ASME B30.28-2010

Balance Lifting Units

Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

AN AMERICAN NATIONAL STANDARD

ASME
SETTING THE STANDARD

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Three Park Avenue • New York, NY • 10016 USA

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The next edition of this Standard is scheduled for publication in 2015. This Standard will become effective 1 year after the Date of Issuance. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued, and will also be published within the next edition of the Standard.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

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FOREWORD

This American National Standard, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings, has been developed under the procedures accredited by the American National Standards Institute (ANSI) (formerly the United States of America Standards Institute). This Standard had its beginning in December 1916 when an eight-page Code of Safety Standards for Cranes, prepared by an ASME Committee on the Protection of Industrial Workers, was presented to the annual meeting of the ASME.

Meetings and discussions regarding safety on cranes, derricks, and hoists were held from 1920 to 1925, involving the ASME Safety Code Correlating Committee, the Association of Iron and Steel Electrical Engineers, the American Museum of Safety, the American Engineering Standards Committee (later changed to American Standards Association and subsequently to the USA Standards Institute), Department of Labor — State of New Jersey, Department of Labor and Industry — State of Pennsylvania, and the Locomotive Crane Manufacturers Association. On June 11, 1925, the American Engineering Standards Committee approved the ASME Safety Code Correlating Committee's recommendation and authorized the project with the U.S. Department of the Navy, Bureau of Yards and Docks, and ASME as sponsors.

In March 1926, invitations were issued to 50 organizations to appoint representatives to a Sectional Committee. The call for organization of this Sectional Committee was sent out October 2, 1926, and the committee organized November 4, 1926, with 57 members representing 29 national organizations. The Safety Code for Cranes, Derricks, and Hoists, ASA B30.2-1943, was created from the eight-page document referred to in the first paragraph. This document was reaffirmed in 1952 and widely accepted as a safety standard.

Due to changes in design, advancement in techniques, and general interest of labor and industry in safety, the Sectional Committee, under the joint sponsorship of ASME and the Naval Facilities Engineering Command, U.S. Department of the Navy, was reorganized as an American National Standards Committee on January 31, 1962, with 39 members representing 27 national organizations. The format of the previous code was changed so that separate standards (each complete as to construction and installation; inspection, testing, and maintenance; and operation) will cover the different types of equipment included in the scope of B30.

In 1982, the Committee was reorganized as an Accredited Organization Committee, operating under procedures developed by the ASME and accredited by ANSI.

This Standard presents a coordinated set of rules that may serve as a guide to government and other regulatory bodies and municipal authorities responsible for the guarding and inspection of the equipment falling within its scope. The suggestions leading to accident prevention are given both as mandatory and advisory provisions; compliance with both types may be required by employers of their employees.

In case of practical difficulties, new developments, or unnecessary hardship, the administrative or regulatory authority may grant variances from the literal requirements or permit the use of other devices or methods, but only when it is clearly evident that an equivalent degree of protection is thereby secured. To secure uniform application and interpretation of this Standard, administrative or regulatory authorities are urged to consult the B30 Committee, in accordance with the format described in Section IX of the B30 Standard Introduction, before rendering decisions on disputed points.

Safety codes and standards are intended to enhance public safety. Revisions result from committee consideration of factors such as technological advances, new data, and changing environmental and industry needs. Revisions do not imply that previous editions were inadequate.

This is the first edition of this Volume, which was approved by the B30 Standards Committee and by ANSI, and designated as an American National Standard on August 3, 2010.

ASME B30 COMMITTEE
Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

(The following is the roster of the Committee at the time of approval of this Standard.)

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SAFETY STANDARD FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

B30 STANDARD INTRODUCTION

SECTION I: SCOPE

The ASME B30 Standard contains provisions that apply to the construction, installation, operation, inspection, testing, maintenance, and use of cranes and other lifting and material-handling related equipment. For the convenience of the reader, the Standard has been divided into separate volumes. Each volume has been written under the direction of the ASME B30 Standards Committee and has successfully completed a consensus approval process under the general auspices of the American National Standards Institute (ANSI).

As of the date of issuance of this Volume, the B30 Standard comprises the following volumes:

B30.1 Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries
B30.2 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
B30.3 Tower Cranes
B30.4 Portal and Pedestal Cranes
B30.5 Mobile and Locomotive Cranes
B30.6 Derricks
B30.7 Base-Mounted Drum Hoists
B30.8 Floating Cranes and Floating Derricks
B30.9 Slings
B30.10 Hooks
B30.11 Monorails and Underhung Cranes
B30.12 Handling Loads Suspended From Rotorcraft
B30.13 Storage/Retrieval (S/R) Machines and Associated Equipment
B30.14 Side Boom Tractors
B30.15 Mobile Hydraulic Cranes (withdrawn in 1982 — requirements found in latest revision of B30.5)
B30.16 Overhead Hoists (Underhung)
B30.17 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
B30.18 Stacker Cranes (Top or Under Running Bridge, Multiple Girder With Top or Under Running Trolley Hoist)
B30.19 Cableways
B30.20 Below-the-Hook Lifting Devices
B30.21 Manually Lever-Operated Hoists
B30.22 Articulating Boom Cranes
B30.23 Personnel Lifting Systems
B30.24 Container Cranes
B30.25 Scrap and Material Handlers
B30.26 Rigging Hardware
B30.27 Material Placement Systems
B30.28 Balance Lifting Units
B30.29 Self-Erect Tower Cranes[1]

SECTION II: SCOPE EXCLUSIONS

The B30 Standard does not apply to track and automotive jacks, railway or automobile wrecking cranes, shipboard cranes, shipboard cargo-handling equipment, well-drilling derricks, skip hoists, mine hoists, truck body hoists, car or barge pullers, conveyors, excavating equipment, or equipment covered under the scope of the following standards: A10, A17, A90, A92, A120, B20, B56, and B77.

SECTION III: PURPOSE

The B30 Standard is intended to

(a) prevent or minimize injury to workers, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements

(b) provide direction to manufacturers, owners, employers, users, and others concerned with, or responsible for, its application

(c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

SECTION IV: USE BY REGULATORY AGENCIES

These Volumes may be adopted in whole or in part for governmental or regulatory use. If adopted for governmental use, the references to other national codes and standards in the specific volumes may be changed to refer to the corresponding regulations of the governmental authorities.

[1] This Volume is currently in the development process.

SECTION V: EFFECTIVE DATE

(a) Effective Date. The effective date of this Volume of the B30 Standard shall be 1 yr after its date of issuance. Construction, installation, inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed after the effective date of this Volume shall conform to the mandatory requirements of this Volume.

(b) Existing Installations. Equipment manufactured and facilities constructed prior to the effective date of this Volume of the B30 Standard shall be subject to the inspection, testing, maintenance, and operation requirements of this Standard after the effective date.

It is not the intent of this Volume of the B30 Standard to require retrofitting of existing equipment. However, when an item is being modified, its performance requirements shall be reviewed relative to the requirements within the current volume. The need to meet the current requirements shall be evaluated by a qualified person selected by the owner (user). Recommended changes shall be made by the owner (user) within 1 yr.

SECTION VI: REQUIREMENTS AND RECOMMENDATIONS

Requirements of this Standard are characterized by use of the word *shall*. Recommendations of this Standard are characterized by the word *should*.

SECTION VII: USE OF MEASUREMENT UNITS

This Standard contains SI (metric) units as well as U.S. Customary units. The values stated in U.S. Customary units are to be regarded as the standard. The SI units are a direct (soft) conversion from the U.S Customary units.

SECTION VIII: REQUESTS FOR REVISION

The B30 Standards Committee will consider requests for revision of any of the volumes within the B30 Standard. Such requests should be directed to

Secretary, B30 Standards Committee
ASME Codes and Standards
Three Park Avenue
New York, NY 10016-5990

Requests should be in the following format:

Volume: Cite the designation and title of the volume.
Edition: Cite the applicable edition of the volume.
Subject: Cite the applicable paragraph number(s) and the relevant heading(s).
Request: Indicate the suggested revision.
Rationale: State the rationale for the suggested revision.

Upon receipt by the Secretary, the request will be forwarded to the relevant B30 Subcommittee for consideration and action. Correspondence will be provided to the requester defining the actions undertaken by the B30 Standards Committee.

SECTION IX: REQUESTS FOR INTERPRETATION

The B30 Standards Committee will render an interpretation of the provisions of the B30 Standard. Such requests should be directed to

Secretary, B30 Standards Committee
ASME Codes and Standards
Three Park Avenue
New York, NY 10016-5990

Requests should be in the following format:

Volume: Cite the designation and title of the volume.
Edition: Cite the applicable edition of the volume.
Subject: Cite the applicable paragraph number(s) and the relevant heading(s).
Question: Phrase the question as a request for an interpretation of a specific provision suitable for general understanding and use, not as a request for approval of a proprietary design or situation. Plans or drawings that explain the question may be submitted to clarify the question. However, they should not contain any proprietary names or information.

Upon receipt by the Secretary, the request will be forwarded to the relevant B30 Subcommittee for a draft response, which will then be subject to approval by the B30 Standards Committee prior to its formal issuance.

Interpretations to the B30 Standard will be published in the subsequent edition of the respective volume, and will be available online at http://cstools.asme.org.

SECTION X: ADDITIONAL GUIDANCE

The equipment covered by the B30 Standard is subject to hazards that cannot be abated by mechanical means, but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are competent, careful, physically and mentally qualified, and trained in the proper operation of the equipment and the handling of loads. Serious hazards include, but are not limited to, improper or inadequate maintenance, overloading, dropping or slipping of the load,

obstructing the free passage of the load, and using equipment for a purpose for which it was not intended or designed.

Operation and maintenance instructions in this safety standard are intended for general applications. The equipment manufacturer and/or installer shall be consulted for specific operating or maintenance instructions.

The B30 Standards Committee fully realizes the importance of proper design factors, minimum or maximum dimensions, and other limiting criteria of wire rope or chain and their fastenings, sheaves, sprockets, drums, and similar equipment covered by the standard, all of which are closely connected with safety. Sizes, strengths, and similar criteria are dependent on many different factors, often varying with the installation and uses. These factors depend on

(a) the condition of the equipment or material

(b) the loads

(c) the acceleration or speed of the ropes, chains, sheaves, sprockets, or drums

(d) the type of attachments

(e) the number, size, and arrangement of sheaves or other parts

(f) environmental conditions causing corrosion or wear

(g) many variables that must be considered in each individual case

The requirements and recommendations provided in the volumes must be interpreted accordingly, and judgment used in determining their application.

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BALANCE LIFTING UNITS

Chapter 28-0
Scope, Definitions, and References

SECTION 28-0.1: SCOPE OF ASME B30.28

Volume B30.28 includes provisions that apply to the marking, construction, installation, inspection, testing, maintenance, and operation of balance lifting units (balancers). Balancers are distinguished by their ability to float the load. This Volume applies to balancers with fixed arm support (Fig. 28-0.1-1) and balancers with overhead flexible lifting medium (Fig. 28-0.1-2). This Volume does not apply to balancers with autonomous operation or balancers used for lifting personnel, as these units require additional considerations, provisions, and features that are not included in this Volume.

SECTION 28-0.2: DEFINITIONS

abnormal operating conditions: environmental conditions that are unfavorable, harmful, or detrimental to or for the operation of balancers, such as excessively high or low ambient temperatures, exposure to adverse weather, corrosive fumes, dust-laden or moisture-laden atmospheres, and hazardous locations.

appointed: assigned specific responsibility by the employer or the employer's representative.

balancer: a balance lifting unit capable of moving loads within the rated capacity and with the capability to float the load.

balancer service, heavy: service that involves operation within the rated load limit, which exceeds normal service.

balancer service, normal: service that involves operation with loads at or less than 65% of rated load for not more than 50% of the time.

balancer service, severe: service that involves normal or heavy service with abnormal operating conditions.

balancer, standby: balancers that are not in regular service but are used occasionally or intermittently, as required.

clearance: the distance from any part of the balancer to the nearest obstruction.

designated person: a person selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

end effector: a feature, device, method, or components for connecting the load to a balancer. Also may be referred to as "receiver" or "below the hook lifting devices" (see ASME B30.20).

exposed: applies to hazardous objects not guarded or isolated (capable of being contacted inadvertently).

float the load: the ability to move the load up or down, without inputs to the operational controls, by applying a force to the load of less than 5% of the load.

hazardous (classified) locations: locations where fire or explosion hazards may exist. Locations are classified depending on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Refer to NFPA 70.

Class I locations: locations in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

Class II locations: locations that are hazardous because of the presence of combustible dust.

Class III locations: locations that are hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.

lifting medium: the balancer component that supports and moves the load up and down and determines the type of balancer.

load: the total superimposed weight on the balancer including any end effector devices attached to the balancer.

load, rated: the maximum load designated by the manufacturer for which the balancer is designed and built.

manual valves: a valve for which a manual actuator is the only means of valve actuation.

normal operating conditions: conditions during which balancers are performing functions within the scope of the original design.

overload: any load greater than the rated load.

qualified person: a person who, by possession of a recognized degree or certificate of professional standing, or

who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

rope: refers to wire rope unless otherwise specified.

safety device: a feature placed in use for the specific purpose of preventing an unsafe condition and designated as such by the manufacturer.

sheave: a grooved wheel or pulley used with a rope to change the direction and point of application of a pulling force.

stop: a device to limit travel. This device is normally attached to a fixed structure and does not have energy-absorbing ability.

switch: a device for making, breaking, or changing the connections in an electric, hydraulic, or pneumatic circuit.

switch, emergency stop: a manually actuated switch to disconnect power independently of the regular operating controls.

unattended: a condition in which the operator of the balancer is not at the operating control device. However, if the operating control devices are within sight of the operator and within a distance equal to the span of the balancer, the balancer should be considered attended.

SECTION 28-0.3: REFERENCES

The following is a list of publications referenced in this Volume:

ANSI/ASSE Z244.1-2003 (R2008), Control of Hazardouc Energy — Lockout/Tagout and Alternative Methods

Publisher: The American Society of Safety Engineers (ASSE), 1800 East Oakton Street, Des Plaines, IL 60018 (www.asse.org)

ANSI Z535.4-2007, Product Safety Signs and Labels

Publisher: National Electrical Manufacturers Association (NEMA), 1300 North 17th Street, Rosslyn, VA 22209 (www.nema.org)

ASME B30.10-2005, Hooks
ASME B30.20-2006, Below-the-Hook Lifting Devices

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

NFPA 70-2008, National Electrical Code

Publisher: National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169 (www.nfpa.org)

Fig. 28-0.1-1 Fixed Arm

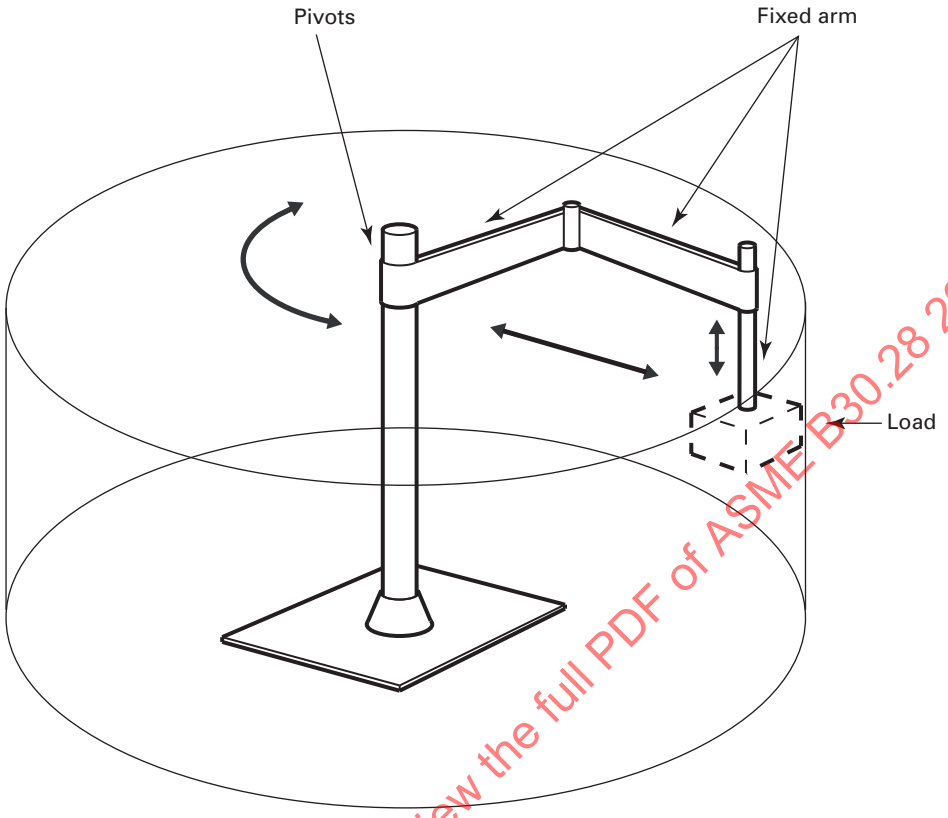
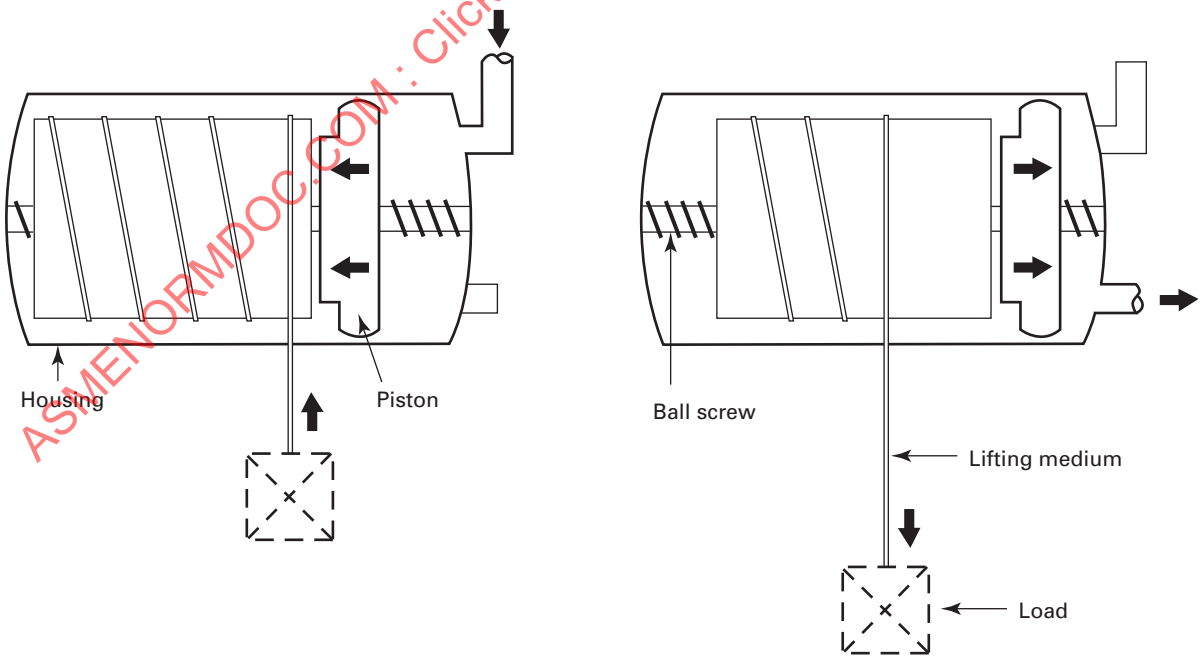


Fig. 28-0.1-2 Flexible Lifting Medium



Chapter 28-1
Marking, Construction, and Installation

SECTION 28-1.1: MARKINGS

28-1.1.1 Rated Load

The rated load of the balancer shall be marked on the unit or its attachment and shall be legible from the operating position.

28-1.1.2 Controls

Control actuators shall be marked to indicate the direction of resultant motion.

28-1.1.3 Identification

The following information shall be legibly marked on a durable identification plate or label on the balancer:

(a) name of manufacturer
(b) year of manufacture
(c) manufacturer's serial number
(d) type or model number
(e) maximum rated load
(f) maximum design working pressure, if applicable
(g) electrical requirements, if applicable (voltage, frequency, amperage draw)

28-1.1.4 Warnings

(a) Safety signs should be designed according to the relevant requirements of ANSI Z535.4.

(b) Balancers shall have information displayed on the balancer and included in operating manuals concerning operating procedures. This information shall include cautionary language against

(1) lifting more than the stated rated load

(2) operating the balancer when the load is not secure or properly attached

(3) operating the balancer with twisted, kinked, or damaged lifting medium

(4) operating a damaged or malfunctioning balancer

(5) lifting people

(6) lifting loads over people

(7) removing or obscuring warning or information labels

(c) A label shall be affixed on all electrical control enclosures. The label shall be in compliance with ANSI Z535.4 and include, but not be limited to, information such as the following:

(1) Disconnect power and lockout/tagout disconnecting means before removing cover or servicing this equipment.

(2) Do not operate without cover in place.

SECTION 28-1.2: CONSTRUCTION

28-1.2.1 Mechanical Design

(a) Balancers shall be designed to withstand all stresses imposed under normal operating conditions while handling loads within the stated rated load capacity.

(b) Load suspension parts shall be designed so that the static stress calculated for rated load shall not exceed 20% of the ultimate tensile strength of the material used.

(c) Power transmission parts shall be designed so that the dynamic stresses calculated for the rated load shall not exceed the endurance limits established by the manufacturer.

(d) Modifications to re-rate or modernize the balancers shall only be as authorized in writing by the original equipment manufacturer or qualified person.

28-1.2.2 Electric Design (Electrically Powered Balancers)

(a) Electrical construction shall comply with relevant sections of Article 610 of NFPA 70.

(b) Electrical components shall be located and enclosed so that energized parts will not be exposed to contact under normal operating conditions.

(c) Electrically powered balancers shall have a power on–off switch mounted on the balancer at or near the power inlet cable.

(d) Electrically powered balancers shall have an emergency stop switch on the operator control.

28-1.2.3 Ropes

(a) Hoisting rope (if used) shall be of a construction as recommended by the balancer manufacturer for the balancer service.

(b) The rated load divided by the number of parts (lines) of rope shall not exceed 20% of the minimum breaking strength of the rope.

(c) Special considerations must be taken when rope may be exposed to environmental conditions under which the rope could be damaged (e.g., corrosion or weld splatter).

(d) Socketing shall be done in a manner recommended by the rope or fitting manufacturer or a qualified person.

(e) The rope ends shall be attached to the balancer in a manner to prevent disengagement throughout rated hook travel.

(f) Eye splices shall be made in a manner as recommended by the balancer manufacturer or qualified person.

28-1.2.4 Load Chain

(a) Load chain shall be pitched (calibrated) so as to pass over all sprockets without binding.

(b) The load chain shall be proof tested by the chain or balancer manufacturer, with a load at least equivalent to 1.5 times the balancer's rated load divided by the number of chain parts supporting the load.

28-1.2.5 Hooks

(a) Hooks, if used, should be articulating or of the swiveling type at the top support of the balancer.

(b) Hooks used at the bottom of the balancer shall be of the swiveling type and shall rotate freely.

(c) Hooks shall be equipped with latches unless use of the latch creates a hazardous condition. When required, a latch shall be provided to bridge the opening of the hook and retain, under slack conditions, lifting devices such as, but not limited to, slings, chains, and eye pads. Refer to ASME B30.10, Hooks.

28-1.2.6 Ergonomics

Control panels, manual overrides, component access doors, and covers shall be located to provide suitable access.

28-1.2.7 Lubrication

If lubrication is required, accessible means for lubrication shall be provided and proper instructions documented in the operations manual as to the frequency, type, and location of lubrication to be applied.

28-1.2.8 Controls

(a) Balancers shall have provisions that will prevent uncontrolled upward movement in the event of a loss of load or failure of the lifting medium.

(b) If there are duplicate controls, they should be interlocked and the same operation shall be performed by each set of control function (e.g., up, down, start, close, open).

(c) The control devices shall return to the neutral position when released.

(d) Manual control valves shall be marked to indicate direction or function of operation.

(e) The control station shall be supported in a manner that will protect the power-source conductors against strain.

(f) Any control station that might present a hazard to the operator if a ground fault occurs shall be grounded.

28-1.2.9 Loss of Power

Interruption of power to balancers shall not cause a hazardous situation such as loss of control, unintended movement, and unintended direction of travel.

28-1.2.10 Manuals

The manufacturer shall furnish a manual with each balancer that shall include information on the following:

(a) hazards

(b) warnings that indicate the consequences of not adhering to the warning and methods to avoid the hazards

(c) installation

(d) operation

(e) inspection

(f) testing

(g) lubrication

(h) maintenance

(i) parts

(j) control diagram (may be supplied separately)

SECTION 28-1.3: INSTALLATION

28-1.3.1 Procedure

(a) Procedure for balancer installation as recommended by the manufacturer shall be followed.

(b) When balancers are suspended from a trolley, monorail, or bridge and the rated capacity of any of these components is different from that of the balancers, the rated load of the system shall be based on the lowest minimum rated load of any individual component within the system.

28-1.3.2 Support

The supporting structure of the balancers, including trolleys, monorails, crane, or floor supports, shall be designed to withstand the loads and forces imposed by the balancers when operated at their rated load.

28-1.3.3 Location

(a) Balancers shall be installed in locations that will allow sufficient space for the operator to stay clear of the balancer's load and provide clearances to preclude the operator from being entrapped by the balancer or its load.

(b) Balancers shall not be installed in a hazardous location unless approved by the manufacturer.

28-1.3.4 Installation Inspection

After installation, an inspection shall be made as defined in para. 28-2.1.2.

28-1.3.5 Power Connections

(a) Electrically powered balancers shall be connected in accordance with the relevant sections of NFPA 70.

(b) Air-powered balancers shall be connected to an air supply providing air at a pressure not exceeding the pressure recommended by the balancer's manufacturer.

(c) Electrical equipment shall be protected from exposure to environmental and physical damage. Fixtures, wiring, and connections used in the installation of the balancers shall be suitable for the location installed.

28-1.3.6 Personnel

Personnel responsible for the installation of the balancers shall be familiar with the applicable contents of the manual furnished with the balancers.

Chapter 28-2
Inspection, Testing, and Maintenance

SECTION 28-2.1: INSPECTION

28-2.1.1 Inspection Classifications

(a) Initial Inspection. Prior to initial use, all new, repaired, or altered balancers shall be inspected by a designated person to verify compliance with the applicable provisions of this Volume.

(b) The inspection procedure for balancers in regular service is divided into two general classifications based upon the intervals at which the inspections should be performed. The intervals, in turn, are dependent upon the nature of the critical components of the balancers and the degree of their exposure to wear, malfunction, or deterioration. The two general classifications are designated as "frequent" and "periodic" with respective intervals between inspections as defined below.

(1) Frequent Inspection. Examinations by the operator or other designated person with written records not required.

(a) normal service — monthly
(b) heavy service — weekly to monthly
(c) severe service — daily to weekly

(2) Periodic Inspection. Examinations by a designated person who makes records of external conditions to provide the basis for a continuing evaluation.

(a) normal service — yearly
(b) heavy service — semi-annually
(c) severe service — quarterly

(c) Personnel responsible for the inspection of the balancers shall be familiar with the applicable contents of the manual furnished with the balancers.

28-2.1.2 Frequent Inspection

(a) Frequent inspections shall be performed at intervals defined in para. 28-2.1.1(b)(1) and shall include observations during operation.

(b) A qualified person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required.

(c) The following items shall be inspected:

(1) operating mechanisms for proper marking, operation, proper adjustment, and unusual sounds

(2) lines, valves, and other parts of air systems for leakage

(3) hooks in accordance with ASME B30.10, "Frequent Inspection"

(4) hook latches, if used, for proper operation

(5) balancer rope in accordance with para. 28-2.1.4.1(a)

(6) balancer load chain in accordance with para. 28-2.1.5.1(c)

(7) hoses for wear, severe abrasion, and cracking

(8) electrical cables for wear, abrasion, or cracking

(9) general corrosion

(10) fixed arms and pins for visible wear, damage, and missing hardware

(11) rope or load chain reeving for compliance with recommendations of the balancer manufacturer

28-2.1.3 Periodic Inspections

(a) Periodic inspections shall be performed at intervals defined in para. 28-2.1.1(b)(2) and may be performed with the balancer at its normal location, and do not require the balancer to be disassembled.

(b) Covers and other items normally supplied to allow inspection of components should be opened or removed.

(c) A qualified person shall determine whether conditions found during inspection constitute a hazard and whether disassembly is required.

(d) The periodic inspection shall include the following items, as applicable:

(1) the items listed in para. 28-2.1.2

(2) fasteners for evidence of loosening

(3) mounting attachments for evidence of missing items

(4) supporting structure or trolley, if used, for evidence of damage or damaging corrosion

(5) hook-retaining nuts or collars and pins used to secure the retaining members for evidence of damage

(6) load sprockets, idler sprockets, drums, and sheaves for evidence of damage and wear

(7) the brake mechanism for proper function [see para. 28-1.2.8(a)]

(8) arms, links, and rotating pivots for proper operation and any deformation

(9) pneumatic lines and fittings for leaks or wear

(a) leaks at joints between sections
(b) shaft seal leaks
(c) unusual noises or vibration
(d) loss of operating speed
(e) loss of pressure

(10) pneumatic valves

(a) cracks in valve housing

(b) improper return of spool to the neutral position

(c) leaks at the spools or joints

(d) sticking spools

(e) relief valves for correct pressure setting and operation, if applicable

(11) pneumatic cylinders

(a) drifting of load caused by piston leakage

(b) rod seal leakage

(c) leaks at welded joints

(d) scored, nicked, or dented cylinder rods

(e) dented case or barrel

(f) loose or deformed rod eyes or connecting joints and stops

(12) balancers' wire-rope end connections or load chains for evidence of wear, corrosion, cracks, damage, and distortion

(13) operational and safety labels for existence and legibility

(14) electrical apparatus for evidences of pitting or deterioration of controller components

28-2.1.4 Rope Inspection and Replacement

28-2.1.4.1 Rope Inspection

(a) *Frequent Inspection*

(1) The operator or other designated person should visually inspect all ropes at the start of each shift. These visual observations should be concerned with discovering gross damage, such as the following, which may be an immediate hazard:

(a) distortion of the rope such as kinking, crushing, bird caging, main-strand displacement, or core protrusion

(b) general corrosion

(c) broken or cut strands

(d) number, distribution, and type of visible broken wires. [See paras. 28-2.1.4.2(b)(1), (2), and (3) for further guidance.]

(2) When such damage is discovered, the rope shall either be removed from service or given an inspection as detailed in para. 28-2.1.4.1(b).

(b) *Periodic Inspection*

(1) The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations; severity of environment; percentage of capacity lifts; frequency rates of operation; and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life.

(2) Periodic inspections shall be performed by a designated person. This inspection shall cover the entire length of rope. The individual outer wires in the strands of the rope shall be visible to this person during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, shall be noted, and determination shall be made as to whether further use of the rope would constitute a hazard.

(a) points listed in para. 28-2.1.4.1(a)

(b) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires

(c) severely corroded or broken wires at end connections

(d) severely corroded, cracked, bent, worn, or improperly applied end connections

(3) Special care should be taken when inspecting sections of rapid deterioration, such as the following:

(a) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited

(b) sections of the rope at or near terminal ends where corroded or broken wires may protrude

(c) sections subject to reverse bends

(d) sections of rope that are normally hidden during visual inspection, such as parts passing over sheaves

28-2.1.4.2 Rope Replacement

(a) No precise rules can be given for determination of the exact time for rope replacement, since many variable factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgment of a qualified person. The rope shall be replaced prior to the equipment being used by the next work shift.

(b) Removal criteria for the rope replacement shall be as follows:

(1) in running ropes, 12 randomly distributed broken wires in six rope diameters or 4 broken wires in one strand in six rope diameters, except as noted in para. 28-2.1.4.2(b)(2)

(2) in rotation-resistant ropes, two randomly distributed broken wires in 6 rope diameters or four randomly distributed broken wires in 30 rope diameters

(3) one outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops out from the rope structure

(4) kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure

(5) evidence of heat damage from any cause

(6) reductions from nominal diameter greater than 5% of the original manufacturer's installed nominal cable diameter

(c) Broken-wire removal criteria, in this Volume, apply to wire ropes operating on drums regardless of sheave material. The user shall contact the balancer manufacturer or qualified person for additional broken-wire removal criteria that is required for the manufacturer's product.

(d) Attention shall be given to end connections. Upon development of two broken wires adjacent to a socketed

end connection, the rope should be replaced. Resocketing shall not be attempted if the resulting rope length will be insufficient for proper operation.

(e) Replacement rope and connections shall have a strength rating at least as great as the original rope and connections furnished by the balancer manufacturer. Any deviation from the original size, grade, or construction shall be specified by a rope manufacturer, the balancer manufacturer, or a qualified person.

28-2.1.5 Welded Link Chain Inspection and Replacement

28-2.1.5.1 Welded Link Chain Inspection

(a) Test the balancer under load in lifting and lowering directions and observe the operation of the chain and sprockets. The chain should feed smoothly into and away from the sprockets.

(b) If the chain binds, jumps, or is noisy, first see that it is clean and properly lubricated. If the trouble persists, inspect the chain and mating parts for wear, distortion, or other damage.

(c) Examine visually for gouges, nicks, weld spatter, corrosion, and distorted links. Slacken the chain and move the adjacent links to one side to inspect for wear at the contact points. If wear is observed or if stretching is suspected, the chain should be measured as outlined in the balancer manufacturer's manual. If instructions are not available, proceed as follows:

(1) Select an unworn, unstretched length of the chain (e.g., at the slack end), suspend the chain vertically under tension, and using a caliper-type gauge, measure the outside length of any convenient number of links approximately 12 in. (305 mm) to 24 in. (610 mm) overall.

(2) Measure the same number of links in the used sections and calculate the percentage increase in length.

28-2.1.5.2 Welded Link Chain Replacement

(a) If the used chain pitch exceeds the balancer manufacturer's recommended length (or in the absence of such recommendation, if the used chain pitch is 1½% longer than the unused chain), replace the chain. Repairing of load chain is not permitted; the chain shall be replaced.

(b) The existence of gouges, nicks, corrosion, weld spatter, or distorted links is sufficient reason to question chain safety and consider chain replacement. Safety in this respect depends largely upon the use of good judgment by a designated person in evaluating the degree of deficiency.

(c) Replacement chain shall be the same size, grade, and construction as the original chain furnished by the balancer manufacturer, unless otherwise recommended by the balancer manufacturer or a qualified person due to actual working conditions.

(d) Load chain links that pass over the balancer load sprocket on edge (alternate to those that lie flat in the pockets) shall be installed (if recommended by the balancer manufacturer) with the welds away from the center of the sprocket. This precaution is not required on idler sprockets that change the direction but not the tension in the chain.

(e) The chain shall be installed without any twist between the balancer and an anchored end on either the loaded side or slack side.

(f) When chain is replaced, disassemble and inspect the mating parts (sprockets, guides, stripper) for wear and replace if necessary.

(g) Discarded load chains shall not be used for slings.

28-2.1.6 Balancers Not in Regular Use

(a) Balancers that are used infrequently or on standby service, which have been idle for a period of 1 mo or more, but less than 1 yr, shall be inspected before being placed in service, in accordance with the requirements listed in para. 28-2.1.2, Frequent Inspection.

(b) Balancers that are used infrequently, which have been idle for a period of 1 yr or more, shall be inspected before being placed in service in accordance with the requirements listed in para. 28-2.1.3, Periodic Inspection.

28-2.1.7 Inspection Records

(a) Dated inspection reports and records shall be maintained for inspections performed as specified in para. 28-2.1.1(b)(2). Records should be stored where they are available to appointed persons.

(b) A long-range inspection program for rope, chain, or both should be established and should include records on examination of ropes or chains removed from service so a relationship can be established between visual observation and actual condition of the rope or chain.

SECTION 28-2.2: TESTING

28-2.2.1 Manufacturer Testing

All newly manufactured balancers shall be tested by the manufacturer after final assembly to verify

(a) proper operation of all safety devices
(b) proper operation of all controls
(c) no unusual vibrations or noise
(d) no fluid leaks
(e) rated load

SECTION 28-2.3: MAINTENANCE

28-2.3.1 Preventive Maintenance

(a) The manufacturer shall provide a recommended preventive maintenance schedule to minimize the possibility of mechanical failures and excessive and unnecessary wear.

(b) A preventive maintenance program based on the balancer manufacturer's recommendations shall be

established for balancers in operation. Dated records of maintenance performed shall be maintained.

(c) Under severe conditions, or if excessive wear is noted, scheduled intervals shall be adjusted to prevent breakdowns and excessive wear.

28-2.3.2 Maintenance Procedures

(a) Maintenance shall be performed by a designated person.

(b) Maintenance shall be performed in accordance with the manufacturer's recommended procedures and the designated maintenance personnel shall be familiar with the applicable contents of the manual(s) supplied by the manufacturer.

(c) A lockout/tagout policy and procedure shall be developed, documented, and implemented by the owner or user of the balancer lifting system. The lockout/tagout policy and procedure shall comply with the requirements of ANSI/ASSE Z244.1.

(d) The policy shall give consideration to the following areas:

(1) balancer-system power-disconnection means

(2) work to be performed on the balancer

(e) All guards shall be reinstalled, all safety devices reactivated, and maintenance equipment removed after maintenance is performed.

28-2.3.3 Adjustments and Repairs

(a) Replacement parts shall meet or exceed the manufacturer's specifications.

(b) Missing or unreadable operational labels and safety signs shall be replaced.

(c) Any hazardous conditions disclosed by the inspection requirements of Section 28-2.1 shall be corrected before operation of the balancer is resumed.

(d) Balancers in which load-suspension parts have been altered, replaced, or repaired shall be tested for proper operation before being returned to service after the maintenance or repair.

28-2.3.4 Lubrication

(a) Lubrication should be performed according to the manufacturer's recommendations and procedures.

(b) Delivery of lubricant to intended point shall be verified.

(c) Machinery shall not be in operation while lubricants are being applied, unless equipped for automatic or remote lubrication, or unless the lubrication point specifically requires movement for the lubricating procedure.