

REFERENCE MANUAL
FOR
CARGO GEAR
CERTIFICATION
OF
PEDESTAL CRANES

ICGB-201

ICGB-202

ICGB-203

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REFERENCE MANUAL
FOR
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OF
PEDESTAL CRANES

Prepared by:

MARTIN  **OTTAWAY**

VOLUME TWO



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PREFACE

This Volume Two of the ICGB “Reference Manual” contains ICGB Publication #201, #202, and #203, which were prepared with reference to the standards respecting cargo gear as set forth by ILO Convention No. 32 and as specified by individual National Authorities and Classification Societies throughout the world. The standards provided herein are offered to describe for interested Owners and responsible National Authorities, the basic ICGB certification services which are available, and the related conditions and procedures required for the issuance of associated ICGB certifications for pedestal cranes. This volume was prepared and published by Martin, Ottaway, van Hemmen & Dolan, Inc. with reference to Volume One of the ICGB “Reference Manual”, and is published with the approval of the ICGB Board.

Tomer Chen

Martin, Ottaway, van Hemmen & Dolan, Inc.

On behalf of ICGB

New York, New York

July 2023

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**SUMMARY OF STANDARDS
AND GUIDE FOR THE
CERTIFICATION OF
CARGO GEAR**

ICGB-201



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Prepared by: Martin & Ottaway 2023

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Summary of Standards and Guide for the Certification of Cargo Gear

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Section 1 **GENERAL**

1.1 Description of Organization

International Cargo Gear Bureau, Inc. is a non-profit membership corporation which provides cargo gear inspection, certification and consulting services throughout the world. International Cargo Gear Bureau, Inc. inspection and certification services may be arranged through the international headquarters office in New York or directly with any local bureau representative.

1.2 Standards Provided

ICGB endeavors to provide and promote services in accordance with ILO Convention 32 and other standards of certification generally accepted internationally. Further, in recognition of the variations in regulations enforced by various countries, ICGB provides specialized certification services, upon request, to facilitate compliance. Therefore, the standards provided herein are offered to describe for interested Owners and responsible National Authorities, the basic ICGB certification services which are available, and the related conditions and procedures required for the issuance of associated ICGB certifications.

1.3 Methods and Procedures

ICGB endeavors to ensure that services and associated documents provided are acceptable to individual National Authorities, and consistent with specific requirements of prevailing Regulations. Accordingly, methods and procedures are under continual review.

1.4 Authorization

The international headquarters office of ICGB is located in New York, New York. Accordingly, the primary accreditations and authorizations of the ICGB Representatives throughout the world, as "competent persons" to provide cargo gear certification services, are derived from the U.S. Coast Guard and the U.S. Department of Labor. They are the responsible "competent authorities" of the United States of America whose requirements equal or exceed those of the ILO Convention 32, and require that shipboard cargo gear comply with the standards as set forth in such convention. Consequently, the acceptability of ICGB certificates associated with ICGB inspections in ports throughout the world may be confirmed through the respective Washington, DC headquarters offices of the U.S. Coast Guard (Merchant Vessel Inspection Division) and the U.S. Department of Labor (Bureau of Labor Standards, Longshore Branch); and/or through the U.S. Department of State (Office of Maritime Affairs), Washington, DC.

Section 2 **DOCUMENTATION**

2.1 Issuing of Documents

Generally, all ICGB documents are issued from and coordinated by the international headquarters office of ICGB based upon inspection procedures accomplished by and required tests witnessed by authorized ICGB Representatives in accordance with associated reports submitted to the international headquarters office of ICGB. Therefore, complete details of ICGB operations and

Summary of Standards and Guide for the Certification of Cargo Gear

certifications are maintained and controlled by the international headquarters office of ICGB. Further, consistency in certification procedures is thereby enhanced.

2.2 Registers and Certificates

Cargo Gear Registers are issued for equipment certified to provide a record of certification status at the location of the gear certified. Appropriate endorsements are made in such Registers by authorized ICGB Representatives to verify examinations accomplished and tests witnessed. Subsequently, associated certificates are issued to provide additional certification details and to confirm documentation. In this regard, effort is made to provide certificates without undue delay and under certain circumstances individual ICGB representatives are authorized to issue temporary certificates, which are valid for up to 90 days from the effective date of certification pending issuance of original documents by the international headquarters office of ICGB.

2.3 Entries in Registers

ICGB assumes no responsibility for entries made in Cargo Gear Registers, other than such entries which are made by authorized ICGB Representatives in connection with ICGB inspections. However, for the convenience of the Owner, and if consistent with applicable prevailing Regulations, favorable consideration may be given by ICGB to acknowledge in the ICGB records certifications accomplished by other recognized organizations and/or Authorities.

2.4 Fees

Minimal fees and expenses are charged by ICGB to subscribing companies for services rendered consistent with the associated operating expenses incurred by ICGB in providing such services and as necessary to ensure the continuation of ICGB activities in a responsible manner.

Section 3 DEFINITIONS

3.1 Cargo Gear

The term *cargo gear* includes masts, kingposts, booms (of derricks), winches, cranes, elevators, conveyors, standing and running gear forming that part of the equipment used in connection with the loading or unloading of a vessel with the exception of such items as hoses, hose connections, and supplementary components utilized to rig cargo gear into working positions.

3.2 Ton

Unless otherwise specifically indicated, the term *ton* means a long ton of 2240 pounds.

3.3 Resultant Load

The *resultant load* on a component of cargo gear is the single force which is equivalent to all the individual forces acting on the component under a given loading condition.

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3.4 Maximum Resultant Load

The *maximum resultant load* on a component of cargo gear is the greatest anticipated load which can be imposed on the component in a given rigging arrangement, under anticipated loading conditions.

3.5 Safe Working Load

Safe working loads are defined as follows for various components of cargo gear:

3.5.1 The *safe working load* (SWL) is the load for which the gear is designed and is approved to support, excluding the weight of the gear itself.

3.5.2 The *safe working load* of rope is the maximum permissible line pull on the rope.

3.5.3 For multiple sheave blocks and block fittings the *safe working load* is the maximum resultant load which is permissible to be imposed on the eye or pin of the block.

3.5.4 For single sheave blocks, the *safe working load* is the maximum load which is permissible to be lifted by the block when the load is attached to a rope which passes around the sheave of the block, and when both ends of the rope lead parallel to each other from the block. (*Note: When the load is attached directly to the block as in the case of a single sheave lower hanging cargo purchase block, it is permissible that the load so lifted be up to two times this "defined SWL" of the block.*)

3.6 Proof Load

The *proof load* is the test load to which a component or an assembled unit is subjected as required by prevailing Regulations and/or to satisfactorily verify the suitable condition of the gear.

3.7 Thorough Examination

The term *thorough examination* is intended to include a visual examination, supplemented if considered necessary by the attending ICGB Representative by other usual and customary means such as a hammer test or a test with electronic or ultrasonic devices.

3.8 Dismantling or Disassembling of Gear

The terms *dismantling* and *disassembly* of gear are intended to include the taking apart of units of gear to the extent considered necessary by the attending ICGB Representative to determine the suitability of such gear for continued service and as may be specifically required to carry out the intent of a particular Regulation. After proofload tests, the disassembling need not necessarily include the sheaves and pins of the blocks included in the tests, unless there appears to be evidence of deformation or failure, or unless in the opinion of the attending ICGB Representative such disassembling is considered to be necessary to verify the satisfactory condition of the gear. However, in connection with unit tests accomplished in association with quadrennial or quinquennial certification procedures, it is intended that all gooseneck, swivel, etc., fittings be sufficiently taken apart when practicable to facilitate careful examination.

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(Note: Consistent with the provisions of prevailing regulations, means considered to be equivalent to careful examination of dismantled or disassembled gear, such as an electronic, ultra-sonic, or other equally efficient non-destructive examination may be accepted to verify the satisfactory condition of gear in lieu of. or in association with such careful examination.)

3.9 Loose Gear

The term *loose gear* is intended to include any component of cargo gear (*i.e. block, shackle, link, chain, hook, ring, eye plate, swivel, etc.*) which upon removal from an assembled unit is a complete component of itself, or is able to be either utilized as an individual component or placed in service in another unit of cargo gear in a similar manner to that for which the complete component was utilized in the initial unit. However, it is not the intention of ICGB to impose specific *loose gear* certification requirements for components which may not be considered as being *loose gear* by individual National Authorities within the intent of their associated prevailing national regulations; nor is it the intention of ICGB to preclude the imposing of specific loose gear certification requirements for other components which may be considered by individual National Authorities to be subject to such requirements.

3.10 ICGB Representative

An *ICGB Representative* for the purpose of providing inspection and certification services in accordance with ICGB policies, standards, and procedures, is:

- 1) a person considered to be qualified by the international headquarters office of ICGB and appointed for a specific period directly by the international headquarters office of ICGB to provide such services, or
- 2) a person authorized upon request to provide such services on behalf of ICGB and considered by the international headquarters office of ICGB by virtue of being a representative of another recognized organization, to be qualified to provide such services, which services shall be rendered only in accordance with arrangements confirmed by the international headquarters office of ICGB. *(Note: Every ICGB Representative appointed by the international headquarters office of ICGB for a specified time should have a current ICGB Representatives Identification Card issued on or after June 1, 1966 to verify their authorization to provide ICGB services. The authorization of other persons to provide services in behalf of ICGB may be promptly verified through the international headquarters office of ICGB.)*

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Section 4 **BASIC TESTS**

4.1 General

The prooftesting of cargo gear usually involves two distinct testing procedures:

- a) prooftesting of each article of loose gear, and
- b) prooftesting of the assembled unit.

Prooftests required in connection with the issuance of associated ICGB documents generally are no less than as given in the following Tables A and B. Each article of loose gear is to be proof tested prior to being employed for cargo handling operations, typically by the manufacturers. Each assembled unit is also to be proof tested as a unit at least once in every four years for shoreside cranes and five years for shipboard cranes. *(Note: ICGB Quadrennial/Quinquennial Certification procedures require unit testing in addition to and in association with thorough examination and dismantling or disassembly of cargo gear, and it is emphasized that neither of the prooftesting procedures described above is a substitute for the other.)*

4.2 Unit Testing Criteria

All unit tests should be accomplished under such operating or simulated conditions which represent the condition(s) imposing the greatest anticipated stresses on the booms, masts, winches, standing rigging, permanent fittings, etc., insofar as is practicable.

Unit testing of shipboard and land-based cargo pedestal cranes and accessory gear should be accomplished with the proofload being supported with the designed rigging arrangement and with the boom at the minimum radius, maximum radius, and an intermediate radius, as determined from physical limitations, basic design considerations, current loose gear certification, previous documentation, etc. Proof loads should then be suspended at those radii for 5 minutes. Subsequently, the pedestal crane is to conduct controlled slewing, luffing, and hoisting operations while the proof load is rigged. Once the unit test is complete, a thorough examination of the crane is to be conducted to determine if any loose gear or other equipment associated with the crane have been damaged or affected and need repair or replacement.

4.3 Special Testing

Special testing of cargo gear may be witnessed by ICGB Representatives upon request, and the results of such tests certified as appropriate with due consideration of the intended use and/or the special design of such cargo gear. For example, when units of cargo gear are rated for various capacities at correspondingly varying operating radii, separate unit tests may be required in order to satisfactorily certify anticipated operating conditions. Further, as with certain hydraulic cranes with capacities limited by pressure, and with which it is not possible to lift proofloads specified in Table B, the greatest possible load in excess of the safe working load should be utilized and recorded for associated certification purposes. In general, though, the process for special testing corresponds with that which is defined for proof load testing.

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TABLE A

Schedule of Proof test for Articles of Loose Gear

(Whether accessory to machine or not)

ARTICLES OF GEAR

PROOF LOAD

Chains, rings, hooks, links, shackles, swivels.....	Twice the safe working load.
Single sheave block.....	*Four times the safe working load.
Multiple sheave block with safe working load up to and including 20 tons.....	Twice the safe working load.
Multiple sheave block with safe working load over 20 tons up to and including 40 tons.....	20 tons in excess of the safe working load.
Multiple sheave block, with safe working load over 40 tons.....	One and a half times the safe working load.
Roller chains (pitched chains) used with hand operated chain falls, and rings, hooks, shackles, or swivels permanently attached thereto.....	One and a half times the safe working load.
Chain fall blocks used with roller chains (pitched chains, and rings, hooks, shackles or swivels permanently attached thereto.....	One and a half times the safe working load.

*For single sheave blocks, the safe working load is the maximum load which is permissible to be lifted by the block when the load is attached to a rope which passes around the sheave of the block, and when both ends of the rope lead parallel to each other from the block. (Note: When the load is attached directly to the block, as in the case of a single sheave lower hanging cargo purchase block, it is permissible that the load so lifted be up to two times this "defined SWL" of the block.)

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TABLE B

Schedule of Prooftests for Assembled Units

(Winches with their accessory gear, including derricks and attachments; and cranes and other hoisting machines with their accessory gear)

<u>SAFE WORKING LOAD OF ASSEMBLED GEAR</u>	<u>PROOF LOAD</u>
Not exceeding 20 tons.....	25 percent in excess of the safe working load.
Over 20 tons but not exceeding 50 tons.....	5 tons in excess of the safe working load.
Over 50 tons.....	10 percent in excess of the safe working load.

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4.4 Responsibility

While ICGB endeavors to advise subscribing Companies as to apparent lifting capabilities of gear and associated appropriate testing arrangements and provides testing standards for the convenience of and as a service to the Owners of such gear, ICGB assumes no responsibility for any damages caused by cargo gear tests arranged by or with the permission of the Owners of such gear, nor does ICGB assume responsibility for testing equipment and/or weights provided by or with the permission of the Owners of such gear.

(Note: Owners of cargo gear certified by ICGB should maintain a record of, and arrange to have ICGB provided with documentation for record purposes as to the certified accuracy of testing equipment and/or certified weights of test loads utilized in connection with related ICGB certifications. ICGB is not responsible for providing certified weights or test loads for such tests.)

Section 5 BASIC CERTIFICATION SERVICES AVAILABLE

5.1 General

All cargo gear should be rigged and employed in an approved, certified, and safe manner. Certification services are made available by ICGB upon request in order to facilitate compliance by Owners of cargo gear equipment with prevailing Regulations and/or to facilitate implementation of safety codes voluntarily desired by Owners of such equipment.

While ICGB endeavors to ensure the suitability of gear for appropriate use in connection with associated certifications issued by ICGB and consistent with the requirements of prevailing Regulations, ICGB assumes no responsibility for maintenance or possible misuse of such gear. Further, when gear is certified by ICGB as being in satisfactory condition but recommendations are made by ICGB regarding the continued or special maintenance of such gear, it is the responsibility of the Owner of the gear to service, repair or replace the gear or components of the gear as necessary, consistent with such ICGB recommendations, in order to ensure the continued satisfactory condition of the gear throughout the duration and within the intent of the associated ICGB certificate(s) issued.

5.2 Approval of Design

5.2.1 Plan approval

The international headquarters office of ICGB will review and approve or comment upon design calculations and related data submitted to verify lifting capacities (SWL) of cargo gear, in order to facilitate, when applicable, submittal of ICGB approved technical material to National Authorities for anticipated confirmation of approval as may be required. However, ICGB reserves the right to require the submittal of such technical data in connection with any requests received for ICGB certifications which involve the certification as to lifting capacity (SWL).

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5.2.2 Special Gear

The international headquarters office of ICGB will give favorable consideration to reviewing and offering approval and/or comments in connection with technical data submitted to verify the suitability of design of special loose gear components or other special lifting devices. When such technical data is intended by the Owner to be offered in lieu of the usual proof tests to comply with the intent of prevailing certification standards it may be required by individual National Authority regulations that such ICGB approved technical data be submitted to the National Authorities for confirmation of approval and acceptance in lieu of the usual proof tests and it may be required by ICGB for issuance of appropriate certificates that other tests be conducted to demonstrate the suitability of such special gear for the intended uses.

5.2.3 Design Considerations

Plan approval action by ICGB may be issued only by the international headquarters office of ICGB and is accomplished with due consideration for accepted and recognized design methods and factors of safety, the basic minimum values of which generally are as given in the following Table C:

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**TABLE C
DESIGN SAFETY FACTOR**

Safe Working Loads for Component Parts	Safety Factors Based On*		
	Ultimate Strength	Yield Point	Breaking Test Load
All metal structural parts except booms, pins and connections, rope, and chains:			
5 tons or less working load of the assembled gear.....	5.00	**2.75	
15 tons working load of the assembled gear.....	4.00	**2.20	
60 tons or more working load of the assembled gear.....	3.75	**2.05	
Steel booms:			
10 tons or less working load of the assembled gear.....		3.00	
13 tons or more working load of the assembled gear.....		3.00	
Pins and connections:			
10 tons or less working load of assembled gear.....		**3.00	
13 tons or more working load of assembled gear.....		**2.50	
Wire Rope:			
10 tons or less working load.....			5.00
13 tons or more working load.....			4.00
Fiber Rope:			
For running rigging.....	7.00		
Chains.....	4.50		

* Intermediate values of safety factors may be used.

** The minimum yield point for design purposes shall not be considered greater than 72 percent of the minimum ultimate strength of the steel.

(Effective revision date; November 6, 1972)

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5.2.4 Verifying SWL by Special Testing

ICGB may acknowledge lifting capacity (SWL) rating of cargo gear based upon the satisfactory proof testing of cargo gear with a load of up to 100% in excess of the apparent SWL if such load is appropriately applied and if such a test is considered to demonstrate the suitability of the cargo gear to be appropriately employed to support the apparent SWL. Before voluntarily deciding to subject cargo gear to such overload testing, the Owner should carefully consider the design, construction, record of performance, and current condition of the cargo gear to withstand such testing without damage. *(Note: This alternate method of soliciting ICGB acknowledgement as to apparent lifting capacity may only be arranged through the international headquarters office of ICGB and does not supersede any special provisions of prevailing Regulations which may specifically require approved plans and calculations in order to verify lifting capacity of cargo gear.)*

5.2.5 Diagrams

ICGB provides as an additional service, upon request, rigging diagrams and similar material which may be placed in Cargo Gear Registers and/or suitably posted to describe certified rigging arrangements and satisfy the requirements of certain Regulations regarding the availability of such additional material at the location of the gear.

5.2.6 Approval of Suitability of Design

Upon request, ICGB will advise subscribing Companies as to the apparent design suitability of gear in connection with certifications issued. However, unless otherwise specifically provided for by associated ICGB documents, forms, diagrams, or correspondence, ICGB approval of the working capability of certified gear is restricted to the certification of the capability demonstrated and attested to by the specific tests to and inspections of such gear accomplished in accordance with corresponding standards and requirements for such tests and inspections as established by applicable prevailing Regulations, and consistent with the rated lifting capacity of such gear as previously documented by other recognized organizations and/or Authorities.

5.3 Quadrennial Certification

5.3.1 General

The requirement for receipt of ICGB quadrennial certification is that the Owner of the cargo gear arrange to subject the gear to appropriate unit testing (*re: Table B*) in the presence of an ICGB Representative, arrange to have the gear dismantled and disassembled as considered necessary by the attending ICGB Representative to facilitate a thorough examination of the gear and individual components of the gear consistent with the requirements of prevailing Regulations, and arrange to accomplish any periodic heat treatment procedures which may be required.

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5.3.2 Initial Unit Testing

When unit tests are being conducted for the first time, the gear is to be completely dismantled or disassembled for examination after testing to determine if gear has been damaged or is in need of repair/replacement. The sheaves and pins of the blocks included in such tests does not necessarily need to be removed unless there appears to be evidence of deformation or failure, or unless in the opinion of the attending ICGB Representative, such disassembling is considered to be necessary to verify the satisfactory condition of the gear.

5.3.3 Subsequent Unit Testing

For subsequent unit tests it may be required that the gear be disassembled and/or dismantled and thoroughly examined prior to testing as decided by the attending ICGB Representative with further disassembling and/or dismantling and thorough examination as necessary being conducted after testing. This option of requiring disassembly and/or dismantling prior to testing is intended to facilitate proper evaluation of the condition of the gear before and/or after the gear has been subjected to proof test overloading. However, regardless of the extent of disassembling and/or dismantling and thorough examination prior to unit testing, it is intended that disassembling after such tests include, but not necessarily be limited to, the taking apart of associated gooseneck assemblies when practicable and as necessary to permit thorough examination of such assemblies.

5.3.4 Crediting Certification Date

If under certain circumstances it does not suit the Owner to schedule quadrennial/quinquennial testing and examination consecutively for a cargo gear unit, such procedures may be accomplished separately at the Owner's convenience with the date of certification being credited upon completion of all required procedures as of the date of testing, providing that all such procedures be accomplished within a period not to exceed 90 days, and provided that no changes or alterations to the cargo gear being certified be made during the period of the continuous inspection with the exceptions of changes *in kind* or other changes to improve the gear which changes are appropriately recorded by a responsible Owner's Representative and reported to ICGB. *(Note: The completion of quadrennial/quinquennial recertification procedures should be within four/five years of the last previous quadrennial/quinquennial certification for gear continued in regular service.)*

5.3.5 General Proof testing Procedure

All proof tests are to be accomplished in accordance with prevailing applicable Regulations and/or in a manner consistent with the design and certified intended use of the gear.

5.3.6 Methods of Proof testing

Cargo gear being tested for the first time is to be tested with appropriate movable weights and the operation of such gear satisfactorily demonstrated

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by handling the proof load through a complete operating cycle or cycles and in accordance with applicable prevailing regulations. Typically, this includes slewing, luffing, and hoisting the weights at the minimum and maximum radii and a chosen intermediate radius.

If movable weights for proof testing are not reasonably available, subsequent unit tests, and unit tests being accomplished in connection with the repair or replacement of gear (*i.e. repaired or replacement booms but not "upgradings"*) may be accomplished by alternate means such as by the use of a spring, hydraulic scale, or dynamometer which has been appropriately certified for accuracy. When such an alternate method of unit testing is employed, the testing should be conducted in such a manner and under such varying conditions as may be decided upon by the attending ICGB Representative consistent with the requirements of prevailing Regulations. (*Note: It is generally required that whenever such scales are used, the indicator remain constant at the proofload position for a period of at least five minutes in order to satisfactorily test the gear in accordance with the intent of Quadrennial/Quinquennial Certification or Special Certification procedures.*)

5.3.7 Winches

On all types of winches and cranes, efficient means are to be provided to stop and hold the proof load in any position and the efficiency of such means is to be demonstrated.

5.3.7.1 When more than one device to stop and hold the proofload is available, such devices are to be in satisfactory operating condition, and it should be clearly indicated which device is to provide the primary and usual method of braking, and under what conditions, if any, any secondary device is necessary for efficient and effective braking.

5.3.7.2 Electric winches, electro-hydraulic winches fitted with electromagnetic or hydraulic brakes at the winch, or cranes are to be equipped so that a failure of the electric power shall stop the motion and set the brakes without any action on the part of the operator.

5.3.7.3 Current for electric winches and crane operation during the tests is to be taken from the associated operating circuits. Shore current may be used if it passes through the associated operating circuits.

5.3.8 Progressive Quadrennial/Quinquennial Procedure

Regarding shipboard inspections, where many lifting units are involved, it may be considered advantageous by some Owners to employ a *progressive quadrennial/quinquennial procedure*, similar in principle to normal progressive maintenance programs.

It is solely the prerogative of the Shipowner or Operator to decide whether the progressive quadrennial/quinquennial procedure is undertaken rather

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than scheduling a complete quadrennial for all units at the same time once every four/five years.

For the purpose of explanation, the example of a ship equipped with four pedestal deck cranes may be considered. If Quadrennial/Quinquennial certification were issued for all four pedestal deck cranes in July 2023, quadrennial/quinquennial recertification for all four cranes would be required by July 2027/2028. Therefore, in reference to a quadrennial recertification program, the choice would be either:

1. Accomplish a complete annual inspection in July 2024, July 2025, July 2026, and a complete quadrennial inspection in July 2027; or
2. Accomplish a complete annual inspection in July 2024 with a quadrennial certification for one crane at the same time, then a complete annual inspection in July 2025 with a quadrennial for one more crane, and likewise for the remaining cranes in July 2026 and July 2027.

Either procedure provides that all the cranes receive annual certification every year, and receive quadrennial certification within a four-year period.

If, in the example discussed above, the ship's cargo gear had not been inspected at all prior to July 2023, the progressive quadrennial procedure should not be initiated by accomplishing quadrennial certification (in this instance, initial certification) for only one crane. If this were done, three of the cranes would not have been quadrennially certified as required. In employing either procedure, all units at any given time must have been quadrennially certified within the previous four years.

When a ship is employing the progressive quadrennial/quinquennial procedure, effort is made to accomplish a complete annual inspection of all gear in conjunction with any quadrennial/quinquennial inspections performed on a portion of the total number of units fitted, even if the annual inspection is not due at the time, provided that the complete annual inspection can be accomplished without additional charges for services over those entailed for the quadrennial/quinquennial portion of the survey. This situation may occur when the quadrennial inspections get *out of phase* with the annual inspections due to ship schedules and availability for cargo gear inspections. In this way, all inspections are kept in phase.

5.4 Annual Certification

5.4.1 General

The requirement for receipt of ICGB annual certification is that the Owner of the cargo gear make such gear available for thorough examination by an ICGB Representative, arrange to have such gear dismantled and/or disassembled as may be required by the attending ICGB Representative in accordance with applicable prevailing regulations, and arrange to accomplish any periodic heat treatment procedures which may be required. Normally, it is not necessary to dismantle and/or disassemble the cargo gear to obtain ICGB annual certification, except as may be necessary for

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the heat treatment of components for which such periodic treatment may be required.

The annual certification will also require operational testing of the cargo gear using known and typical loads for the subject gear. Typical operational testing includes, but is not limited to, slewing, luffing, hoisting, testing of high and low limit switches, and testing of any alarms.

5.4.2 Relationship to Quadrennial/Quinquennial Certification

An annual recertification for cargo gear is automatically issued upon satisfactory completion of a quadrennial/quinquennial certification for any unit comprised of such cargo gear. However, annual recertification does not extend or substitute any current quadrennial/quinquennial certification or recertification which may be required.

5.5 Loose Gear Certification

5.5.1 General

ICGB quadrennial, quinquennial, special unit test, or annual certificates do not routinely include specific certification of the associated individual articles of loose gear as required by separate prevailing Regulations regarding the testing and examination of loose gear prior to being taken into use. Typically, loose gear is inspected, certified, and proof load tested by the manufacturers of such gear.

Other than inspections of articles of loose gear which are accomplished in connection with initial, annual, or quadrennial certification of associated cargo gear units, specific ICGB certification of individual articles of loose gear may be obtained only if the Owner of such gear arranges to subject the gear to appropriate testing (*re: Table A*) in the presence of an ICGB Representative, arranges to have the individual articles taken apart including the removal of pins and sheaves of blocks to the extent that the construction of such blocks permits so as to facilitate careful examination, and arranges to have each article suitably and separately marked for identification.

5.5.1.1 In lieu of accepting articles for such specific certification on the basis of tests witnessed, and careful examinations accomplished by ICGB Representatives, ICGB may acknowledge, by the issuing of related ICGB loose gear certificates, previous test data and examinations as documented by appropriate certificates issued by other recognized persons provided that such test data is in accordance with the schedules included in Table A.

5.5.1.2 When such previous loose gear test data is not in accordance with Table A, but is in accordance with other, different established requirements or standards of another recognized Authority, ICGB will give due consideration to verifying on associated documents issued the particular acceptability of such test data in order to clarify for interested National Authorities the standards to which

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such tests refer. *(Note: When subscribing companies decide to retain such different loose gear test data, due consideration should be given by the companies to the acceptability of such certifications by the various interested National Authorities of the various countries where the cargo gear is likely to be employed.)*

5.5.2 Marking Systems

With regard to the marking of individual articles of loose gear, it is generally recommended for receipt of ICGB loose gear certificates that the articles be marked in accordance with the ICGB suggested method, which is described by other ICGB publications and provides for the separate and distinctive marking of each article of loose gear. *(Note: Owners of cargo gear components should select means of marking which will provide reasonable and continued identification and liability but which will not cause the components to be unsatisfactory for continued use.)*

5.6 Special Certification

5.6.1 Special Types of Cargo Gear

ICGB certifications for special types of cargo gear and/or for specialized uses of cargo gear are available upon request, provided that sufficient technical data is submitted and/or tests accomplished as may be appropriate consistent with the design and/or intended use of such cargo gear.

5.6.2 Wire and Fiber Rope

ICGB wire and fiber rope certifications are available in association with the completion of required tests and examinations.

5.6.3 Heat Treatment

ICGB certifications of heat treatment for components of cargo gear which are required to be heat treated in accordance with prevailing Regulations and/or manufacturers recommendations are available upon the supervised completion of required procedures.

5.6.4 Repairs, Alterations or Replacements

Special ICGB certificates are available to verify the suitability of cargo gear repairs, alterations, or replacements. *(Note: See Section 4 for basic testing requirements and Section 5.3.6 for unit prooftesting methods.)*

5.7 Other and Related Requirements

5.7.1 Marking

To facilitate compliance with prevailing Regulations and in association with ICGB certifications accomplished, all units and components of cargo gear are to be marked for identification, SWL, boom radius/outreach, and minimum boom angle. For example, in addition to the loose gear markings mentioned in Section 5.5 herein, all booms should be marked to indicate

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the associated certified location (*i.e., boom at hatch #2 aft end stbd. to be marked "2AS"*) the SWL for an assembled unit of cargo gear is to be marked on the heel of the boom with the minimum angle to the horizontal for which the gear is certified for operations and the maximum outreach. Additional markings may be required as applicable.

(Note: Owners of cargo gear should select means of marking which will provide reasonable and continued identification and legibility but which will not cause the gear to be unsuitable for continued use.)

5.7.2 Special Recertification Requirements

Quadrennial/Quinquennial certifications (*Section 5.3*) are normally required by prevailing regulations to be renewed once every four/five years. Annual certifications (*Section 5.4*) are normally required by prevailing regulations to be renewed once every year. Loose gear certification (*Section 5.5*) for individual components may be verified by confirming markings or remarking from time to time as necessary, although retesting of components is not normally required (*regardless of whether or not such components are transferred from one cargo unit to locations of no greater loading in another unit*) unless significant repairs to or alterations of the components are made and/or unless current loose gear documentation is not evident and readily verified by existing certificates. However, for the renewal of ICGB Quadrennial, Quinquennial, Annual and/or Loose Gear Certifications, ICGB reserves the right to require special tests, repairs, replacements, disassembling and/or dismantling of gear as may be considered necessary or appropriate to verify the condition of cargo gear which may have been subjected to unusual use or stowed for a considerable length of time unused, which may be in an apparently damaged condition, or which may apparently be in marginally satisfactory condition.

5.7.3 Loose Gear Annual Inspection

Each component of loose gear in use in a cargo gear unit and spare gear which may be placed in service during intervals between regular certifications should be inspected and heat treated, if necessary, at least once each year in connection with Annual Certification requirements.

5.7.4 Loose Gear Marking

Loose gear marking and/or verification of loose gear markings is recommended and may be required by the attending ICGB Representative in connection with ICGB certifications in order to facilitate the verification of loose gear certification status and/or to confirm for future reference which components of cargo gear were utilized in an assembled unit at the time of ICGB certification.

5.7.5 Damaged or Excessively Worn Gear

Damaged or excessively worn gear should be repaired or replaced and recertified as appropriate prior to the continued use of such gear regardless of other current certification of such gear. When gear is damaged as an apparent result of proper prooftesting, such gear is to be repaired or

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replaced and subsequent proper prooftesting is to be satisfactorily completed without causing such damage before any associated certification may be issued.

5.7.6 Significant Alterations

When significant alterations to cargo gear are accomplished, suitable recertification should be completed prior to the use of such gear regardless of other current certification of such gear. Owners should give such gear due consideration to any related requirements for the prior approval of plans and/or calculations for such alterations.

5.7.7 Important Repairs or Renewals

Whenever important repairs or renewals for masts, booms, and permanent fittings of cargo gear are indicated, such repairs or renewals should be accomplished in an appropriate and approved manner and suitable recertification should be completed prior to the use of such gear regardless of other current certification of such gear. Owners should give such gear due consideration to any related requirements for the prior approval of plans and/or calculations for such repairs or renewals which are not in kind.

**LOOSE GEAR
CERTIFICATION GUIDE
FOR
PEDESTAL CRANES**

ICGB-202



INTERNATIONAL CARGO GEAR BUREAU, INC.

Prepared by: Martin & Ottaway 2023

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Section 1 DEFINITIONS

1.1 Loose Gear

The term loose gear is intended to include any component of cargo gear (*i.e., block, shackle, link, chain, hook, ring, eye plate, swivel, etc.,*) which upon removal from an assembled unit is a complete component of itself, or is able to be either utilized as an individual component or placed in service in another unit of cargo gear in a similar manner to that for which the complete component was utilized in the initial unit. However, it is not the intention of ICGB to attempt to impose specific loose gear certification requirements for components which may not be considered as being loose gear by individual National Authorities within the intent of their associated prevailing national regulations; nor is it the intention of ICGB to preclude the imposing of specific loose gear certification requirements for other components which may be considered by individual National Authorities to be subject to such requirements.

1.2 Resultant Load

The resultant load on a component of cargo gear is the single force which is equivalent to all the individual forces acting on the component under a given loading condition.

1.3 Maximum Resultant Load

1.3.1 The *maximum resultant load* on a component of cargo gear is the maximum greatest anticipated load which can be imposed on the component in a given rigging arrangement, under anticipated loading conditions.

1.3.2 The *maximum resultant load* on a block is the largest possible load which can be imposed on the eye or pin of the block in a given rigging arrangement.

1.3.2.1 From a practical standpoint, the maximum resultant load on the components of the hoisting equipment is proportional to the lifted load and the friction present in the system.

1.3.2.2 For the luffing equipment, the resultant load is determined by taking the moment around the heel pin and is dependent on the vertical and horizontal components of the tension in the hoisting and luffing wires, taking into account the boom and gear weight. From a practical standpoint, the maximum resultant load for the luffing gear is taken as twice the weight of the load and is typically when the boom is at its lower limit (*i.e.* wires parallel with the horizontal).

1.3.2.3 In instances where at least one of the wires passing around the sheave(s) of a block could never lead parallel to the other wires on the block, the angle between the wire leads should be considered in determining the maximum resultant load.

1.4 Safe Working Load

1.4.1 General Definition

The *safe working load (SWL)* is the load for which the gear is designed and is approved to support, excluding the weight of the gear itself.

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1.4.2 Rope

The safe working load of rope is the maximum permissible line pull on the rope.

1.4.3 Multiple Sheave Blocks & Block Fittings

For multiple sheave blocks and block fittings, the safe working load is the maximum resultant load which is permissible to be imposed on the eye or pin of the block.

1.4.4 Single Sheave Blocks

For single sheave blocks, the safe working load is the maximum load which is permissible to be lifted by the block when the load is attached to a rope which passes around the sheave of the block, and when both ends of the rope lead parallel to each other from the block.

1.4.4.1 The ICGB definition refers to one-half of the maximum resultant load for single sheave blocks as determined from the stress diagram for the unit or as determined from the construction of the block if the construction facilitates a greater rating than required for the intended use.

(Note: When the load is attached directly to the block, as in the case of a lower hanging cargo purchase block, it is permissible that the load so lifted be up to two times this "defined SWL" of the block.)

1.4.4.2 It should be noted that other Standards may utilize other definitions for single sheave block safe working loads. The associated proof load calculation is correspondingly specially defined so that the proof load for the selected block would be the same regardless of the method selected to define the safe working load. However, due consideration is to be given to the safe working load given by the manufacturer of the gear.

1.4.5 Special Note

The safe working loads of individual articles of loose gear in a unit of cargo gear are not necessarily the same as the safe working load for the unit.

1.5 Proof Load

The *proof load* is the test load to which an article of loose gear is subjected as required by prevailing Regulations and/or to satisfactorily verify the suitable condition of the gear.

1.6 Ton

Unless otherwise specifically indicated, the term ton means a long ton of 2240 pounds.

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1.7 ICGB Representative

An *ICGB Representative* for the purpose of providing inspection and certification services in accordance with ICGB policies, standards, and procedures, is:

- a. A person considered to be qualified by the international headquarters office of ICGB and appointed for a specific period directly by the international headquarters office of ICGB to provide such services, or
- b. A person authorized upon request to provide such services in behalf of ICGB and considered by the international headquarters office of ICGB by virtue of being a representative of another recognized organization, to be qualified to provide such services, which services shall be rendered only in accordance with arrangements confirmed by the international headquarters office of ICGB.

(Note: Every ICGB Representative appointed by the international headquarters office of ICGB for a specified time should have current ICGB Representative's Identification Card issued on or after June 1, 1966 to verify his authorization to provide ICGB services. The authorization of other persons to provide services in behalf of ICGB may be promptly verified through the international headquarters office of ICGB in New York.)

Section 2 TESTS

2.1 General

The prooftesting of cargo gear usually involves two distinct testing procedures:

- a) prooftesting of each article of loose gear, and
- b) prooftesting of the assembled unit.

Prooftests required in connection with the issuance of associated ICGB documents generally are no less than as given in Tables A and B. Each article of loose gear is to be proof tested prior to being employed for cargo handling operations, typically by the manufacturers. Each assembled unit is also to be proof tested as a unit at least once in every four years for land-based cranes and five years for shipboard cranes.

(Note: ICGB Quadrennial/Quinquennial Certification procedures require unit testing in addition to and in association with thorough examination and dismantling or disassembly of cargo gear, and it is emphasized that neither of the prooftesting procedures described above is a substitute for the other.)

2.2 Special Gear

ICGB will give favorable consideration to reviewing and offering approval and/or comments in-connection with technical data submitted to verify the suitability of design of special loose gear components or other special lifting devices. When such technical data is intended by the Owner to be offered in lieu of the usual proof tests to comply with the intent of prevailing certification standards, it may be required by individual National Authority regulations that such ICGB approved technical data be submitted to the National Authorities for confirmation of approval and acceptance in lieu of the usual proof tests, and it may be required by ICGB for issuance of appropriate certificates that other tests be conducted to demonstrate the suitability of such special gear for the intended uses.

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TABLE A
Schedule of Proof test for Articles of Loose Gear
(Whether accessory to machine or not)

<u>ARTICLES OF GEAR</u>	<u>PROOF LOAD</u>
Chains, rings, hooks, links, shackles, swivels.....	Twice the safe working load.
Single sheave block.....	*Four times the safe working load.
Multiple sheave block with safe working load up to and including 20 tons.....	Twice the safe working load.
Multiple sheave block with safe working load over 20 tons up to and including 40 tons.....	20 tons in excess of the safe working load.
Multiple sheave block, with safe working load over 40 tons.....	One and a half times the safe working load.
Roller chains (pitched chains) used with hand operated chain falls, and rings, hooks, shackles, or swivels permanently attached thereto.....	One and a half times the safe working load.
Chain fall blocks used with roller chains (pitched chains, and rings, hooks, shackles or swivels permanently attached thereto.....	One and a half times the safe working load.

*For single sheave blocks, the safe working load is the maximum load which is permissible to be lifted by the block when the load is attached to a rope which passes around the sheave of the block, and when both ends of the rope lead parallel to each other from the block.

(Note: When the load is attached directly to the block, as in the case of a single sheave lower hanging cargo purchase block, it is permissible that the load so lifted be up to two times this "defined SWL" of the block.)

2.3 Responsibility

While ICGB endeavors to advise subscribing Companies as to apparent lifting capabilities of gear and associated appropriate testing arrangements, and provides testing standards for the convenience of and as a service to the Owners of such gear, ICGB assumes no responsibility for any damages caused by cargo gear tests arranged by or with the permission of the Owners of such gear nor does ICGB assume responsibility for testing equipment and/or weights provided by or with the permission of the Owners of such gear.

(Note: Owners of cargo gear certified by ICGB should maintain a record of, and arrange to have ICGB provided with documentation for record purposes as to the certified accuracy of testing equipment and/or certified weights of test loads utilized in connection with related ICGB certifications.)

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Section 3 IDENTIFICATION

3.1 General

With regard to the marking of individual articles of loose gear it is generally recommended for receipt of ICGB loose gear certificates that, in addition to the marking of safe working load as required by prevailing Regulations, each article of loose gear be marked in accordance with the ICGB suggested method, which is illustrated in Figure 1 and which is summarized as follows:

First Character	Hatch number (1, 2, 3, 4, 5, etc.)
Second Character	Forward or aft (F or A)
Third Character	Port, starboard, or centerline (P, S, or C, respectively)
Fourth Character	Hoisting, luffing, or slewing (H, L, or S, respectively)
Fifth Character	Sequence block in the arrangement (1, 2, 3, etc.) by following the run of the rope from the winch or dead end, and numbering the blocks in order of contact with the rope.
Sixth Character	Shackle or link number in sequence starting with the number one at each block and first marking the shackle or link attached to the supporting fitting on the mast, boom, deck, or bulwark.

(Note: Owners of cargo gear components should select means of marking which will provide reasonable and continued identification and legibility but which will not cause the components to be unsatisfactory for continued use.)

3.2 Shackles, Chain Links, etc.

Shackles, chain links, etc., are identified by the same marking as the block to which they are attached, plus an additional number. This additional number in sequence starts with the first shackle, chain link, etc., attached to the supporting fitting on the mast, boom, or deck as the case may be.

3.3 Special Articles

In addition to the general markings described above, the following markings for special articles are recommended:

3.3.1 Cargo Hooks

If they are integral with a block they may be considered as being part of the block with no separate marking required. Independent hooks usually have a serial number corresponding to the manufacturer's test certificate. If a separate mark is needed, for instance, on a hook and associated shackles used with a boom at hatch #4 aft, port, the markings would be 4AP-HH, 4AP-HH-1, 4AP-HH-2, etc.

3.3.2 Miscellaneous Items

Other items used in a specific location would be identified with the component to which they are most closely associated in the same manner as shackles are identified with blocks to which they are attached.

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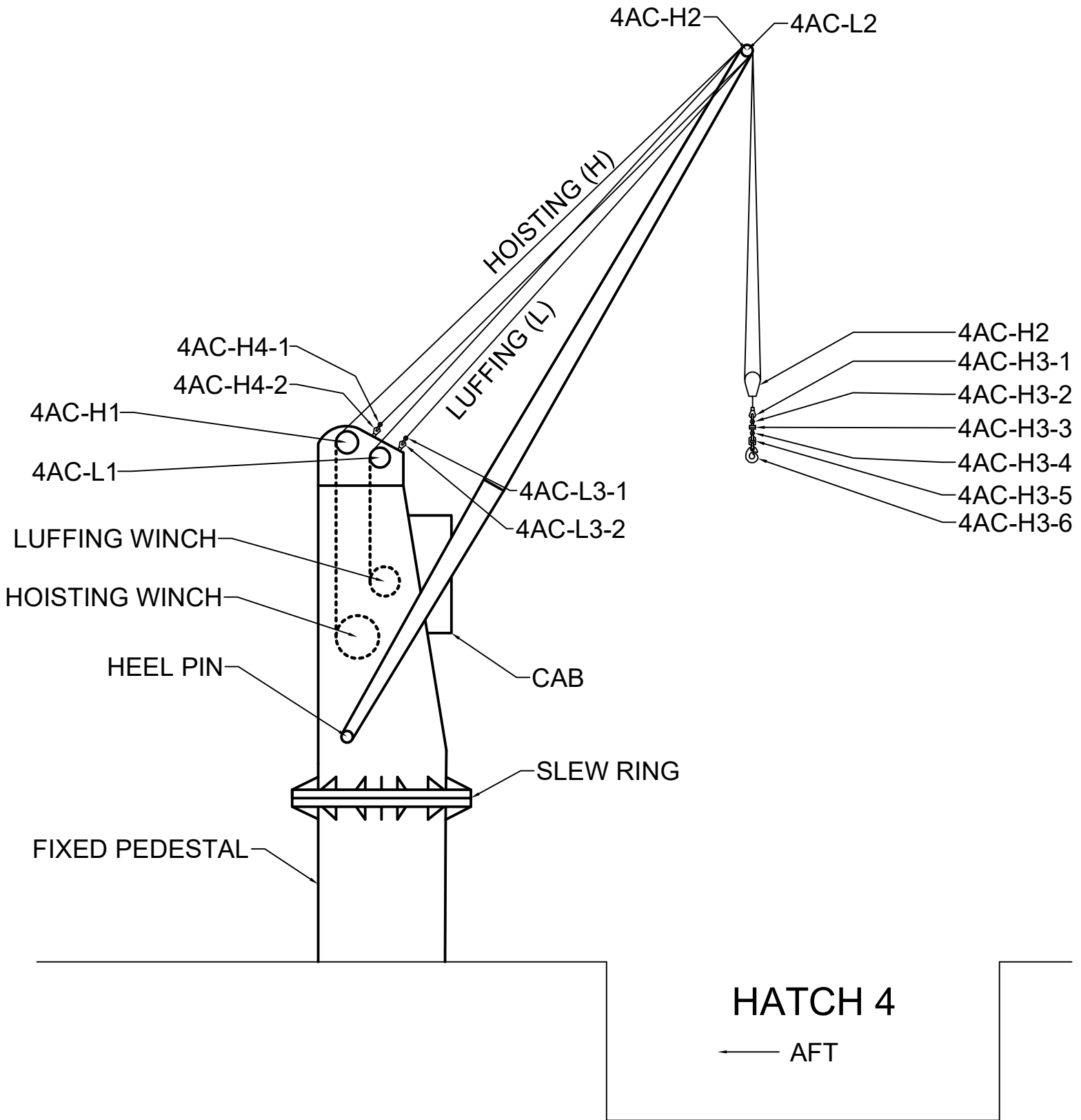


FIGURE 1
ICGB METHOD OF IDENTIFYING LOOSE GEAR

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3.3.3 Spare Loose Gear, Heavy Lift Beams, Spreaders, etc.

Such items may be marked as follows:

SWL _____ Tons (date)

ICGB (*Representative's initials*) – number*

** The number will be 1, 2, 3, 4, 5, etc., as per the individual ICGB Representative's record of loose gear certified in this manner.*

3.3.4 Relatively Small Articles

When extensive markings are not feasible, abbreviated separate and distinct markings would be employed for identification.

3.5 Other Methods of Identification

It is recognized that there are many other acceptable and recognized methods for identifying loose gear. The method offered herein is intended to provide the ICGB suggested and preferred method whereby each article is separately and individually identified in accordance with the requirements of prevailing Regulations, but is not intended to indicate any objection to other acceptable methods which may be preferred by other interested Agencies, Owners of cargo gear, etc.

3.6 Interchangeability and Replacement

While the ICGB method does not encourage interchanging of loose gear components from one crane to another, the ICGB method does not prohibit such interchanging when properly accomplished. Actually, using the location system for each article will facilitate proper and accurate recordkeeping for such interchanged or replacement articles, as illustrated by the following note:

(Note: As an example, take a four hatch ship with a similar pair of 5 ton cargo cranes at each hatch, varying in "boom ratio" (length of boom divided by effective mast height) from hatch to hatch, and assume that all loose gear is properly documented by test certificates, based upon associated maximum resultant loads, all loose gear is marked by the "location system" utilizing the ICGB method, and a complete set of ICGB loose gear certificates (listing all loose gear by associated boom sets) is in the Cargo Gear Register Book.)

- a. *If the top block at hatch #1 aft end, starboard, is replaced by a new or spare block, with a proper certificate of test and identical markings on the certificate as appears on the block (say WXYZ), then the new individual certificate may be attached to the ICGB loose gear certificate for hatch #1 aft end, and a notation as to the replacement block may be made on the ICGB certificate (i.e., block 1AS-TZ replaced by block WXYZ on date). A notation on the new individual certificate should also be made to indicate the location where the new or spare block has been placed into service. This process provides a direct method of recordkeeping, facilitates the comparison of SWL rating of the new and old block before actual replacement and enables one to locate readily the documentation for the replacement block (since the certificate would still be filed in accordance with the hatch location at which block WXYZ is being used.)*
- b. *In connection with a subsequent ICGB certification of the cargo gear at hatch #1 aft end, starboard, the block marked WXYZ could be remarked as 1AS-T1 and a new ICGB loose gear certificate could be issued for the set of gear at hatch #1 aft end. The new ICGB certificate would differ from the old certificate in that a*

Loose Gear Certification Guide

different date of test would presumably be listed for block 1AS-T1, and the new ICGB certificate would have a more current date of issue.

- c. If, for some reason, it was to be decided to interchange the topping blocks for the booms located at hatches #1 aft end, starboard, and #4 forward end, port, then notation could be made in the associated ICGB loose gear certificates that such an interchange was made.*
- d. In any event, and regardless of any interchanges or replacements, one could always either locate a certificate for an article sighted in the rigging, or find in the rigging any article referred to on a certificate.*
- e. Certificates for spare gear should be kept separately from the certificates for the gear in use.*

Section 4 **CERTIFICATION**

4.1 General

ICGB quadrennial, quinquennial, special unit test, or annual certificates do not routinely include specific certification of the associated individual articles of loose gear as required by separate prevailing Regulations regarding the testing and examination of loose gear prior to being taken into use. Typically, loose gear is inspected, certified, and proof load tested by the manufacturers of such gear.

4.1.1 Other than inspections of articles of loose gear which are accomplished in connection with initial, annual, or quadrennial certification of associated cargo gear units, specific ICGB certification of individual articles of loose gear may be obtained only if the Owner of such gear arranges to subject the gear to appropriate testing in the presence of an ICGB Representative, arranges to have the individual articles taken apart including the removal of pins and sheaves of blocks to the extent that the construction of such blocks permits so as to facilitate careful examination, and arranges to have each article suitably and separately marked for identification.

4.1.2 In lieu of accepting articles for such specific certification on the basis of tests witnessed, and careful examinations accomplished by ICGB Representatives, ICGB may acknowledge, by the issuing of related ICGB loose gear certificates, previous test data and examinations as documented by appropriate certificates issued by other recognized persons provided that such test data is in accordance with the schedules included in Table A.

4.1.2.1 When such previous loose gear test data is not in accordance with Table A, but is in accordance with other, different established requirements or standards of another recognized Authority, ICGB will give due consideration to verifying on associated documents issued the particular acceptability of such test data in order to clarify for interested National Authorities the standards to which such tests refer.

(Note: When subscribing companies decide to retain such different loose gear test data, due consideration should be given by the companies to the acceptability of such certifications by the various interested National Authorities of the various countries where the cargo gear is likely to be employed.)

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4.2 Confirmation of Loose Gear Marking

Loose gear certification for individual components may be verified by confirming markings or remarking from time to time as necessary although retesting of components is not normally required (*regardless of whether or not such components are transferred from one cargo unit to locations of no greater loading in another cargo unit*) unless significant repairs to or alterations of the components are made and/or unless current loose gear documentation is not evident and readily verified by existing certificates.

Loose gear marking and/or verification of loose gear markings is recommended and may be required by the attending ICGB Representative in connection with ICGB certifications in order to facilitate the verification of loose gear certification status and/or to confirm for future reference which components of cargo gear were utilized in an assembled unit at the time of ICGB certification.

4.3 Loose Gear Annual Inspection

Each component of loose gear in use in a cargo gear unit and spare gear which may be placed in service during intervals between regular certifications should be inspected (and heat treated if necessary) at least once each year in connection with Annual Certification requirements.

4.4 Special Certification

ICGB certifications of heat treatment for components of cargo gear which are required to be heat treated in accordance with prevailing Regulations and/or manufacturers' recommendations are available upon the supervised completion of required procedures.

4.5 Approval of Safe Working Load Ratings

Unless otherwise specifically provided for by associated ICGB documents, forms, diagrams, or correspondences, ICGB approval of safe working load ratings indicated for individual articles of loose gear on ICGB certificates is restricted to and assigned on the basis of manufacturers' recommendations or specifications and/or satisfactory associated proof test data.

4.6 Damaged or Excessively Worn Gear

Damaged or excessively worn gear should be repaired or replaced and recertified as appropriate prior to the continued use of such gear regardless of other current certification of such gear. When gear is damaged as an apparent result of proper prooftesting, such gear is to be repaired or replaced and subsequent proper prooftesting is to be satisfactorily completed without causing such damage before any associated certification may be issued.

**FORCE DIAGRAM
AND
CALCULATION GUIDE
FOR
PEDESTAL CRANES**

ICGB-203



INTERNATIONAL CARGO GEAR BUREAU, INC.

Prepared by: Martin & Ottaway 2023

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Force Diagram and Calculation Guide

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Force Diagram and Calculation Guide

Section 1 GENERAL

This publication has been prepared to explain the considerations for, and to provide a relatively simple method of determining safe working load (*SWL*) and proofload requirements for articles of loose gear and wire rope utilized in pedestal crane operations.

Reference to other ICGB publications concerning related certification standards and procedures is recommended. Reference to other standard and regulatory guides is suggested, including but not limited to the following:

- International Labour Organization – Register of Lifting Appliances and Items of Loose Gear
- American Bureau of Shipping – Guide for Certification of Cranes
- Bureau Veritas – Rules for the Classification and Certification of Lifting Appliances of Ships and Offshore Units
- American Petroleum Institute – Recommended Practice for Operation and Maintenance of Offshore Cranes, API RP 2D
- Federal regulations including, but not limited to the following:
 - Title 46 CFR Chapter I, Subchapter D, Part 31, Subpart 31.10-16
 - Title 29 CFR 1910 Subpart N & O; 1915 Subpart G; 1917.42; 1917.45-47

Force Diagram and Calculation Guide

Section 2 PROOFTESTING REQUIREMENTS

2.1 Basic Requirements

In connection with certification requirements, the prooftesting of cargo gear usually involves two distinct testing procedures:

- a) prooftesting of each article of loose gear, and
- b) prooftesting of the assembled unit.

Prooftests required in connection with the issuance of associated ICGB documents is defined in ICGB #201 and #202. Each article of loose gear is to be proof tested prior to being employed for cargo handling operations, typically by the manufacturers. Each assembled unit is also to be proof tested as a unit prior to initial usage and at least once in every four years for shoreside cranes and five years for shipboard cranes.

(Note: ICGB Quadrennial/Quinquennial Certification procedures require unit testing in addition to and in association with thorough examination and dismantling or disassembly of cargo gear, and it is emphasized that neither of the prooftesting procedures described above is a substitute for the other.)

2.2 Loose Gear Testing Requirements

Articles of loose gear to be utilized in a cargo handling unit should be selected after the rigging arrangement and SWL requirements have been determined. Certification standards usually require the individual prooftesting of each article prior to use for cargo handling purposes.

(Note: Individual testing is usually only required to be accomplished prior to initial use regardless of whether or not components are transferred from one cargo unit to locations of no greater loading in another cargo unit, and is usually conducted by the manufacturer.)

2.3 Unit Testing Requirements

Certification standards usually require the prooftesting of each unit after assembly with previously tested articles of loose gear and wire rope.

(Note: For all ICGB Quadrennial/Quinquennial Certifications, initial and subsequent, unit testing is required to be accomplished.)

Force Diagram and Calculation Guide

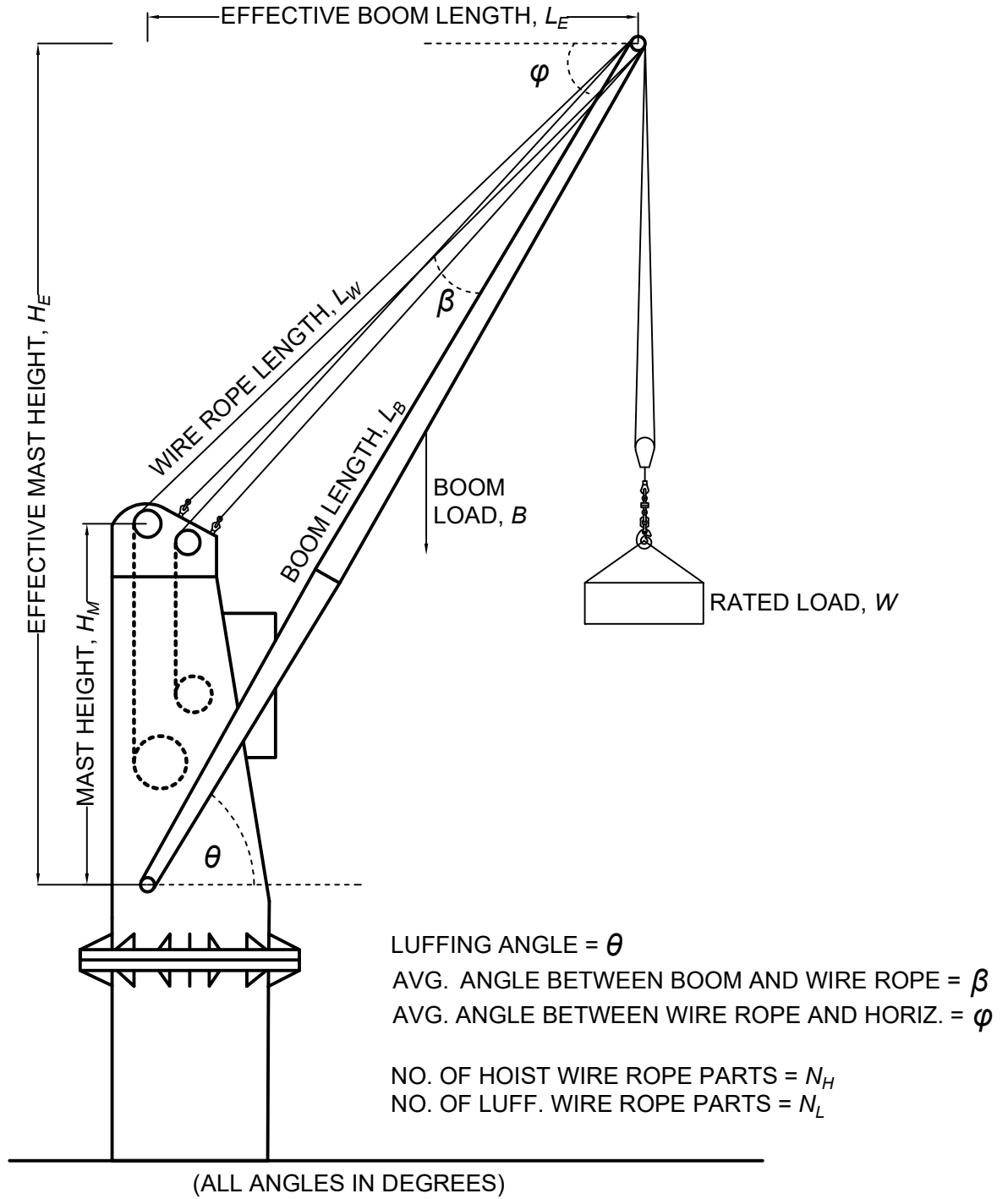


FIGURE 1
DESIGN FORCE DIAGRAM FOR
PEDESTAL CRANES

Force Diagram and Calculation Guide

Section 3 FORCE DIAGRAMS AND CALCULATIONS

3.1 General

The conventional method of cargo gear force analysis involves the use of an accurately constructed force diagram supplemented by technical calculations. For pedestal cranes, this is a complex analysis that is beyond the scope of this certification manual. However, provided herein is a diagram and guideline for items to keep in mind during the scope of the calculation. In general, though, the manufacturer of cargo gear is to provide actual criteria for line pull, breaking strength, safety factor, and safe working load, as well as other criteria as required.

3.2 Force Analysis Guideline

Figure 1 shows a conventional force analysis by use of a simplified force diagram where a theoretical load, W , is applied and the load of the boom and loose gear is included.

When calculating the design loads on a pedestal crane's hoisting and luffing wires, at least six main factors should be considered:

- 1) The arrangement of the cargo gear, including the number of blocks and the number of parts employed.
- 2) The hook load which may be taken as the total of the load and loose gear.
- 3) Geometry of the gear, including boom weight, boom length, and mast height.
- 4) The possible boom angles which may be expected while handling a hook load since changes in the boom angle will change the moment about the heel pin.
(Note: pedestal cranes will typically have an upper and lower limit that is not to be exceeded while lifting loads, and particularly during prooftesting.)
- 5) Friction at each sheave.
- 6) The speed at which the load is being lifted.

The variations in pedestal cranes are myriad. These variations include differences in boom capacities, rigging arrangements (*i.e., the number of parts in the luffing and hoisting arrangements*) boom lengths, effective mast heights, and design boom elevation angles; all of which significantly affect the force analysis calculation.

Again, it is noted, that the manufacturer of the pedestal crane and associated gear will typically provide breaking and yield strength criteria, including allowances for ship list or trim and boom side loads.