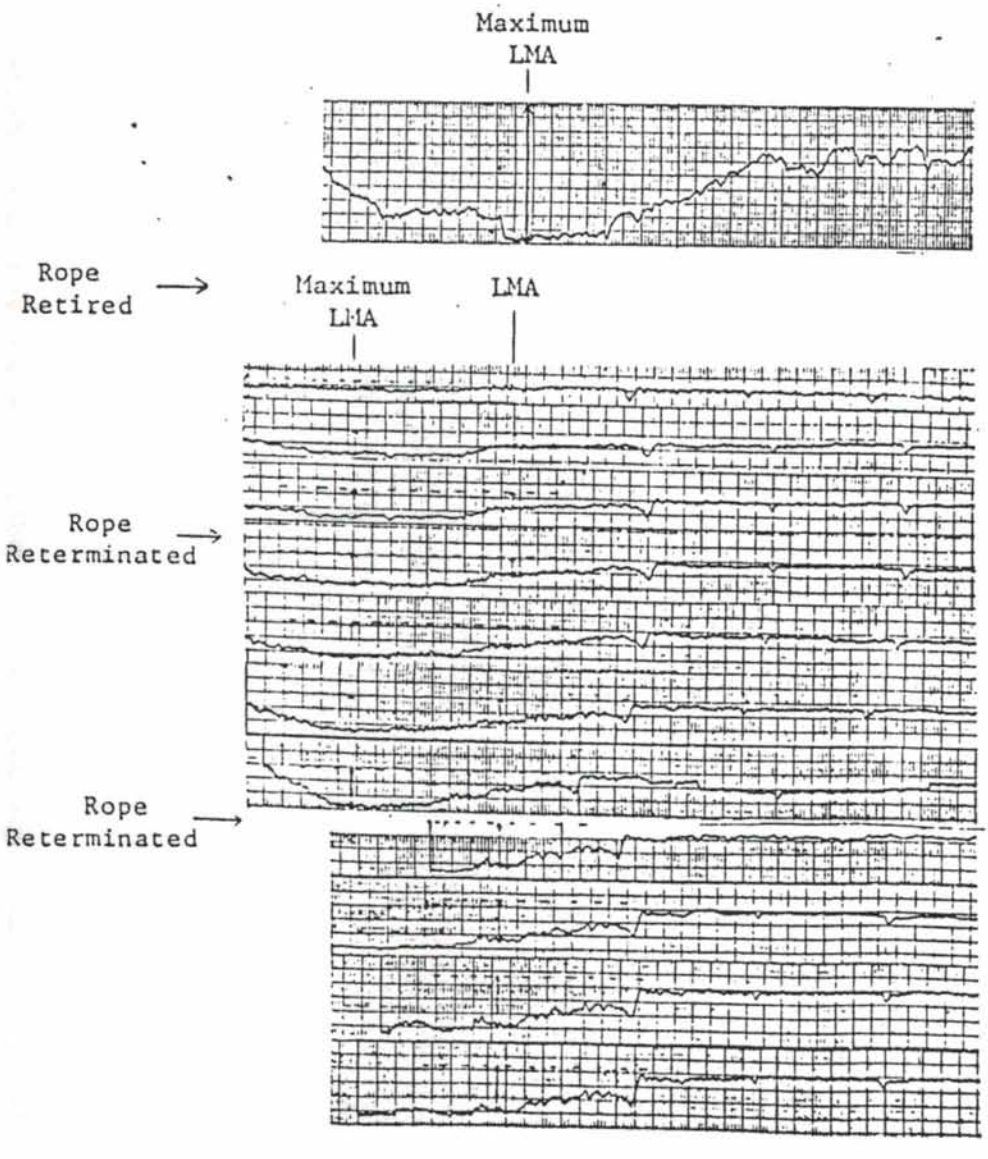


Figure 3.- Plan view of hoist ropes.



Lubricant*	Rope Age, months	Maximum LMA, %	LMA %
ANP	19	9.9	
ANP	2	.7	.
ROP	6	1.8	1.
SP1	9	2.2	1.
SP1	12	2.5	1.
SP1	15	2.6	1.
SP1	18	2.8	1.
SP1	21	2.9	2.
SP1	25		2.
SP1	27		3.
SP1	30		3.
SP1	34		3.

*ANP = Asphalt base, nonpenetrating.
*ROP = Rice-oil base, thin, penetrating.
*SP1 = Synthetic base, thin, penetrating.

Figure 4.- LMA strip charts for mine 1 south waste hoist ropes.

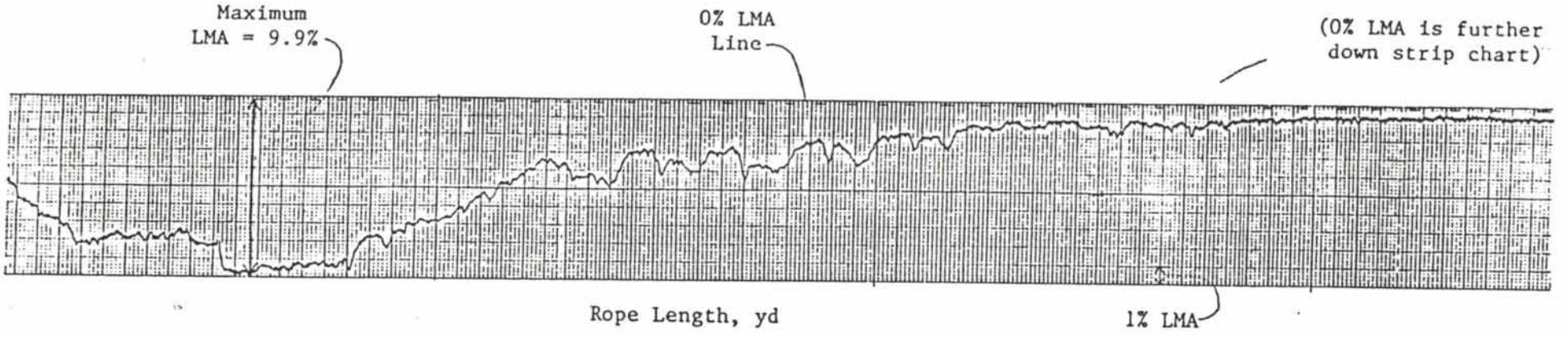


Figure 5.- How the LMA is read from the strip chart.

LMA of 9.9% is obtained by counting the major vertical divisions between the 0% LMA Line and the lowest point on the LMA trace.

The asphalt-base, nonpenetrating lubricant performed poorly as evidenced by the rope retirement after only 19 months of service. The replacement rope had rice-oil-base, penetrating lubricant applied after 6 months of service and a synthetic penetrating lubricant applied thereafter. The extension of rope life is indicated by the much smaller LMA after 34 months than for the first rope after 19 months.

Figure 6 shows a plot of the LMA versus rope age. The lubricants and rope reterminations are also indicated. Those LMA's shown as black squares (■) are the maximum LMA's on the rope before the area was cut off. Those LMA's shown as black circles (●) are at the same point on the rope past the reterminated section. The retermination before the 25-month test placed the remaining rope closer to the skip; this increased the rate of LMA because the skip descends into an environment that promotes greater internal corrosion.

Figure 7 shows the LF portion of the strip charts for the south waste ropes. The charts show that, due to more internal corrosion, the vertical widths of the traces are greater in those areas where the LMA's are larger. Also shown is the rope age and "LF factor." The LF factor is the percentage of total strip chart squares that contain at least one LF trace. As the rope ages, the LF factor will increase as the rope degrades. A smaller LF factor with increasing rope age as shown at 25 months (figure 7) is the result of slight variations in instrument calibration.

Figure 8 shows a plot of the LF factor versus age. The first rope had a larger LF factor due to its greater internal corrosion. As the replacement rope aged, its LF factor increased.

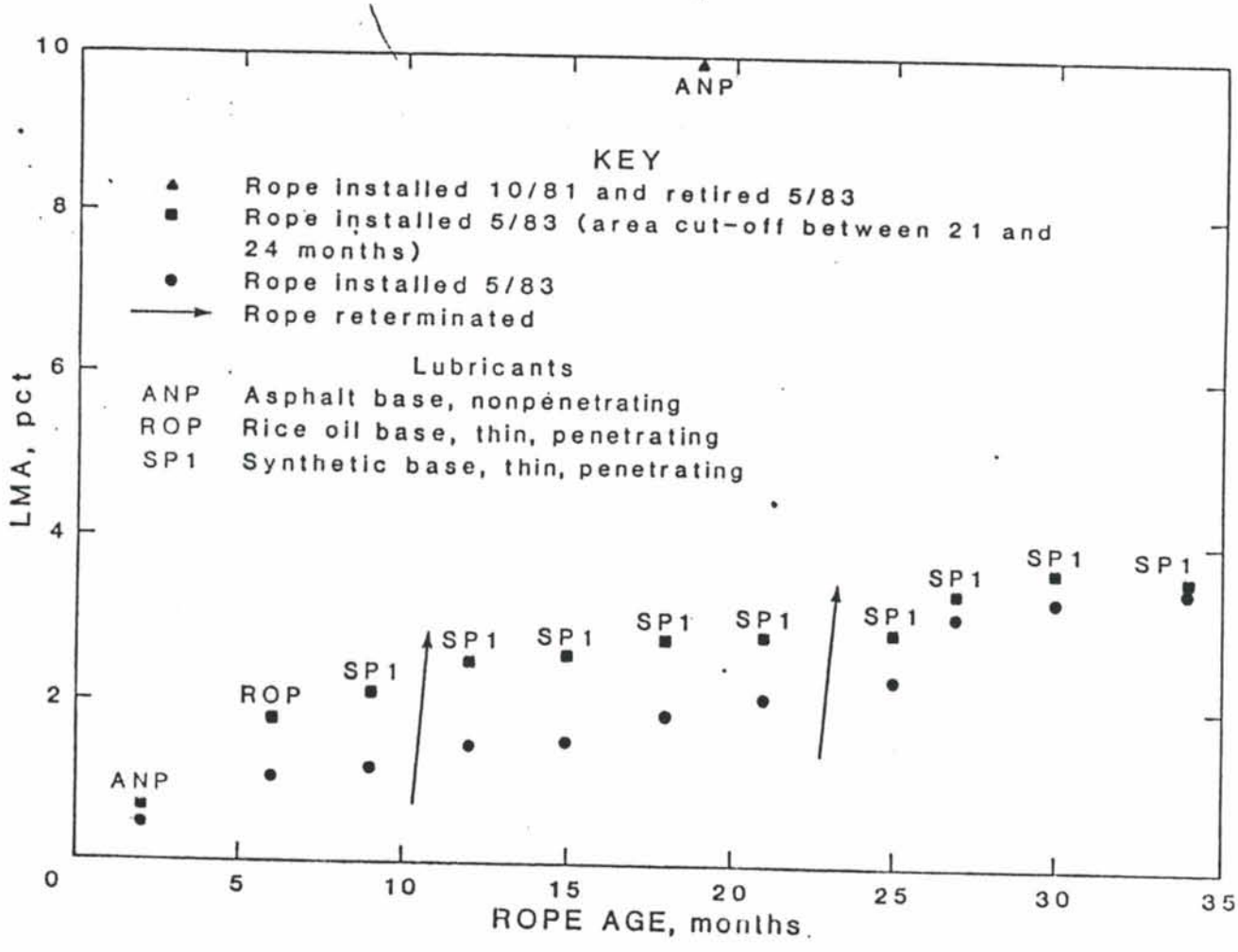
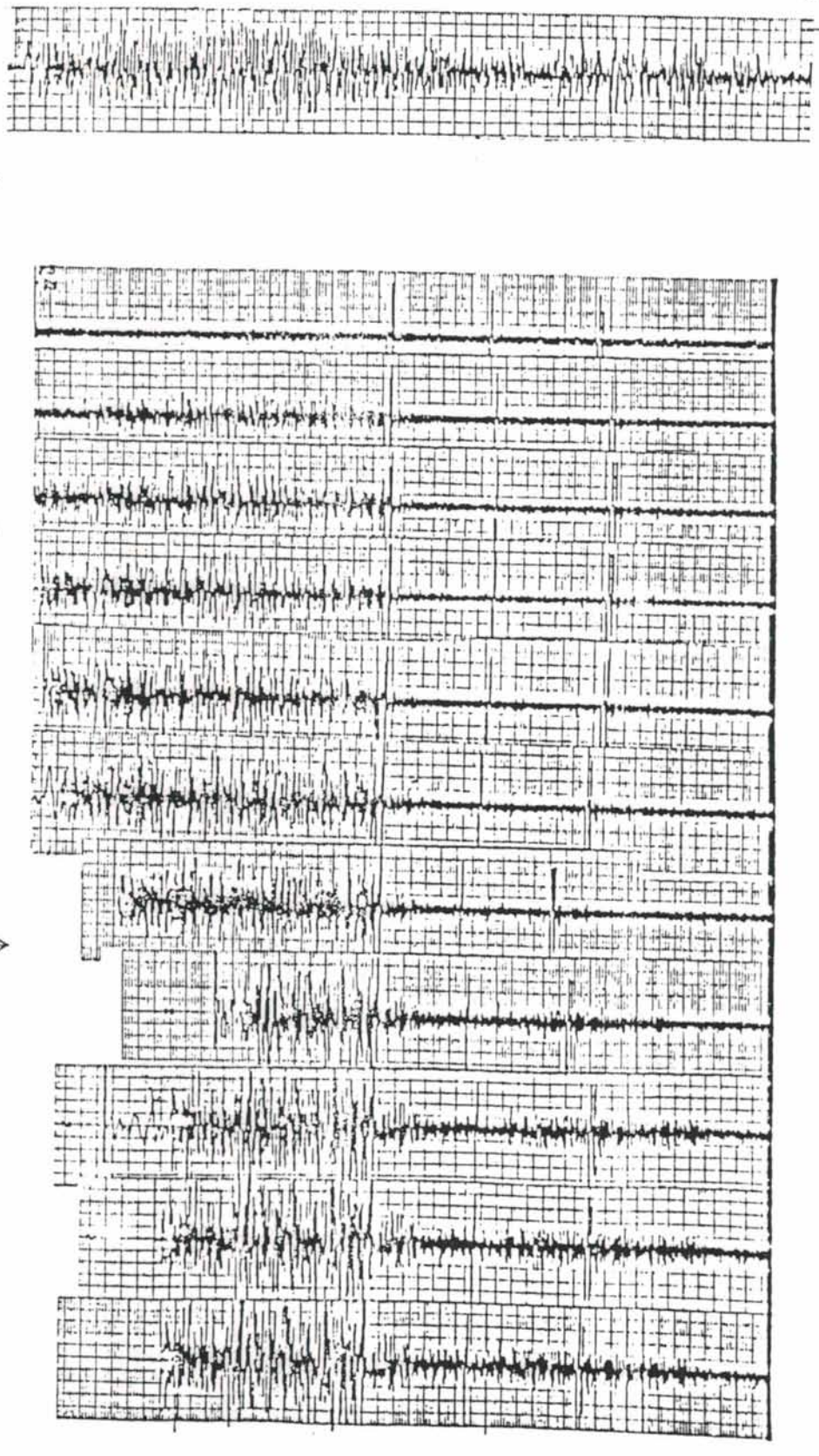


Figure 6.- LMA for mine 1 south waste hoist ropes.



Lubricant*	Rope Age, months	LF** Factor
ANP	19	40.3
ANP	2	22.3
ROP	6	24.8
SP1	9	27.5
SP1	12	28.0
SP1	15	28.9
SP1	18	30.7
SP1	21	31.7
SP1	25	28.1
SP1	27	32.6
SP1	30	33.3
SP1	34	32.4

*ANP = Asphalt base, nonpenetrating.
*ROP = Rice-oil base, thin, penetrating.
*SP1 = Synthetic base, thin, penetrating.
**LF factor = % of strip-chart squres containing a local fault trace.

Figure 7.- LF strip charts for mine 1 south waste hoist ropes.

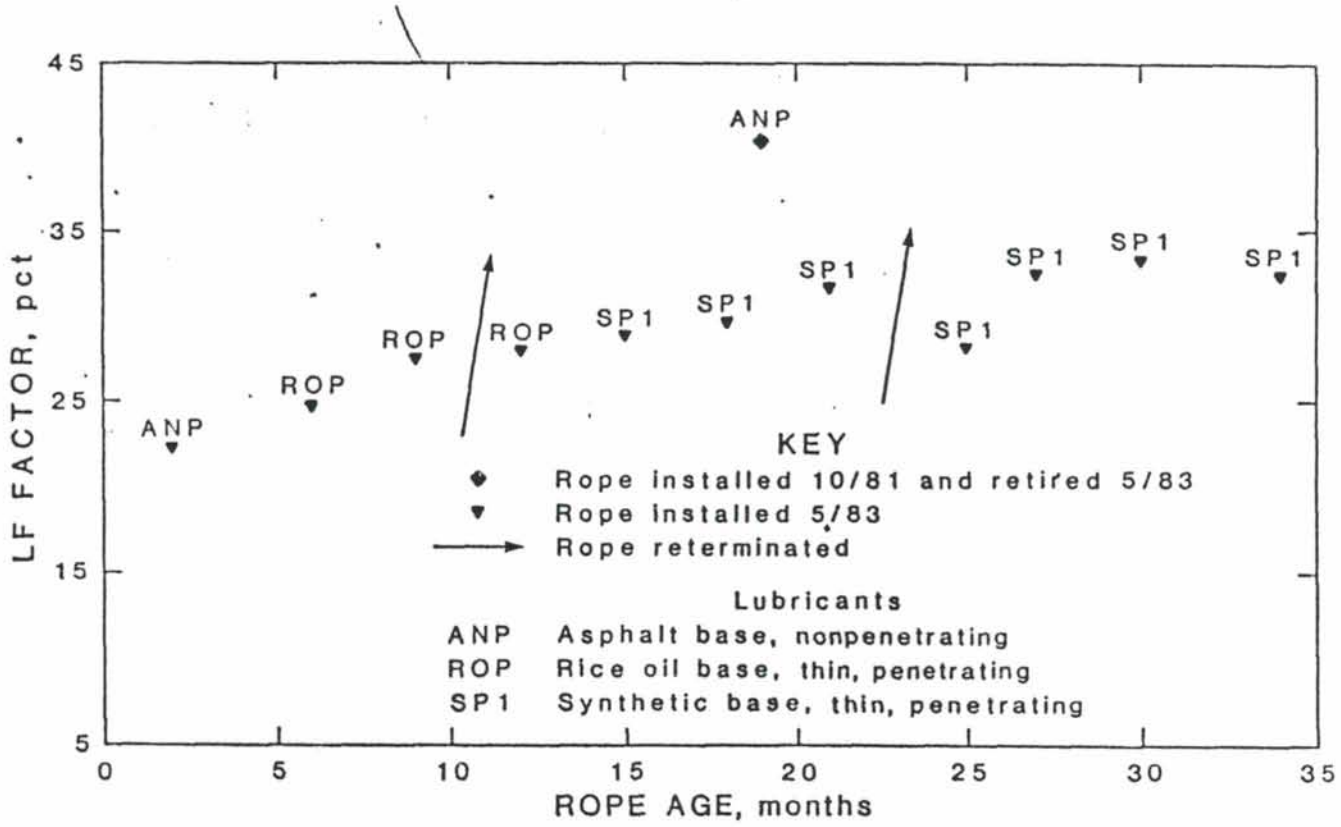


Figure 8.- LF factors for mine 1 south waste hoist ropes.

North Waste Hoist

Figure 9 shows the LMA traces for the north waste hoist ropes. The information is similar to that for the south waste ropes because both hoists are side by side and had similar lubricants applied. The first rope, again, showed a greater LMA after 19 months than did the replacement rope after 34 months. The asphalt-base, nonpenetrating lubricant on the first rope did not reduce internal corrosion.

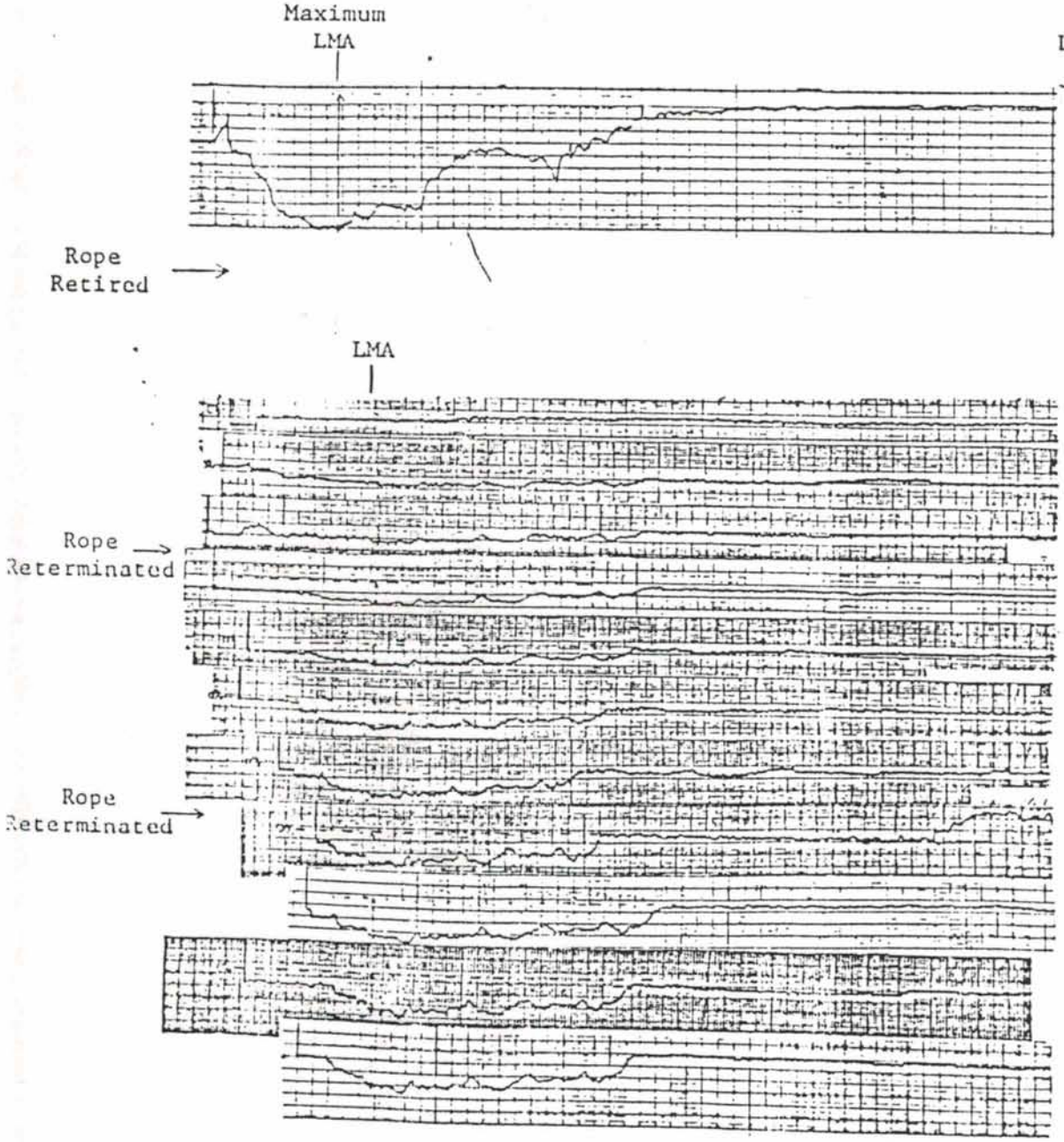
Figure 10 shows the LMA for the north waste hoist rope versus the rope age. As the rope aged, the LMA increased; however, the synthetic-base, thin, penetrating lubricant slowed the growth of internal corrosion more than did the asphalt-base lubricant.

Figure 11 shows the LF strip charts for the north waste hoist ropes. As before, the vertical height of the LF trace is greater in those areas that have more internal corrosion. The smaller LF factor with increasing rope age is caused by variations in instrument calibration. Figure 12 shows the larger LF factor for the first rope and the LF factor growth as the replacement rope ages.

SUMMARY

As a rope is loaded during hoisting operation, the strands are tensioned and pushed toward the core, causing the rope length to increase and the rope diameter to decrease. The wires rub against one another, causing wear. Ropes are simultaneously subjected to environmental conditions, such as high humidity and acidic mine water, which cause rapid internal corrosion. The internal corrosion and wear reduce the metal area on the rope with consequent loss of strength.

As illustrated by the analysis of the strip charts, the thin, synthetic lubricants capable of penetrating the spaces between the wires and into the core are able to extend rope life significantly where internal corrosion and



Lubricant*	Rope Age, months	LM %
ANP	19	11
ANP	2	
SP1	6	1
SP1	9	1.
SP1	12	1.
SP1	15	2.
SP1	18	2.
SP1	21	2.
SP1	25	2.
SP1	27	3.
SP1	30	3.
SP1	34	3.

*ANP = Asphalt base, nonpenetrating.
*SP1 = Synthetic base, thin, penetrating.

Figure 9. - LMA strip charts for mine 1 north waste hoist ropes.

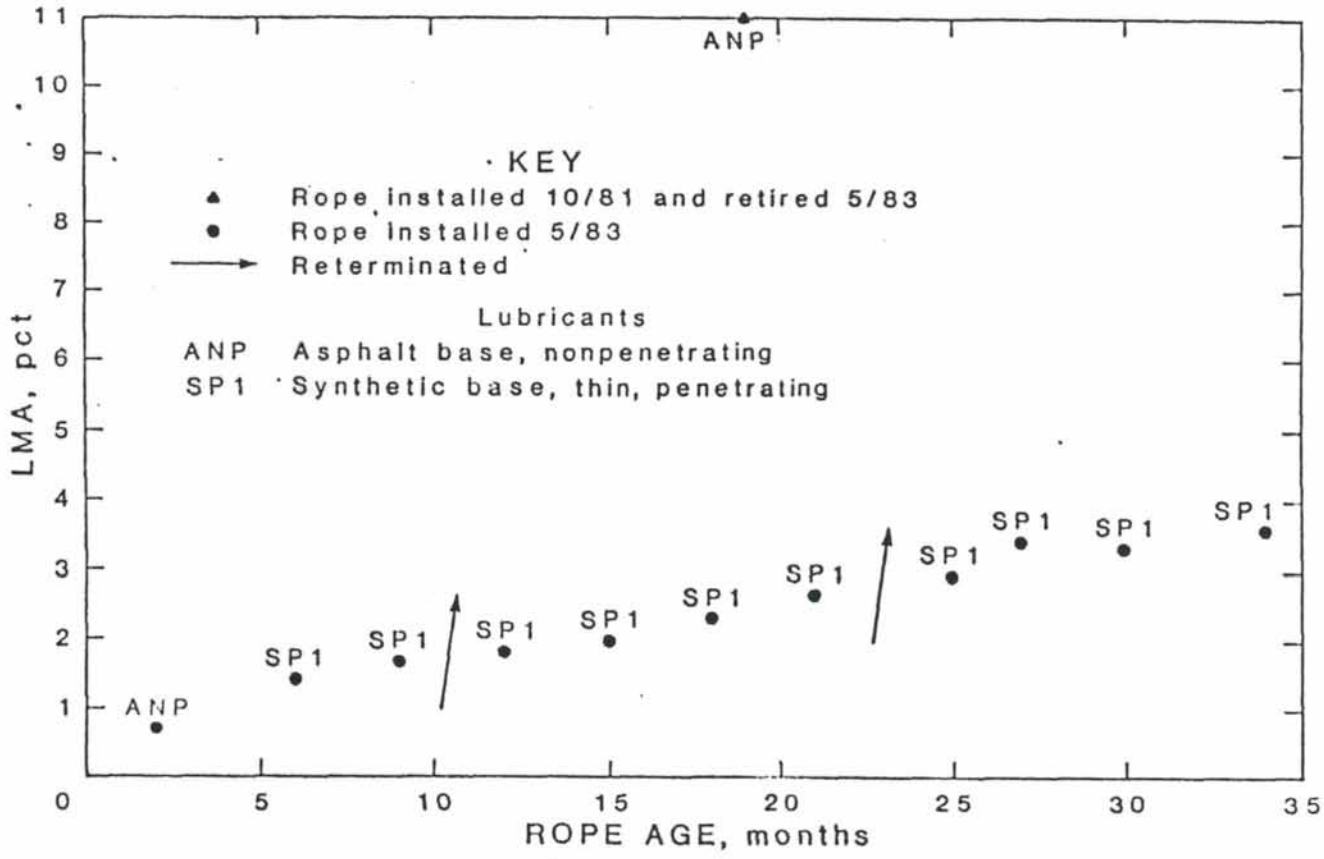
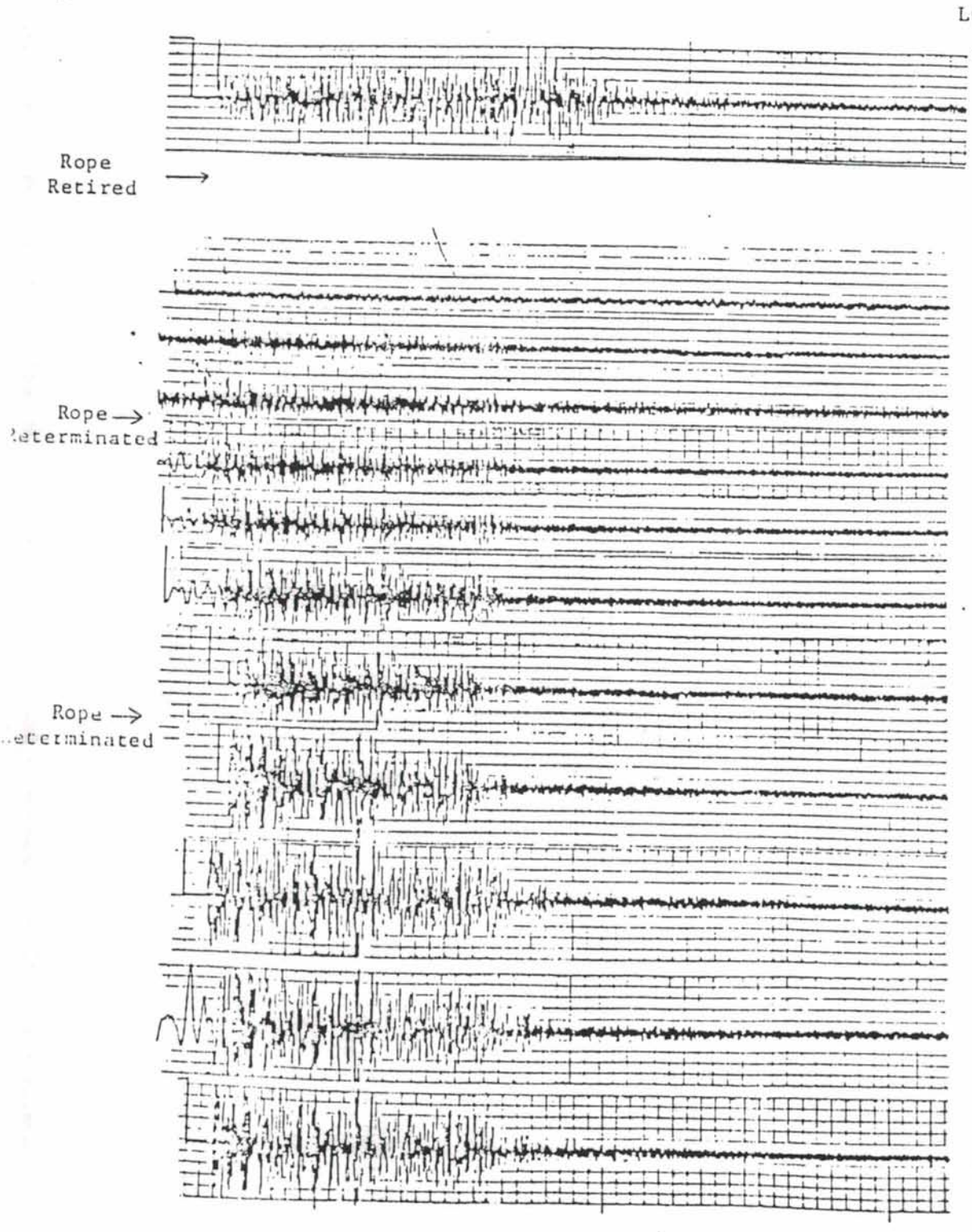


Figure 10.- LMA for mine 1 north waste hoist ropes.



Lubricant*	Rope Age, months	LF**
ANP	19	35.4
ANP	2	20.0
SP1	6	21.5
SP1	9	23.5
SP1	12	24.0
SP1	15	24.2
SP1	18	26.5
SP1	21	27.5
SP1	25	31.8
SP1	27	29.9
SP1	30	31.7
SP1	34	31.8

*ANP = Asphalt base, nonpenetrating.
*SP1 = Synthetic base, thin, penetrating.
**LF factor = % of strip-chart squares containing a local fault trace.

Figure 11.- LF strip charts for mine 1 north waste hoist ropes.

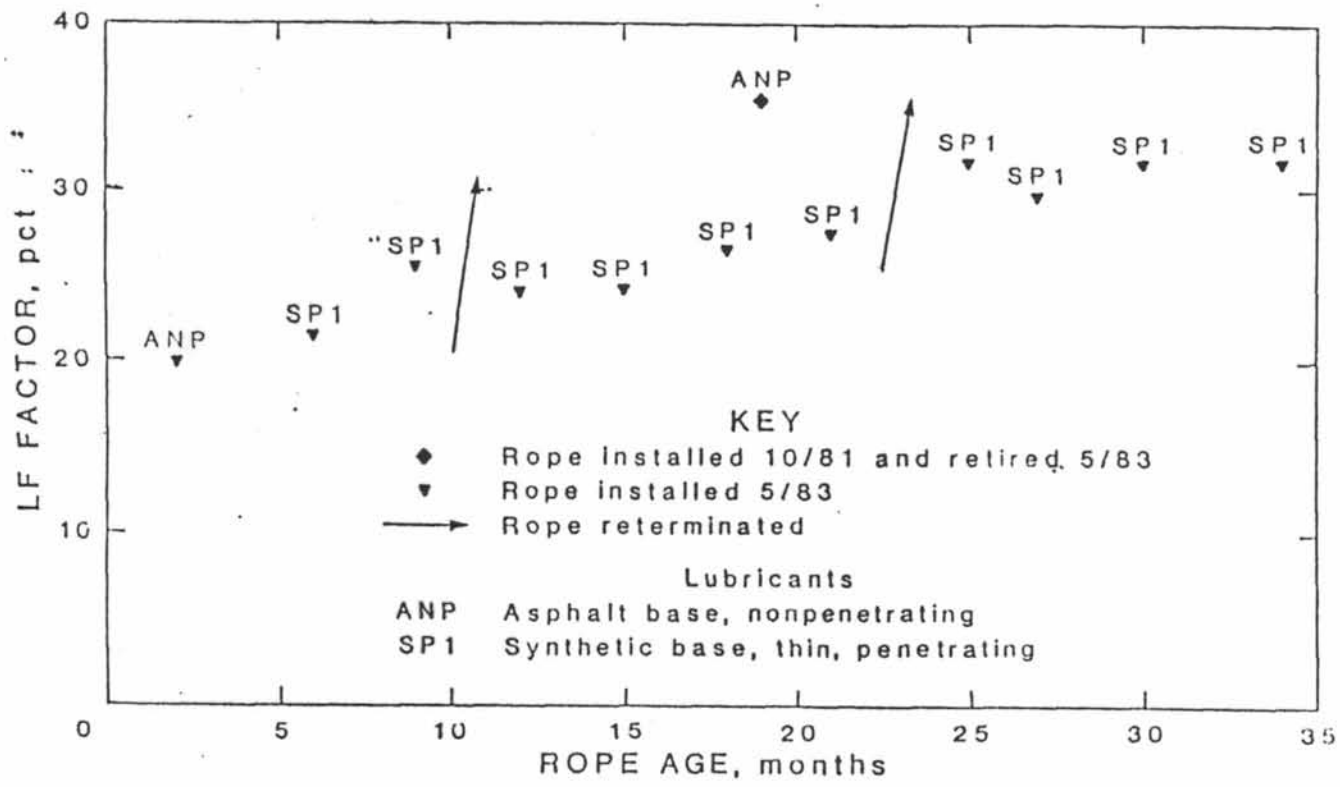


Figure 12.- LF factors for mine 1 north waste hoist ropes.

wear are present. By coating the wire surfaces with lubricant, both corrosion and wear can be reduced. The rope does not require an excess of lubricant at one time, but a small amount applied periodically.

The strip charts also show that the heavy, nonpenetrating lubricants can cause rapid internal corrosion and deterioration. In some cases, they may even accelerate internal corrosion by promoting the retention of moisture inside the rope.

Drug testing regulations

YN2 Robert Grant

1988 final rule

On November 21, 1988, the Coast Guard published a final rule entitled, "Programs for chemical drug and alcohol testing of commercial vessel personnel," in the *Federal Register.* The goals of this rule are:

1. To discourage the use of intoxicants by commercial vessel personnel, and to promote a drug-free and safe work environment.

2. To reduce drug- and alcohol-related marine casualties.

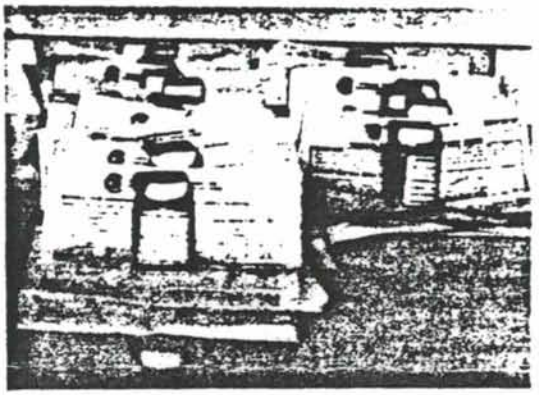
3. To enhance maritime transportation industry safety.

How drugs are tested

Technicians at American Medical Laboratories, a NIDA-certified testing facility in Fairfax, Virginia, follow specific procedures in conducting drug tests. They:

- Provide employers special kits to collect specimens.
- Match specimens with employee information forms.
- Produce by computer adhesive-backed bar codes with pertinent employee data.
- Affix bar codes to aliquots (test tubes containing specimen samples),
- Conduct initial aliquot screenings.
- Subject "positive" screening results to gas chromotography/mass spectrometry (GCMS) tests.
- Report positive confirmation test results to employers.

(Photographs taken at the American Medical Laboratories illustrate these steps.)



Step 1) Specimen jars and identification forms are matched.

The 1988 final rule requires five types of testing:

1. Pre-employment

2. Periodic

3. Reasonable cause

4. Post-accident

5. Random

The federal district court for the District of Columbia enjoined the implementation of the random test requirements. The Coast Guard is drafting new random drug regulations, which are expected to be published soon.

Currently, marine industry employers are responsible for conducting pre-employment, post-accident and reasonable cause testing of vessel crewmembers, while employees are responsible for periodic testing.

These employers must conduct pre-employment tests before hiring individuals to serve as crewmembers aboard United States commercial vessels. They must conduct

Continued on page 8

Step 2) ID data is entered into a computer, which prints out the bar codes.

Continued from page 7

reasonable cause tests when they have sufficient reason to suspect employees of using drugs. They must conduct post-accident (or post-serious marine incident) drug and alcohol tests on vessel personnel directly involved in serious marine casualties.

The employers must maintain records of negative test results for one year and positive results for five years. They must also report all positive results involving individuals holding Coast Guard licenses or merchant mariner's documents to the local Marine Safety Office. These records must be made available to the Coast Guard upon request.

Whenever a physical examination is required for a license or merchant mariner's document application, the applicant must pass a periodic test.

Sections of the rule

The Coast Guard's drug testing regulations are contained in Title 46, Code of Federal Regulations, Parts 4 and 16.

Part 4

This section outlines the marine industry employer's responsibilities when a serious marine incident occurs.

It states, "when a marine employer determines that a casualty or incident is, or is likely to become, a serious marine incident, the marine employer shall take all practicable steps to have each individual engaged or employed on board the vessel who is directly involved in the incident chemically tested for evidence of drug and alcohol use."

It establishes requirements for specimen collection and transmission to laboratories, and responsibilities for reporting results to the Coast Guard.

Part 16

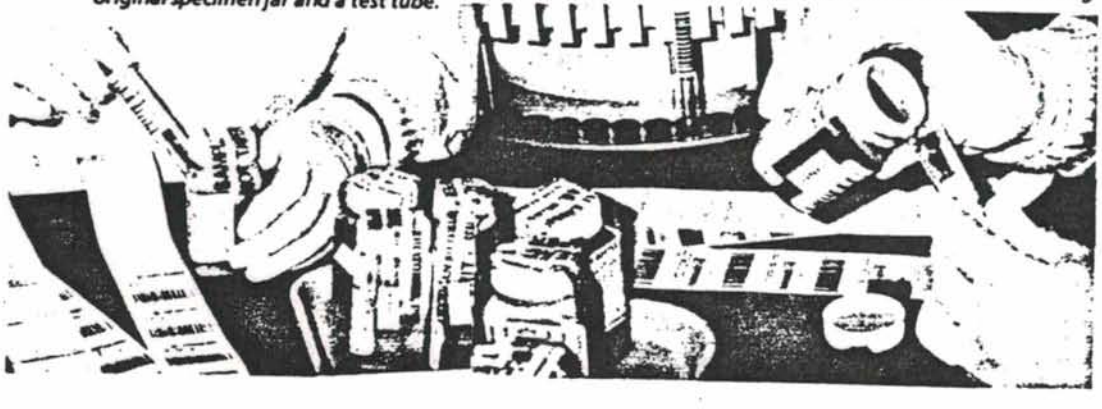
The 1988 final rule added a new Part 16, which contains four sections.

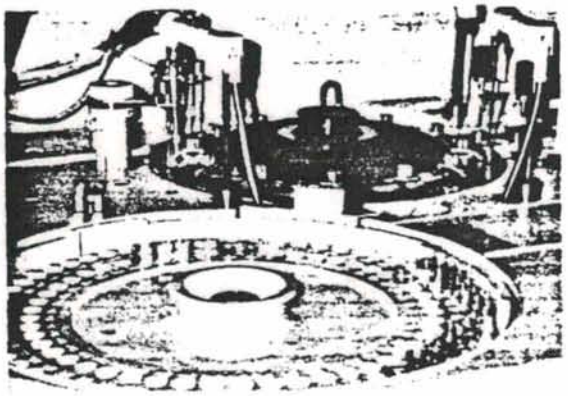
A) Contains general requirements which apply to chemical testing of commercial vessel personnel.

B) Discusses types of chemical testing required. It outlines a graduated scale of compliance with the regulations for employers, and contains criteria for determining when to conduct various drug tests.

Step 3) The bar code is attached to the original specimen jar and a test tube.

Step 4) A specimen sample or "aliquot" is poured into the matching bar-coded tube for testing





Step 5) Aliquots are screened for drugs in this machine.

C) Establishes standards to be met when conducting chemical testing for dangerous drugs. This section provides the marine industry employer with general guidelines for collection and transmittal procedures. It also provides guidance on testing and reporting.

D) Requires employee-assistance programs,which include education and training for all crewmembers. While employers can use such programs to promote drug rehabilitation of employees, the 1988 final rule does not require this.

Test Procedures

Drug tests must be conducted according to Department of Transportation (DOT) "Procedures for transportation workplace drug-testing programs," published in the *Federal Register* on December 1, 1989.

The DOT procedures explain how to conduct each phase of the drug-testing process. For example, they outline specific procedures which must be followed when collecting specimens and transmitting them to testing laboratories. Only laboratories certified by the Department of Health and Human Services may be used.

Rigorous procedures are set forth for laboratories to follow in maintaining quality control of their drug-testing operations. Also included are procedures the labs must follow when receiving and testing urine samples.

Finally, the procedures state record-keeping and reporting requirements which employers, employees and certified drug-testing labs must follow. Medical review officers and chain-of-custody forms play important roles in this process.

Drugs tested

DOT procedures require testing for five drugs. They are marijuana, cocaine, opiates, amphetamines and phencyclidine (PCP).

Marine industry employers should note that the 1988 final rule also requires them to test for alcohol in post-accident cases by taking blood or breath specimens.

Only qualified medical personnel may take employees' blood specimens, but any appropriately trained personnel may administer breath tests.

Continued on page 10

Step 6) (left) Chemicals are mixed into a "positive" aliquot to prepare for a "confirmation" test. Step 7) (below) Centrifugal force machine separates drug properties from the aliquot, forming a concentrate.

TITLED
LETTER J.GIBBONS DATED 12 MARCH 1973

" I have been doing some research on the subject of alcoholic beverages aboard ship. I am convinced that open dispensing of same by the master, with approval of the owner, would unquestionably produce an unseaworthy condition and be grounds for suit and punitive damages in case of any accident.

One rather excellent reference is 'Oceanographic Research Vessel - Operations - Liabilities and Remedies' by V. Carl Bloede, Attorney, and Director, University of Hawaii Contracts Office. This is a simple document to read and summarizes nearly 300 court decisions. It contains no specific prohibition, however, it certainly substantiates the specific obligation of the owner or operator to maintain seaworthiness, i.e., 'The duty of the shipowners to provide a seaworthy vessel is ''absolute, continuing, and non-delegable'', and the shipowner is not absolved from this obligation by the exercise of due diligence.' 'The negligent violation of government regulations simultaneously makes a vessel unseaworthy.' (Manning, v M/V Sea Road, 4.7 F. 2nd 603, 5th Cir. 1969.).

Since the U.S.C.G Shipping Articles (R.S. 4612 U.S.C. 46 Sec. 713) states in part ''... and the said crew agree to conduct themselves in an orderly, faithful, honest and sober manner...no dangerous weapons or grog allowed, and none to be brought on board by the crew...'', I maintain that allowing ''Grog'' is a violation of government regulations and therefore produces unseaworthiness.

In persuing CG-200, Subchapter K. Suspension and Revocation Proceedings, I find on p. 27, Table 137.20-165 a listing of punishment, under Group E, as six months probation for first offense of 'Sale of intoxicating liquor'. My own opinion is that the Master could be charged with misconduct if a complaint or charge is made to the OCMI. USC 46, Sec. 239 states in part '...and all cases of acts of incompetency or misconduct committed by any licensed officer or holder of a certificate of service, whether or not any of such acts are committed in connection with any casualty or accident...(must be investigated)'.

I feel that an open policy on alcoholic beverages places the master in a compromised position.

Also, disputes or fights between seamen and/or seamen-technician-scientist, could bring charges and suits under the Jones Act. Since, 'The employer is responsible for the negligent acts of omission or commission by the Master, the officers, and fellow crew members, including assaults both disciplinary and unprovoked, and for the negligent defect or insufficiency of equipment.' (Gilmore and Black S6-37) If a fight or alleged

fight took place on board and one or both were under the influence of alcohol sold them by the Master, I believe the Master could be charged by one or both for misconduct, and suit could be brought for punitive damages on the basis of unseaworthiness.

'... the Jones Act is broadly construed to hold the employer liable if his negligence played any part, however slight, in producing injury or death for which damages are sought...' (Hampton vs. Magnolia Towing Co., Inc., The Arizona V. Anelich, 298 U.S. 110 1936).

'Where there is a violation of a regulation or statute recovery may be had without proof of negligence.' (Kerman vs. American Dredging Co., 355 U.S. 426 1957).

Realizing that this was not conclusive evidence that dispensing alcohol is illegal, I inquired further into the matter by contacting a local attorney who specializes in admiralty law, and represents several marine insurance companies. He stated that he has not found a specific statute making sale of liquor illegal, however, he agreed that the owner (and insurance carrier) would be in a very vulnerable position in any accident case, coming under the Jones Act where liquor was involved, and sanctioned by the owner. He stated further that the Coast Guard considers enforcement of the terms of the Articles sufficient to insure a 'dry' ship."

cc: Chron
Ron Hutchinson

Are Merchant Ships As Safe With Smaller Crews on Duty?

The technology in merchant ships has improved significantly, and as vessels become more automated, fewer and fewer people are needed to operate them. Crews once numbered 45 or so for an average commercial cargo vessel, but now total about half that number on U.S. ships; foreign ships operate with even fewer crew members.

The most technologically advanced ships in the world fleet today are European and Japanese. Crews of between eight and 12 members operate these sophisticated vessels with centralized navigation and automated engine control, communications and administrative functions on the bridge. But how far can the numbers fall before safety is compromised?

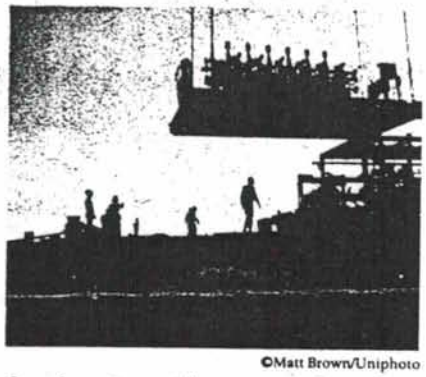
A new study by a committee of the Research Council's Marine Board concludes that "with careful attention to workers' functions and the fundamental design of ships," American merchant ships can operate safely with smaller crews.

Moreover, the committee found that after studying a 20-year record of shipping industry safety, "there has been a measurable and substantial improvement in [the reduction of] both vessel casualties (accidents) and personnel injuries." In fact, the industry's accident, loss and injury rate has actually declined. "Technology has improved, operating procedures have been refined and the scrutiny of maritime operations by government and industry bodies has increased," the committee explained.

Crew Size and Maritime Safety. Committee on the Effect of Smaller Crews on Maritime Safety, Marine Board, Commission on Engineering and Technical Systems. (1990, 188 pp; ISBN 0-309-04375-1; available from National Academy Press, $22.95 plus shipping).

From Steam to Diesel

Until the 1960s, most ocean-going U.S. merchant ships were powered by steam and had separate engine and boiler rooms. Teams of seamen took their turns standing watch, navigating, maintaining the vessel and making sure all machinery functioned properly. The introduction of the diesel engine with automated controls meant that crews no longer had to stand watch to make sure the ship's energy source operated safely. Additional advances in technology have permitted further reductions in crews, with computers handling much of the work previously done by people. Innovations in other departments — from modern mooring equipment to microwave ovens and prepackaged meals — further reduced crew size as the need for dozens of seamen, including deck hands, cooks and utility men, diminished.



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Many navigational tasks, such as steering, updating charts and plotting

National Research Council
News Report Vol XLI #1 Dec 90-Jan 91

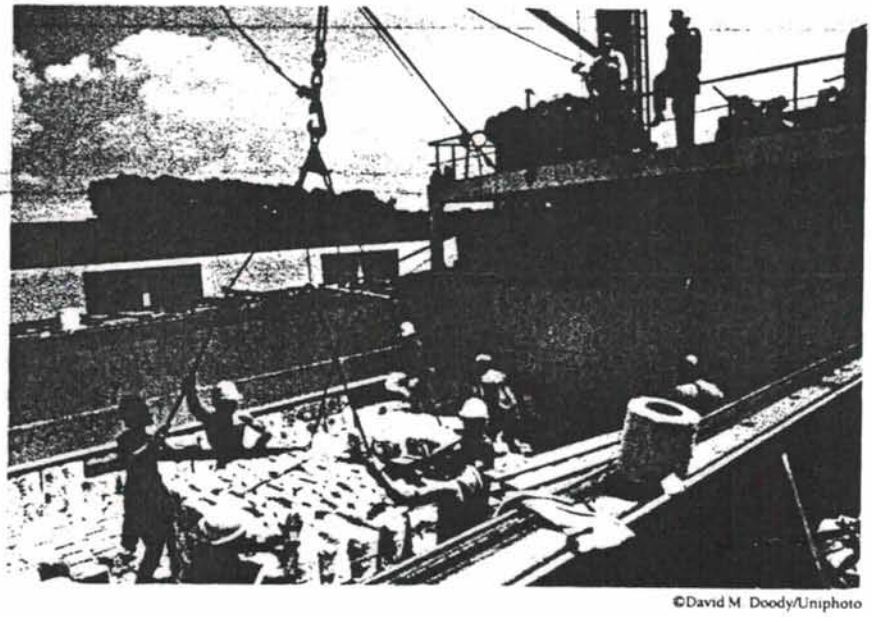
positions, have been automated. In state-of-the-art vessels, the ship's position is determined automatically by a computer that integrates information from satellite navigation systems and other equipment. The position is displayed as a dot of light on an electronic chart. Logs, reports, certificates and other documents are computerized, with electronic voice and data links between ship and shore via satellite.

Focus on Fatigue

While the committee concluded that a decrease in crew size does not necessarily compromise safety, it also said that careful attention must be paid to several operational considerations, including the extent to which crew fatigue becomes a problem, the ability of smaller crews to handle big emergencies, and availability of personnel to look after essential maintenance.

"Lack of attention to these problems will raise the risk of injuries and vessel accidents with attendant social, economic and environmental costs," the committee warned.

A concerted effort should be made to collect and evaluate data on the extent of the impact of crew size on safety. While safety records from around the globe detail the number of shipping accidents and injuries,



©David M. Doody/Uniphoto

"the data don't consider what effect crew size may have had on those situations," said Richard Soper, committee head and retired chair of the American Bureau of Shipping.

Critical information is lacking, the committee acknowledged. It recommended detailed studies on the prevalence and severity of fatigue among crew members, with particular attention to the role of fatigue in navigation errors and personal accidents. In addition, it called for studies of how traditional watch schedules affect crew members' circadian rhythms — the body's inner clock that determines sleep and wake patterns.

Coast Guard casualty reports rarely note fatigue as a contributing factor in accidents; however, "there is reason to believe that its contribution is under-reported," the committee concluded. Moreover, it said that numerous labor representatives believe safety has deteriorated with smaller crews, in large part because of increased fatigue due to longer working hours.

Human factors have received too little emphasis in evaluations of shipboard automation, the report says. "Many automated systems reduce operators to passive monitors and remove much of the active content from the job, without decreasing the need for vigilance," it notes.

Furthermore, reducing the numbers of crewmen on board can weigh heavily on morale and performance.

"The pressures of schedule and the minimal size of crews mean that shore leave is nearly non-existent," the report says.

To address these and other concerns, it suggested that U.S. shipping firms conduct careful studies and experimentation — similar to steps taken by northern European and Asian firms — before further reducing crew size on U.S. ships.

Computer Models

Currently, the Coast Guard relies on a combination of regulations, tradition and informal policy practices in setting safe crew levels. But today's technology demands a more sophisticated procedure, the report concludes, including "computer models of vessel operations, so that shipboard functions and tasks can be precisely specified and evaluated for a ship of a given design, trade, and level of technology under normal and emergency conditions."

The committee developed a functional task-analysis model as a guide for determining the minimum number of crew members for operating different types of ships under various conditions. However, the committee recommended that the Coast Guard consider adopting a similar method as part of its vessel certification process.

The committee's model can assess the adequacy of a crew's size over an entire voyage and in emergency situations such as shipboard fires.

In addition, the model can be used to analyze the effect that new technology, alternative voyage profiles or changed operating conditions would have on crew size requirements.

Human factors have received too little emphasis in evaluations of shipboard automation.

"Such a procedure would give the Coast Guard a sound basis for decisions, explicitly taking account of the vessel's type, voyage profile, level of technology and operating conditions," the committee explained. "It would replace the current system of reliance on a patchwork of manning statutes, informal policy and tradition."

The committee noted, however, that its model has been tested on only two types of ships and needs further enhancement before being adopted for general use.

New Technology, Old Laws

In the meantime, changes in the rules that set crew size need to be considered, the committee concluded. The statutes are based on old technology and outdated practices, it explained. While the law specifies that crews still must be split into deck and engine components, the jobs of crew members have evolved so that an arbitrary division no longer applies. Instead, today's crews need multiple skills with the flexibility to work both on the deck and in the engine room, the committee said.

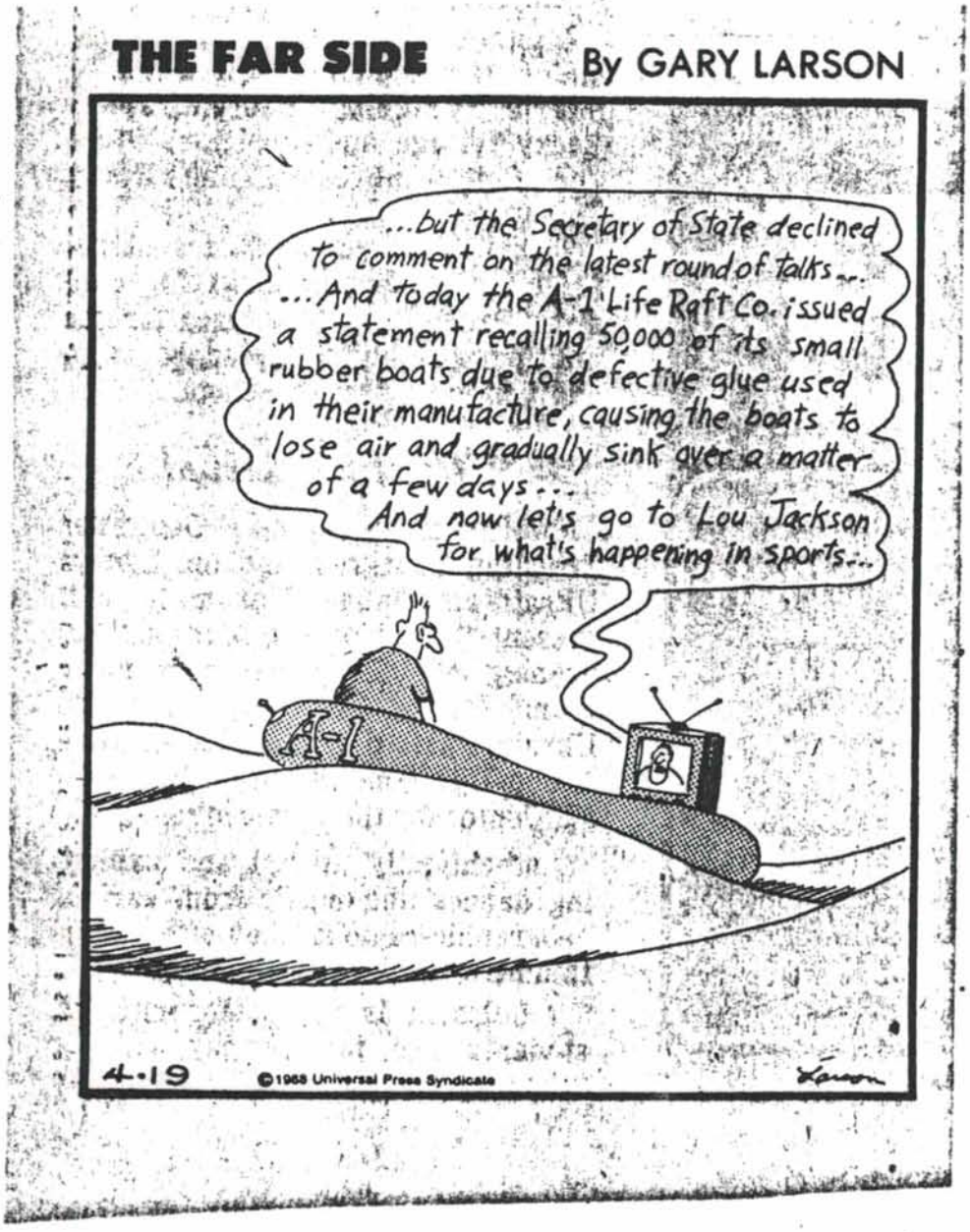
"These provisions of the law, in their rigidity and specificity, leave little room for innovation, and discourage the adoption of new technology or more efficient manning practices," it argued.

Consequently, U.S. ships operate with higher numbers of crew members than their foreign counterparts. In fact, identical modern vessels may carry substantially different sizes of crews in U.S. waters depending on the flag they fly.

"A safety framework that enforces the practices of a half-century or more ago in a rapidly evolving industry can support neither safety nor competitiveness," the report asserts.

"The essence of this study," said Soper, "is that safety need not decline simply because fewer crewmen are on board. The key is a careful study of all the factors, from the training of crew members to the design of new technology."

— *Susan Turner-Lewis*


THE FAR SIDE
By GARY LARSON
...but the Secretary of State declined to comment on the latest round of talks... ...And today the A-1 Life Raft Co. issued a statement recalling 50,000 of its small rubber boats due to defective glue used in their manufacture, causing the boats to lose air and gradually sink over a matter of a few days... And now let's go to Lou Jackson for what's happening in sports...
A-1
4-19
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Larson

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Cable: LAMONTGEO
Palisades New York State

December 21, 1990

Captain Jim Williams
Scripps Institution of Oceanography
P.O. Box 6730
San Diego, CA 92106

Dear Jim:

We have just acquired 15 tons of lead pigs in order to "tune-up" the stability aboard R/V MAURICE EWING. It turned out that we needed this additional weight down near the keel in order to consume all of our available fuel on long cruises (60 days) and still have the minimum required GM.

The current commercial cost of lead is about 40 cents a pound. However, we discovered that there is a company that contracts for the Department of Energy to smelt down lead recovered from old automobile batteries. The D.O.E. makes this lead available to qualified D.O.E. contract holders at a price of 2 cents per pound. We were able to reference a couple of current research grants with the Department of Energy to obtain the lead from the smelting contractor who has a facility not far from our location. The procedure is as follows: One should obtain a copy of the Department of Energy Notice of Financial Assistance Award describing the current research grant from the University Contracts and Grants Office. This document is forwarded with a purchase order to EG&G Company, P.O. Box 1625, Idaho Falls, Idaho 83415-4135. Attention: Mr. Ray Hogan. Telephone (208) 526-2617. Fax number (208) 526-2610. It also helps to contact the contract officer at DOE whose name is on the DOE Notice of Financial Assistance Award to explain one's requirements. The contract officer will normally be able to approve the request for purchase and a release number is then provided by the Idaho office to the nearest DOE contracted smelter so

that the lead can be made available to the institution. I understand there are three smelters in this system: East Coast, West Coast, Gulf Coast. The only cost to the institution other than the 2 cents a pound paid to EG&G Idaho is the transportation cost from the smelter location to where one needs the lead delivered. In our case we had a 3 hour truck trip between Middletown, New York and Newark, New Jersey.

This information may be a useful input to the R.V.O.C. Newsletter.

I expect I'll be leaving Lamont around 15 May and devote myself to restoring my old 1931 Model A Ford and perhaps a little consulting if anything should come my way.

Best regards,

Sincerely yours,

Sam

RDG:ph

Sam Gerard

The Professional Rigger.

Volume 6 Number 1 Circulation 6,020 MAR 1991

TECHNICAL NEWS

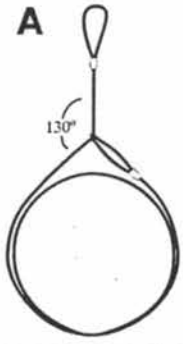
HITCHES & CAPACITIES

Deciding how to rig a load is an important step to achieving load control. An important factor to also consider is that the sling's capacity can vary greatly depending on the hitch configuration.

Pictured are 10 different sling hitches. Assume that the slings are 1" (wire rope) E/E mech. splice and the D/d ratio (load dia./sling dia.) is 30/1 for all illustrations. Identify the slings (A-J) in order of highest to lowest rated capacity and also give their approx. rated capacities.

High = 1 Low = 10	Sling Letter	Approx. Rated Capacity (lbs.)
1.	____	_____
2.	____	_____
3.	____	_____
4.	____	_____
5.	____	_____
6.	____	_____
7.	____	_____
8.	____	_____
9.	____	_____
10.	____	_____

A

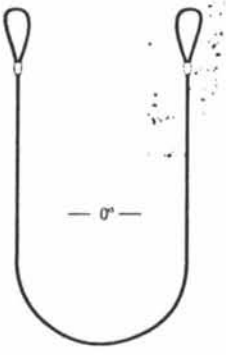


Double Wrap Choker Hitch

B

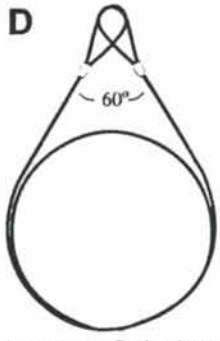
Single Wrap Basket Hitch

C



Single Wrap Basket Hitch

D

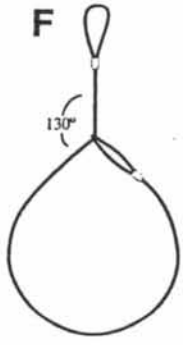


Double Wrap Basket Hitch

E

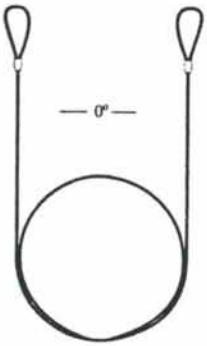
Single Vertical Leg

F



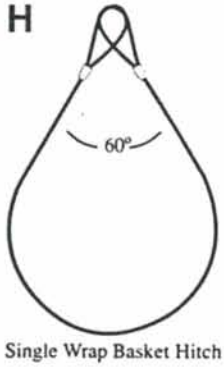
Single Wrap Choker Hitch

G



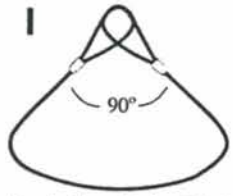
Double Wrap Basket Hitch

H



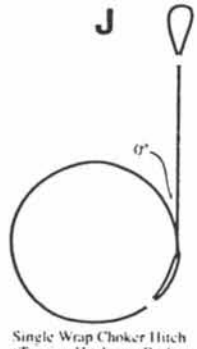
Single Wrap Basket Hitch

I



Single Wrap Basket Hitch

J



Single Wrap Choker Hitch
(Turning Hitch in a Bight)

(For sling capacity info. refer to Section 1 of WRRC's Rigger's Reference Card and AISI chart on pg. 2)

TECHNICAL NEWS

(cont.)

HITCHES & CAPACITIES

The following two charts should be used to arrive at the solutions for the workshop on page 1. We invite our clients to photocopy pages 1 & 2 of this newsletter and incorporate this information into a mini-training session on sling hitches. [The solutions are on pg 3.] Clients may purchase the entire Rigger's Reference Card from WRRC (complete with a 20 question quiz & answer key) to help employees become more familiar with all the data on the card.

Rigger's Reference Card - General version

Sling Capacities MECHANICAL SPLICE IN POUNDS DESIGN FACTOR = 5:1 ①

Wire Rope IPS	WRC	Size in inches	VERTICAL	CHOKER	2 - LEGS OR BASKET	60°	90°	120°	Color Code (Optional)	Size in inches	Wire Rope IPS	WRC
		1/4	1,100	840	2,200	1,940	1,580	1,100	White	1/4		
		5/16	1,700	1,300	3,400	3,000	2,400	1,700	Lt.Green	5/16		
		3/8	2,400	1,860	4,800	4,200	3,600	2,400	Red	3/8		
		7/16	3,400	2,500	6,800	5,800	4,800	3,400	Yellow	7/16		
		1/2	4,400	3,200	8,800	7,600	6,200	4,400	Lt. Blue	1/2		
		9/16	5,500	4,200	11,000	9,600	7,700	5,500	Black	9/16		
		5/8	6,800	5,000	13,600	11,800	9,600	6,800	Orange	5/8		
		3/4	9,700	7,200	19,400	16,800	13,600	9,700	Tan	3/4		
		7/8	13,000	9,800	26,000	22,000	18,300	13,000	Dk.Green	7/8		
		1	17,000	12,800	34,000	30,000	24,000	17,000	Purple	1		
		1-1/8	20,000	15,600	40,000	36,000	30,000	20,000	Dk. Blue	1-1/8		
		1-1/4	25,000	18,400	50,000	42,000	34,000	25,000	Gold	1-1/4		
				MULTIPLIER →		1.00	.75	.60	← MULTIPLIER			

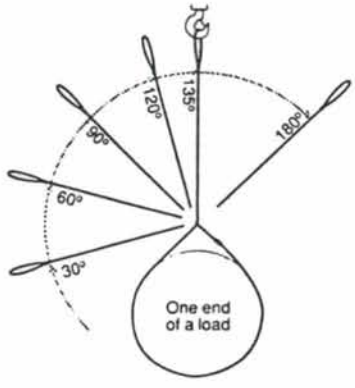
Formula to find sling length → Load width x Multiplier = Sling Length

Choker Hitch Rated Capacity Adjustment

For slings in choke hitch when angle of choke is less than 135°.

Angle of choke in degrees*	Rated Capapcity Percent*
120-180	100
90-119	87
60- 89	74
30- 59	62
0- 29	49

* Percent of sling rated capacity in a choker hitch



When a choker hitch is drawn tight at an angle of less than 120 degrees, the Choker Hitch Rated Capacity shown in the sling Rated Capacity Tables must be reduced to allow for loss of Rated Capacity. In controlled tests, where the angle was less than 120 degrees, the sling body always failed at the point of choke when pulled to destruction. Allowance for this phenomenon must be made anytime a choker hitch is used to shift, turn or control a load, or when the pull is against the choke in a multi-leg lift.

Source: American Iron & Steel Institute, WIRE ROPE USER'S MANUAL, 2nd Edition

CLIENT NEWS

ALCOA

Ms. Char Padilla from ALCOA's Rockdale, TX site contracted WRRC to present two 2-day Comprehensive Rigging Courses. A total of 30 participants attended the program at the Sandow Mine. The course included hitch configurations, load weight estimation and the proper rigging and moving of a variety of loads during the hands-on course. ♦

IDAHO POWER CO.

Mr. Leon Swensen, Line Training Instructor for Idaho Power asked WRRC to conduct Crane Operator Training for their bridge and mobile cranes. The five-day Mobile Crane Operator Training Course attended by 16 participants consisted of comprehensive classroom instruction, load chart workshops and hands-on operator evaluations. Nine operators participated in the Bridge Crane Operator course. Written exams and a hands-on evaluation of each operator were performed. ♦

HOFFMAN CONST.

Hoffman Construction in Portland, OR was the location for a one-day Comprehensive Rigging Course in October. Mr. Wayne Thomas, Safety Director, coordinated the program which covered proper rigging techniques and load control methods. ♦

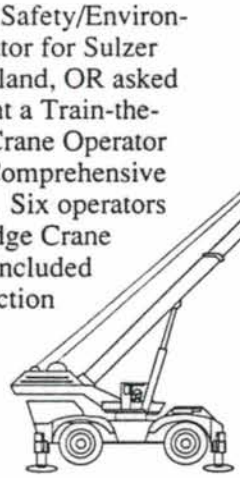
The Professional Rigger is a quarterly publication of Wire Rope & Rigging Consultants, Inc. It is distributed to those whose occupations require the safe and effective use of lifting and rigging equipment. For more information contact: Editor, The Professional Rigger, PO Box 728, Vancouver, WA 98666 (206) 693-6030

GRANT COUNTY PUD

Mr. Marv Scott, Safety Supervisor for Grant County PUD in Ephrata, WA contracted WRRC to conduct Comprehensive Rigging training at their Ephrata, Moses Lake and Wanapum Dam locations. The classes were given over a 7-day period and were attended by hydro mechanics, linemen, warehouse and electrical shop employees. The programs included classroom activity followed by a series of field rigging exercises with the participants implementing the items covered in the classroom. ♦

SULZER BINGHAM

Mr. Tom Davis, Safety/Environmental Coordinator for Sulzer Bingham in Portland, OR asked WRRC to present a Train-the-Trainer Bridge Crane Operator Program and a Comprehensive Rigging Course. Six operators attended the Bridge Crane Program which included classroom instruction with written exams, and a hands-on operator evaluation was completed lifting live loads according to an operator's checklist. The two-day rigging program consisted of eight hours classroom activity followed by an extensive series of field rigging exercises. ♦



CITY OF PORTLAND

The City of Portland, Bureau of Water Works contracted WRRC to present two 2-day Comprehensive Rigging Courses for 40 employees. The classes which were coordinated by Mr. Clint VanArsdall, Safety and Health Manager, covered rigging gear inspection and safe and efficient rigging techniques. ♦

TROJAN NUCLEAR

Mr. Kevin Davidson from Trojan Nuclear Plant in Rainier, OR asked WRRC to present a two-day Comprehensive Rigging Course for 20 employees. The course included rigging gear inspection, rigging and load control practices for vertical and horizontal rigging systems. ♦

WEYERHAEUSER

Weyerhaeuser in North Bend, OR was the site for a Comprehensive Rigging Course held at the end of October. Mr. Thomas Scheideman, Maintenance Manager, contracted WRRC to present the four-day program. The course included extensive classroom activity of proper rigging techniques and load control methods followed by a series of field rigging exercises. ♦

Mr. Jack Quien, Maintenance Education Coordinator for Weyerhaeuser's Pulp Mill in Cosmopolis, WA contracted WRRC to present a 2-day Mobile Crane Training Course. A series of written tests were administered along with a load chart workshop on the Drott 30 Ton Rough Terrain and hands-on operator evaluations were performed. ♦

JACOBS RANCH MINE

Mr. John Metzger, Maintenance Trainer for Jacobs Ranch Mine in Gillette, WY coordinated two 3-day Mobile Crane Operator Training Programs in October. 17 operators participated in the program which included extensive classroom instruction, load chart workshops and hands-on operator evaluations. ♦

HITCH & CAPACITIES WORKSHOP SOLUTIONS

High = 1 Low = 10	Sling Letter	Approx. Rated Capacity (lbs.)
1.	C	34,000
2.	G	34,000
3.	D	30,000
4.	H	30,000
5.	I	24,000
6.	B	17,000
7.	E	17,000
8.	F	12,800
9.	A	12,800
10.	J	6,272

Riggers should always remember that the type of hitch that's applied to a load can greatly affect the rated capacity of the sling. This 1" wire rope sling can offer the rigger 34,000 lbs. of lifting capacity or as little as 6,272 lbs.! How it is rigged makes the difference, and after the rigging system has been selected, it's up to the rigger to ensure that the sling has the necessary rated capacity to lift its assigned portion of the load.

CLIENT NEWS

(cont.)

WESTINGHOUSE HANFORD

In October Westinghouse Hanford's nuclear facility at Richland, WA was the location for a Comprehensive Rigging Program. The two-day program included eight hours of classroom activity followed by an extensive series of field rigging exercises with the participants implementing the items covered during the classroom instruction. ♦

PACIFIC POWER & LIGHT

Mr. Jim Smith, Training Supervisor at PP&L's Centralia Steam Plant asked WRRC to present a one-day Advanced Rigging Program. The course included classroom instruction, load chart workshop and hands-on operator evaluations. ♦

SACRAMENTO COUNTY

Mr. Graham McEntire, Training Officer for Sacramento County, Water Quality Division contracted WRRC to present a two-day Comprehensive Rigging Course for 20 employees. The classroom portion included extensive written testing followed by a hands-on operator evaluation. ♦

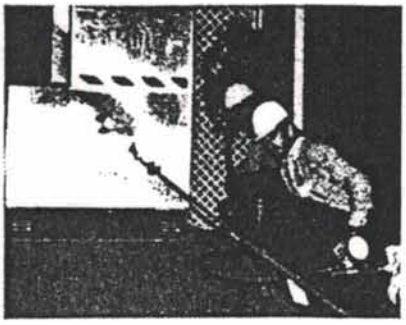
WRRC NEWS

RIGGING CONFERENCE 1991

A Huge Success!!

"I have been to many seminars & conferences, but this one has topped them all. Keep up the outstanding work." R. Tejchman, Baltimore Gas & Electric.

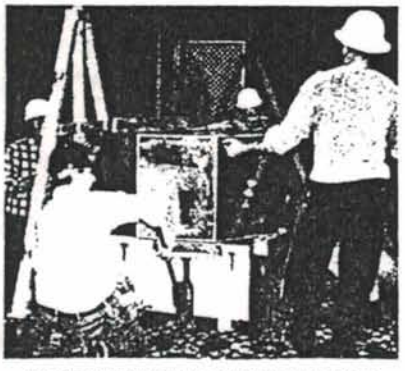
The responses received were unanimous. Rigging Conference 1991 was a huge success!! Hands-On Rigging including the Mobile Learning Center, Rigging Gear Inspection, Load Chart Interpretation, and Load Weight Estimation Workshops were listed as favorites by those in attendance.



RC '91 Hands-On Rigging / Mobile Learning Center

WRRC would like to thank the following companies who participated in RC '91:

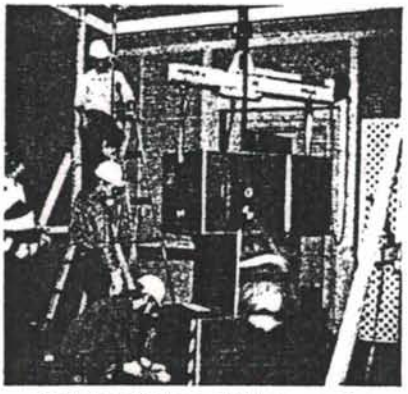
Amoco, Ayers Wire Rope Service, Baltimore Gas & Electric, Bonneville Power Admin., Cape Romain Contractors, Charleston Naval Shipyard, Charleston's Rigging & Marine Hdwr., Dept. of Energy, Duke Power, Hercules, Hanahan Water Treatment Plant, Kemira, Kiewit Western, Longbeach Naval Shipyard, Murphy Rigging and Erecting, Norfolk Naval Shipyard, N.Y. Power Authority, Rigging Products, Scherbon Consolidated, Southwest Paper Mfg., Trident Refit Facility, U.S. Coast Guard, U.S. Steel Mining Co, Union Pacific Railroad, Utah P&L, Waterman Wrecking, Westinghouse Elect.,Westinghouse Hanford, Westinghouse-Savannah River, and Weyerhaeuser Co.



RC '91 Hands-On Rigging / Mobile Learning Center

We also had representatives from several of the manufacturers who donated to the Mobile Learning Center with us for the Conference. Our special thanks to Aero Go, Columbus-McKinnon, Enerpac, Griphoist, Harrington, I & I Sling, Inter Product, Lift-All, Measurement Systems Int'l, Paratech, and The Caldwell Co.

Rigging Conference 1992 will be in the Los Angeles Area. WRRC is already planning to make it even better by including the rigging gear inspection and case study accident workshop as part of the Rigging Rodeo, along with the load moving contest. The manufacturers presentations will include actual demonstrations of their products showing do's and don'ts, applications and maintenance. ♦



RC '91 Hands-On Rigging / Mobile Learning Center

CERTIFIED INSPECTOR PROGRAM 1991

WRRC cordially invites you to register for our sixth annual CIProgram which will take place March 12-14 in Vancouver, WA.

The course addresses wire rope, wire rope slings, synthetic web slings, alloy chain slings and rigging gear/testing. The instructional format is based on OSHA CFR 29 1910, ANSI B30 series, ASTM A-391, ASTM E-4 and RR-W-410D. Participants are required to pass written and hands-on field inspection tests to complete each course section.

Call WRRC today to register and reserve your seat.

Rigger's Reference Cards

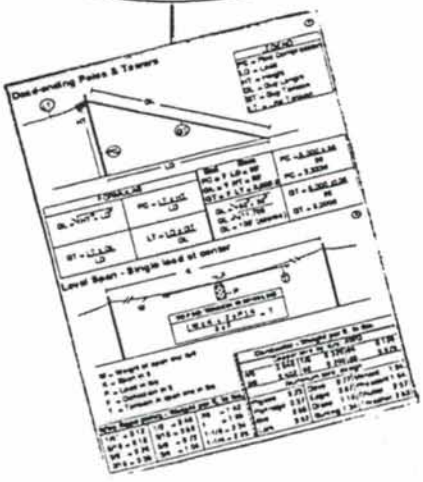
WRRC's Rigger's Reference Cards contain a wealth of information for those who rig and move loads. Riggers, millwrights, maintenance mechanics, iron workers, pipe fitters, substation maintenance and transmission line crews, machinery movers, longshoremen, crane operators, hoisting and rigging supervisors and many more can have immediate access to important information to help complete a rigging job quickly and safely!

There are two Rigger's Reference Card versions available. Both contain the following information:

- Quick method to estimate load weights
- **Off-set center of gravity picks**
- Coefficients of friction for skidding loads across surfaces
- **Load factors for sling and come-a-long angles**
- Sling length formula
- **Snatch block and fairlead line pulling systems, load factors**
- Shoulder eye bolt, eye nut, turnbuckle and shackle rated capacities
- **Wire rope clips - minimum number per rope size, turnback and torque**
- Color code system for wire rope slings
- **Load weights of various materials and liquids in cu. ft., sq. ft. and gallons**
- Formulas for area of a square and a circle, circumference and volume
- **Sling capacity charts for wire rope, web, chain and polypro rope**
- Formula to find guy length and tension, pole compression and line tension
- **Method to find tension in span line with load and center**
- Weight per foot of wire rope, aluminum and copper wire conductor
- **Mobile crane hand signals**
- Rigger's Checklist
- **Operator's Checklist**

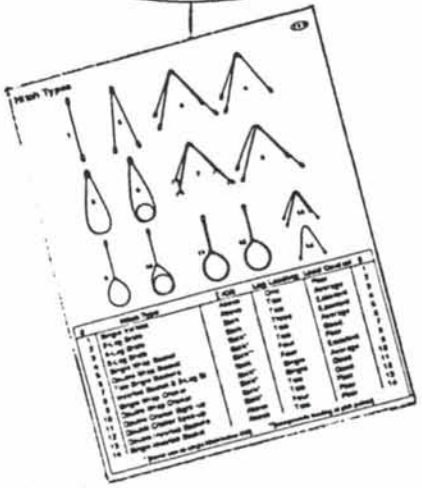
Plus

The **Electric Utility Version** also contains two special sections on dead-ending poles and towers and level span - single load at center.

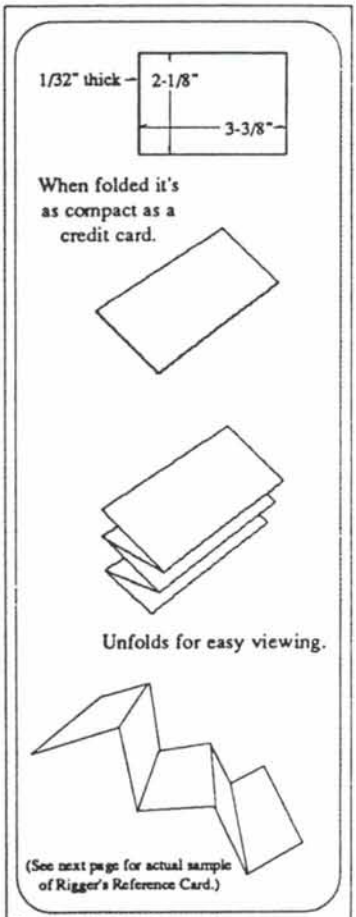


Plus

The **General Version** contains two sections for rigging hitches with illustrations of hitch types according to their load control ability.



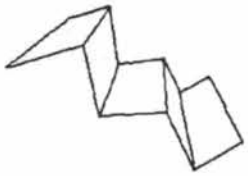
(Shown as 50% images)



When folded, the card measures 2-1/8" x 3-3/8" and is only 1/32" thick (credit card dimensions) and contains five sections on each side. Made of KIMDURA synthetic heavy book weight paper stock and printed with water-proof ink, the Rigger's Reference Card resists water, tearing, stains and will withstand folding and unfolding hundreds of times.

"Over 12,000 cards sold in the first ten months. Order the Electric Utility or General version for your crews today. See other side for details!"

A special offer from the ➡➡➡ **RIGGER'S TOOL CRIB**



Rigger's Reference Card

WRRC's latest addition to the Tool Crib are our Rigger's Reference Cards. These ten section cards are classics in the making! Seldom has this much information been so accessible for those who rig and move loads. Do your crew members a favor and put one of these cards into their hands today!

Quantity Pricing

Cards	Price ea.	Cards	Price ea.
1-9	$4.95	500-999	$3.25
10-49	4.50	1000-1999	3.00
50-99	4.00	2000-2999	2.75
100-199	3.75	3000-3999	2.50
200-499	3.50	4000+	2.25

Versions:
Electric Utility ☐ General ☐

Quantity Ordered _____ Total $ Amount $_____

Washington companies please add 7.6% tax _____

* (Shipping charges are added to all orders. All orders payable in U.S. funds.) * Total $_____

Name _____ Title _____
Organization _____ Phone _____
Shipping Address _____
City _____ State/Prov. _____ Zip/Postal Code _____
Authorized Signature

Purchase Order No. _____
Billing Address _____
City _____
State/Prov. _____
Zip/Postal Code

To Order the Rigger's Reference Card

Mail this completed order form to:

Wire Rope & Rigging Consultants, Inc.
PO Box 728
Vancouver, WA 98666-9931 USA

Fax this completed order form to :

(503) 286-8012 Main Fax
(206) 694-1242 Second Fax

Call in your order to:

(206) 693-6030

REV 7/90

WIRE ROPE & RIGGING CONSULTANTS, INC.
PO BOX 728
VANCOUVER, WA 98666 -9931 USA

BULK RATE
U.S. POSTAGE
PAID
VANCOUVER, WA PERMIT
NUMBER 974

ADDRESS CORRECTION REQUESTED

Video Tape Ordering Information

PREVIEW

Previews are for evaluation by two or more decision makers and may not be used for training. Time available for preview is up to 3 working days. Specific dates cannot be guaranteed.

Preview charges of $25.00 per title (plus shipping and handling) may be applied to the rental or purchase price of the same title if the order is placed within 30 days of the preview. The preview will be automatically charged at the rental rate for the length of time held beyond the preview period.

RENTAL

Rental of any tape can be arranged at a price of $145 for a 5-day period. This price does not include shipping and handling charges. Rentals must be scheduled for specific dates and should be ordered at least three weeks in advance of planned show date.

Rental fees may be applied to the purchase price of the tape if ordered within 30 days of the conclusion of the rental period. Rented tapes not returned immediately at the end of the rental period will be subject to the invoice for the full purchase price. A 10-day notice is required to change or cancel a rental date.

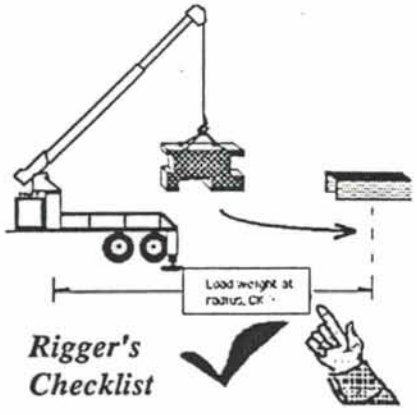
PURCHASE

This gives you unlimited internal use of the tape for the life of the print. The individual purchase price of $425 is standard for all five tapes. If all five titles are purchased as a set, WRRC allows a 6% volume discount of $130.

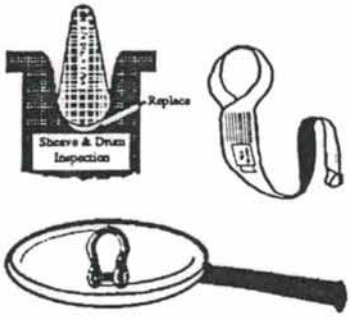
Purchase price does not include shipping / handling charges nor sales tax. All titles are protected by copyrights and may not be copied or reproduced in any form without the written consent of WRRC. Tapes may not be loaned, rented, re-sold, or broadcast without authorization from WRRC.

FORMATS

All WRRC titles are available in 3/4" VC and 1/2" VHS for preview, rental and purchase. Beta I and II formats are available for purchase only.



Rigger's Checklist



FILM SUPPORT

Quiz Booklet / Field Cards sets for the HAND SIGNALS film are $1 each.

Handbooks / Rated Capacity Card sets for all other titles are $5 each.

Film support is sent with each preview tape. For rental or purchase tapes, the desired number of book sets should be purchased.

SHIPPING

Please allow 3 to 6 weeks for delivery. Domestic orders will be shipped via United Parcel Service.

Preview and rental customers should properly pack, seal, and insure each tape for the full retail price prior to return.

Customers should return all preview and rental tapes via UPS or insured mail. Shipping and handling charges are added to all orders, F.O.B. Vancouver, Washington.

PAYMENT TERMS

A 4% cash discount is allowed if paid within 10 days of invoice, otherwise net 30 days. All orders are payable in U.S. funds.

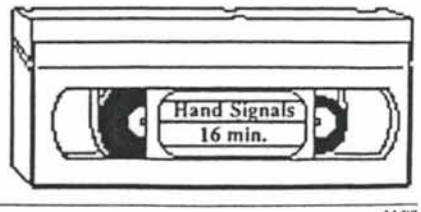
DAMAGED TAPES

Tapes damaged in transit to customer will be replaced free of charge if returned within 10 days of shipping.

REPLACEMENT

Tapes severely damaged within the first year of purchase will be replaced with a new print at the current price less 25%, plus shipping. The damaged print must be returned to WRRC prior to our shipping the replacement.

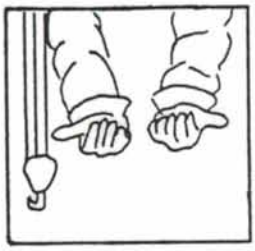
For additional information:
WRRC (206) 693 - 6030



11/88

Wire Rope & Rigging Consultants, Inc.

Video Tape Training Program



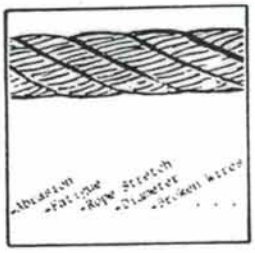
(16 minutes)

Hand Signals

Instruction & Quiz

One of the most effective films ever produced to instruct individuals in standard hand signals used during safe crane operations. Twenty-one signals are described, performed and the corresponding crane response is illustrated in an easy to learn format. A review, quiz and then one additional review goes the necessary distance in helping the viewers to comprehend and retain this vital information.

A sufficient quantity of quiz booklets and field cards should be purchased for your people when placing your order for rental or purchase of this excellent teaching tool.



(41 minutes)

Wire Rope

Inspection, Maintenance & Application

OSHA and ANSI inspection and maintenance requirements are addressed throughout this tape. Those items which qualify as criteria for removal from service are illustrated.

Abrasion, bending fatigue, broken wires, lay length, reduction of rope diameter, corrosion and much more are outlined to help our clients develop a solid inspection format. Installation, break-in period, sheave, travelling block and drum conditions are also exclusively covered.

Additional information defines the hot spots in repetitive lift applications.

(44 minutes)

Slings and Rigging Hardware

Inspection, Maintenance & Application

A working knowledge of sling types, their use and benefits can be gained from this tape. Inspection of wire rope slings, synthetic web and alloy chain slings are covered.

The dangers resulting from shock load / release are illustrated by test findings. The significance of D / d ratios are also addressed.

Overviews are presented on the proper inspections and applications of rigging hardware such as shackles, shouldered and non-shouldered eye bolts, hooks, turnbuckles and more.

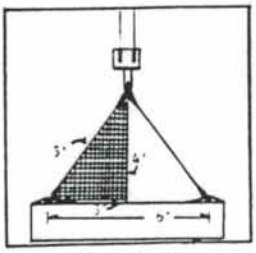
(34 minutes)

Basic Rigging

Rigger's Checklist and Sling Leg Loads

Presented are the elements necessary for a comprehensive rigger's checklist. Foundation, sling selection, head height and center of gravity are only a few of the many items addressed in the rigger's checklist.

The second portion of this film covers types of hitches, their advantages and limitations. Loads on sling legs at various included angles are analyzed and useful conclusions drawn for field rigging situations. A solid understanding can also be gained as to proper use of the rated capacity card.



(33 minutes)

Rigging

Rigging Geometry and Case Study Workshop

Easy to learn methods in calculating:

-Required sling lengths for various load sizes

-Vertical distance from lifting hook to load

-Appropriate slings required when utilizing the rated capacity card's 60, 90, and 120 I.A. columns

Provided is complete instruction for quick field computation to find the required sling length and strength for almost any lift. Instruction covers simple geometry as it applies to selecting slings.

In the second portion of this film is a sample problem which the participants are asked to solve. This workshop helps to consolidate all the subject matter presented and puts rigging geometry into motion as a useable tool.