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USA Standard

Safety Requirements for Material Hoists

American National Standard

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ANSI, 1430 Broadway, New York, N. Y. 10018

A10.5-1969

USA Standard Safety Code
for Building Construction

American National Standards on Safety Requirements for Construction

- A10.3-1972** Powder Actuated Fastening Systems, Safety Requirements for
- A10.4-1973** *Personnel Hoists, Safety Requirements for
- A10.5-1969** *Material Hoists, Safety Requirements for
- A10.6-1969** *Demolition, Safety Requirements for
- A10.7-1970** *Transportation, Storage, Handling, and Use of Commercial Explosives and Blasting Agents in the Construction Industry, Safety Requirements for
- A10.8-1969** *Scaffolding, Safety Requirements for
- A10.9-1970** Concrete Construction and Masonry Work, Safety Requirements for
- A10.10-1970** *Temporary and Portable Space Heating Devices and Equipment Used in the Construction Industry, Safety Requirements for
- A10.11-1971** Safety Nets, Minimum Requirements for
- A10.13-1972** Steel Erection, Safety Requirements for

*Partial revision of American National Standard Safety Code for Building Construction, A10.2-1944.

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**USAS
A10.5-1969**

**USA Standard
Safety Requirements for
Material Hoists**

**Sponsor
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**Approved April 30, 1969
United States of America Standards Institute**

USA Standard

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Foreword

(This Foreword is not part of USA Standard Safety Requirements for Material Hoists, A10.5-1969.)

The existing USA Safety Code for Building Construction, A10.2-1944, covers a broad field and many separate considerations. It was decided that, as each part was revised, it would be written as a separate USA Standard. The present standard is one of the new A10 series of standards on safety in building construction, which was duly initiated November 7, 1958, with the National Safety Council as sponsor.

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the USA Standards Institute.

The USA Standards Committee for Safety in the Construction Industry, A10, had the following personnel when this standard was approved:

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USA Standard

Safety Requirements for Material Hoists

1. Scope

This Standard applies to material hoists installed on the inside or the outside of buildings during construction, alteration, or demolition, and used to raise or lower construction materials. It is not applicable to the temporary use of permanently installed personnel elevators as material hoists.

2. Purpose

Designed to provide reasonable safety for life, limb, and property for those engaged in occupations requiring the use of material hoists, the requirements of the standard are minimum for that purpose.

3. Exceptions

3.1 In cases of practical difficulties, unnecessary hardships, or new developments, exceptions to the literal requirements may be granted by the enforcing authority to permit the use of other devices or methods, but only when it is clearly indicated that equivalent protection is thereby secured.

3.2 Workmen's hoists shall be required to conform to USA Standard Safety Requirements for Workmen's Hoists A10.4-1963, its latest revision, or both.

4. References to Other Codes

This code is supplemented by the following codes:

(1) USA Standard Safety Requirements for Floor and Wall Openings, Railings, and Toe Boards, A12.1-1967.

(2) National Electrical Code, C1-1965 (NFPA No. 70-1965).

(3) USA Standard Safety Code for Head, Eye, and Respiratory Protection, Z2.1-1959.

(4) USA Standard Installation of Portable Fire Extinguishers, Z112.1-1966 (NFPA No. 10-1966)

5. Definitions and Interpretations

Approved. Accepted as satisfactory by a duly constituted administrative or regulatory authority.

Cage. The load-carrying unit, consisting of a platform and enclosure, and including a top as well as walls.

Cantilevered Hoist Tower. A hoist tower in which the platform, cage, or bucket travels on guide rails that are generally an integral part of the vertical tower member(s) and in a vertical plane, outboard from the tower member.

Equivalent. An alternate design, feature, device, or protective action which provides an equal degree of safety.

Hoistway. A shaftway for the travel of one or more platforms, cages, or buckets. It includes the pit and terminates at the underside of the beam at the top of the tower or structure.

Inside Hoists. Hoistways contained entirely within the building being served, which sometimes use the building structure itself for the support of the top beams, guide rails, and appurtenant parts necessary for the proper functioning of the platform.

Load. The total superimposed weight on the hoist platform or bucket.

Platform. The load-carrying unit, including the frame, which directly supports the load.

Rated Load. The maximum load for which the material hoist is designed and built by the manufacturer and which is shown on the equipment name plate(s).

Rated Speed. The speed at which the platform, cage, or bucket is designed to operate in the up direction with a rated load in or on the load-carrying unit.

Rope. Refers to wire rope only.

Shall or Should. The word "shall" is to be understood as mandatory, while the word "should" is advisory.

Tower. The primary structure which forms the hoistway for the travel of the platform, cage, or bucket, and which provides the support for the top beams, guide rails, and other appurtenant parts necessary for the operation of such units.

6. Requirements for Hoisting Towers

6.1 Material hoist towers shall be constructed of strong, sound, timber, structural steel, steel pipe, wrought iron, or other structural metal.

6.2 Before the hoist is placed in service, all parts of the tower, cage, bucket, platform, hoisting machine, and other equipment shall be thoroughly inspected and, when applicable, approved for use by a person designated by the enforcing authority having jurisdiction.

6.3 All sheaves, guy ties, bolt connections, miscellaneous clamps, braces, and similar parts shall be regularly inspected after the installation is initially placed in operation, and at least once each month thereafter. All broken, defective, and worn parts shall be replaced or repaired.

6.4 Hoist-operating rules shall be established and posted in conspicuous locations adjacent to the hoist and the structure it serves. The operating rules shall include the following:

- (1) A Signal System
- (2) Provision for authorized riding on the hoist platform for the purpose of inspection and servicing *only*.
- (3) Acceptable safe procedures for loading and unloading cages, platforms, and buckets.
- (4) Operating procedures including allowable line speed for various loads.

6.5 All material hoist towers shall be designed by licensed professional engineers.

7. Foundations

7.1 Hoist-tower foundations shall be constructed to safely support the intended tower live and dead loads, and shall not exceed the safe bearing capacity of the ground or floor upon which they rest.

8. Erection

8.1 Personnel engaged in the erection, maintenance, and dismantling of a material hoist shall be provided with and required to use such appropriate personal protective devices as set forth in USA Standard Safety Code for Head, Eye, and Respiratory Protection, Z2.1-1959.

8.2 Hoist towers shall be vertically straight.

8.3 Hoist towers shall be electrically grounded.

8.4 The guide rails of hoists shall be of steel or sound, hard, wood securely fastened, and shall deflect no more than $\frac{1}{4}$ inch under normal operation.

8.5 Hoist towers may be used with or without an enclosure on all sides. However, whichever alternate is chosen, the following conditions applicable to either, must be met:

(1) When a hoist tower is enclosed it shall be enclosed on all sides for its entire height with a wire-screen enclosure of not less than No. 18 U. S. gage wire or equivalent material, with openings not exceeding $\frac{1}{2}$ -inch mesh, securely fastened to the tower structure, with openings formed onto each landing.

(2) When a hoist tower is *not* enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides, including the roof, for the full height between the floor and the cage top. The walls of the cage shall be constructed of $\frac{1}{2}$ -inch mesh of No. 14 U. S. gage wire or equivalent. The hoist-platform enclosure shall include the required gates for loading and unloading.

8.6 All entrances to hoistways shall be protected by substantial gates or bars which shall guard the full width of the landing entrance.

(1) Gates shall be not less than 66 inches in height and located not more than 4 inches from the hoistway line with a maximum under-clearance of 2 inches. Gates of grille or lattice or other open work shall have openings of not more than 2 inches.

(2) Bars shall be not less than 2 by 4-inch wooden bars or the equivalent, located 2 feet from the hoistway line. Bars shall be located not less than 36 inches nor more than 42 inches above the floor.

(3) Gates or bars protecting the entrances to hoistway shall be equipped with a latching device. Material hoists serving structures over 70 feet in height, or where the hoist landing platforms are not clearly visible to the hoist operator, shall be equipped with a telephone system or an electrical system or both, to assure that all gates or bars are closed before the hoist platform can be moved.

Table 1
Minimum Sizes of Various Members in Wooden Towers

Platform or Bucket Capacity (Pounds) (Cubic Yards)	Height from Top Down (Feet)	Post Sizes (Inches)	Guide S 4 S Sizes (Inches)	Horizontal Tie Sizes (Inches)	Diagonal Brace Sizes (Inches)	Maximum Tie Spacing (Inches)
To 500 or	Top to 72	4 by 4	2½ by 3½	1 by 6	1 by 6	6
500 or	72 to 198	4 by 6	2½ by 3½	2 by 6	1 by 8	6
1000 or ¼	Top to 72	4 by 4	3½ by 3½	1 by 6	1 by 6	6
1000 or ¼	72 to 126	4 by 6	3½ by 3½	2 by 6	1 by 8	6
1000 or ¼	126 to 198	6 by 6	3½ by 3½	2 by 6	1 by 8	6
2000 or ½	Top to 80	4 by 6	3½ by 3½	2 by 6	1 by 8	8
2000 or ½	80 to 128	4 by 6	3½ by 3½	2 by 6	1 by 8	8
2000 or ½	128 to 208	6 by 6	3½ by 3½	2 by 6	2 by 6	8
4000 or 1	Top to 80	4 by 6	3½ by 3½	2 by 6	2 by 6	8
4000 or 1	80 to 128	6 by 6	3½ by 3½	2 by 6	2 by 6	8
4000 or 1	128 to 208	6 by 8	3½ by 3½	2 by 8	2 by 6	8

8.7 Hoist towers shall be erected to a height necessary for immediate needs. However the tower shall not be extended in height beyond the designer's recommendations and never more than 66 feet above the last (highest) guy point.

8.8 An enclosure of No. 18 U. S. gage wire mesh or equivalent material, which will reject a one-inch steel ball, shall be provided to prevent access into the space at the bottom of the hoist tower. The enclosure shall extend not less than 66 inches above the base of the hoist tower.

8.9 Positive connections, such as those made with bolts or pins, shall join the various segments from which assembled towers are made.

8.10 Diagonal bracing, or the equivalent, shall be placed on each of the four sides of the tower and between horizontal crossties, except at loading platforms, in which case bracing of equivalent strength shall be provided.

8.11 Hoist towers shall only be erected and dismantled under the direct supervision of competent personnel.

9. Guying

9.1 Towers shall be secured with guys or rigid braces at each corner at intervals not to exceed 26 feet vertically.

9.2 Tower guys shall be at least ½-inch diameter improved plow-steel wire rope, secured

to anchorages with wire-rope clips as specified in Table 5, or the equivalent. The wire-rope fastenings and the anchorages shall withstand four times the maximum intended loadings.

10. Wood Towers

10.1 All hoist towers constructed of wood more than 50 feet in height shall have bolted connections throughout. No bolts less than ½-inch diameter shall be used.

10.2 All hoist towers constructed of wood and erected outside of the buildings shall be constructed of strong, sound materials, which shall be No. 1 Common Douglas Fir, or equivalent, except for the cage, platform, or bucket guides, which shall conform to 8.4.

10.3 The wood members, such as pads and braces, shall be bolted or nailed.

10.4 Minimum lumber sizes for the various members in wood towers are specified in Table 1. Nailing shall be in accordance with the schedule shown in Table 2.

Table 2
Nailing Schedule

Members	1-Inch Material	2-Inch Material
Diagonal Braces	5 8-penny	5 20-penny
Horizontal Ties	5 8-penny	5 20-penny
Scabs or Pads	5 8-penny	5 20-penny
	Each Side of Joint	Each Side of Joint

10.5 Where wooden posts are spliced, the ends shall be squared and the upper section shall rest squarely on the lower section. Wooden splice plates shall be provided on at least two adjacent sides of the posts and shall be no less than two inches thick and four feet long, overlapping the abutting ends equally. They shall have a cross section of not less than 50 percent of the cross-sectional area of the post. Metal splice plates of equivalent strength may be used. All splices shall be staggered.

11. Cantilever Towers

11.1 The requirements outlined in 8.10 of this standard do not apply to cantilever towers.

11.2 Cantilever towers shall be secured with guys or rigid braces, according to manufacturer's recommendation, at intervals not to exceed 26 feet vertically or the manufacturer's recommended spacing, whichever is the lesser.

11.3 All other sections of this standard are applicable to cantilever towers.

12. Requirements for Inside Hoists

12.1 The sides of the hoistways not used for entrances shall be enclosed on each floor for their entire height with wire mesh or equivalent material and reinforced to withstand a horizontal force of 100 pounds per square foot, applied at any point. The openings in the mesh shall reject a one-inch steel ball.

12.2 Protective covering of heavy planking shall be provided below the cathead of all hoists to prevent objects falling down the hoistway.

13. Hoist Platforms and Cages

13.1 Workmen shall be prohibited from riding the hoist platform except for authorized inspection and maintenance.

13.2 When wheelbarrows or other rolling equipment are transported, they shall be held securely in place on the hoist platform.

13.3 Overhead protective covering of two-inch planking, $\frac{3}{4}$ -inch plywood or other solid mate-

rial of equivalent strength shall be provided on the top of every material hoist cage or platform to prevent objects falling on the workmen loading or unloading the hoist.

13.4 The protective covering on the top of the cage or platform may be made in hinged sections that may be raised when hoisting long material.

13.5 When using a cage or platform for long material, the several pieces of the material shall be securely fastened together and made fast to the cage or platform, so that no part of the load can fall or project beyond the sides of the cage or platform.

13.6 Platform floors covered with metal, shall have a nonslip surface.

13.7 When a hoist tower *is not* enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides including the roof, for the full height between the floor and the cage top. The walls of the cage shall be constructed of $\frac{1}{2}$ -inch mesh of No. 14 U. S. gage wire or the equivalent. The hoist platform enclosure will include the required gates for loading and unloading.

13.8 A stamped plate indicating the manufacturer's rated load of the hoist in pounds shall be conspicuously displayed in the hoist cage.

13.9 Broken-rope safety devices, if and when used in conjunction with material platforms or concrete buckets, shall conform to the following conditions. However, under no circumstances shall they be construed to satisfy the requirements of USA Standard Safety Requirements for Workmen's Hoists, A10.4-1963, its latest revision, or both.

(1) The safety device when engaged shall be capable of stopping and holding the platform or bucket with its rated load.

(2) The safety device shall be securely attached to the frame of the platform, or bucket, in such manner that the platform, or bucket, will not become separated from the safety device under the conditions cited in (1) above.

(3) Any platform, or bucket, used in conjunction with a safety device shall be capable of meeting the conditions cited in (1) above without resultant failure or loss of its load.

(4) Any material hoist structure including tower components, guide rails, and their

attachments, and any parts affected by the action of the safety device, when subjected to the conditions cited in (1) above shall sustain the platform or bucket with its rated load without structural failure.

(5) The safety device shall be activated by a positive means in the event of rope failure, and when engaged shall be released only by raising the platform or bucket from the stopped position.

(6) The ability of the equipment to satisfy the requirements of (1) and (2) above shall be established by tests witnessed by the enforcing authority, an independent testing laboratory, or registered professional engineer.

14. Concrete Buckets

14.1 When men are required to work in the pit, the bucket shall be shored on two sides with timbers, or their equivalent, of sufficient strength to support the bucket. Timbers shall not protrude into an adjacent hoistway.

14.2 Workmen shall be prohibited from riding the bucket except for authorized inspection and maintenance.

15. Booms

15.1 All booms mounted on a material hoist tower shall operate at fixed radii.

15.2 Live booms shall be prohibited.

16. Hoisting Wire Rope and Sheaves

16.1 Breaking Strength

All hoisting wire rope shall be of such breaking strength as to provide a minimum factor of safety of seven. The factor of safety (F) shall be calculated by the following formula:

$$F = \frac{SN}{W}$$

where

S = Manufacturer's rated breaking strength of one rope

N = Number of parts of ropes under load

W = Maximum static load imposed on all ropes with the platform, cage, or bucket, and its rated load at any position in the hoistway.

16.2 Wire Rope Inspection

16.2.1 *Inspector.* A representative of the user of the material hoist shall be appointed and this representative shall keep written reports of the rope condition on file at the work site. The representative shall have the authority to order wire rope replacements and keep unsafe wire rope from being used.

16.2.2 *Periods of Inspection.* Inspection periods shall be set up for each material-hoist wire rope. The frequency of inspection shall be determined by consideration of environment, degree of hazard to materials, frequency of operation, and the frequency with which the rope is subjected to its capacity limits. Inspections shall be made not less often than once each 30 days.

16.2.3 *Method of Inspection.* The working length of the wire rope shall be unwound from the hoist drum. Thorough inspection shall be made of the rope sections that pass over sheaves, drums, or contact saddles, or which make opposing turns. The rope close to end attachments shall be carefully inspected.

16.2.4 *Inspection of Used Wire Rope.* A used wire rope shall be thoroughly inspected prior to installation.

16.2.5 *Inspection of Wire Rope on Idle Equipment.* The wire rope on equipment that has been idle or shut down for a period of one month or more shall be completely inspected prior to operation.

16.2.6 *Surfaces Contacted by Wire Rope.* Sheaves, guards, guides, drums, flanges, and other surfaces contacted by wire rope during operation should be examined at the time of inspection. Any condition harmful to the rope in use at the time should be corrected.

16.3 Wire Rope Removal and Replacement

16.3.1 Wire rope with one or more of the following defects shall be removed or replaced immediately:

(1) Corrosion

(a) Severe corrosion shall be cause for replacement. Any development of slight corrosion should be noted and watched closely.

(2) Broken Wires

(a) One or more valley breaks shall be cause for replacement. (A valley break is a wire break occurring in the valley between two adjacent strands.)

(b) Six randomly distributed broken wires in one rope lay, or three broken wires in one

strand in one rope lay, shall be cause for replacement. (A rope lay is the length along the rope in which one strand makes a complete revolution around the rope.)

(3) End Attachments

(a) Development of broken wires in the vicinity of attachments shall be cause for replacement. If this condition is localized in an operating rope and the section in question can be eliminated by making a new attachment, this can be done rather than replacing the entire rope.

(4) Abrasion

(a) Abrasion, scrubbing, flattening, or peening causing loss of more than one third of the original diameter of the outside wires shall be cause for replacement.

(5) Kinking

(a) Severe kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure shall be cause for replacement.

(6) Heat

(a) Evidence of any heat damage resulting from a torch, or any caused by contact with electrical wires shall be cause for replacement.

(7) Reduction of Rope Diameter

(a) Reduction from nominal diameter of more than $\frac{3}{64}$ inch for diameters up to and including $\frac{1}{4}$ inch; $\frac{1}{16}$ inch for diameters $\frac{1}{8}$ to $1\frac{1}{8}$ inches; and $\frac{3}{32}$ inch for diameters $1\frac{1}{4}$ to $1\frac{1}{2}$ inches shall be causes for replacement. Marked reduction in diameter indicates deterioration of the core.

16.4 Wire Rope Installation. Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations. The hoisting ropes shall be secured to the drum by clamps or by an approved equivalent means.

16.5 Drums and Sheaves

16.5.1 Pitch diameters of drums shall be a minimum of 24 times the nominal rope diameter. The drum flange shall extend at least two inches radially beyond the last layer of rope when all rope is coiled on the drum.

16.5.2 The winding drum shall have not less than three turns of rope when the platform, cage, or bucket is at the lowest point of travel.

16.5.3 All hoisting wire rope shall be improved plow steel grade or stronger, and equal in flexibility to 6 × 19 classification wire rope.

The joining of hoisting ropes by splicing is prohibited.

16.5.4 There shall be at least four feet of clearance between the cathead sheave and the hoisting-rope fastening on the platform, cage, or bucket when either is at the uppermost terminal or landing.

16.5.5 The arc of the bottom of the sheave groove shall be smooth and concentric with the bore or shaft of the sheave. The center line of the groove shall be in a plane perpendicular to the axis of the bore or shaft of the above sheave.

16.5.6 Sheave grooves shall be machined or cast, providing the bottom of the groove has a radius subtending an arc of 150 degrees and conforms to Table 3.

Table 3
Groove Radii for New and
Reconditioned Sheave Grooves

Wire Rope, Nominal Diameter	Groove Minimum	Root Radius Maximum
$\frac{1}{4}$	.140	.150
$\frac{5}{16}$	.170	.180
$\frac{3}{8}$	.205	.215
$\frac{1}{2}$	.265	.275
$\frac{5}{8}$	.330	.340
$\frac{3}{4}$	.390	.400
$\frac{7}{8}$	.460	.475
1	.525	.540
$1\frac{1}{8}$	.585	.600
$1\frac{1}{4}$	.655	.670

16.5.7 Load-bearing sheaves for wire rope shall be grooved to accommodate the rope and shall have a diameter at least 20 times that of the wire rope. For minimum tread diameter of sheaves see Table 4. (The diameter of a sheave is measured at the bottom of the grooves.)

16.5.8 Sheaves intended for use with fiber rope shall not be used with wire rope.

16.5.9 Defective and worn sheaves that may cause equipment failure or damage to the wire rope shall be replaced. If pillow blocks are used, they shall be mounted on top of beams and securely bolted. Open bearings shall not be used.

16.5.10 No snatch blocks or hood-type sheaves shall be used on any hoist tower.

Table 4
Minimum Ratio of Rope Diameter
to Sheave Tread Diameter

Diameter of Hoisting Rope (Inches)	Minimum Tread Diameter of Sheaves* (Inches)
$\frac{1}{4}$	5
$\frac{5}{16}$	$6\frac{1}{2}$
$\frac{3}{8}$	$7\frac{1}{2}$
$\frac{1}{2}$	10
$\frac{5}{8}$	$12\frac{1}{2}$
$\frac{3}{4}$	15
$\frac{7}{8}$	$17\frac{1}{2}$
1	20
$1\frac{1}{8}$	$22\frac{1}{2}$
$1\frac{1}{4}$	25

*Based on 20 times rope diameter.

16.5.11 All sheaves shall be of iron or steel.

16.5.12 All sheave bearings shall be lined with babbit, or other equivalent bearing metal, or have ball or roller bearings.

16.5.13 Sheave bearings shall be provided with adequate means for lubrication.

17. Wire Rope Fastenings

17.1 Ropes shall be securely attached with drop-forged steel wire rope clips and thimbles or other approved equivalent fastening devices. When extra wire rope is carried on top of the frame of the hoist platform, a drum and clamp tie-down or equivalent type anchor device, which will not damage the wire rope, shall be used.

17.2 The minimum number of wire rope clips shall be in accordance with Table 5 and shall be determined by the diameter of the rope.

17.3 The spacing between clips shall be equal to at least six times the diameter of the rope. After the rope has been in use a short time, the nuts on all wire rope clips should be re-tightened at each inspection to the torque recommended by the clip manufacturer. Clips work loose because of oscillating tension stresses, as well as by vibration, and should be checked periodically for tightness.

18. Hoisting Machines

18.1 Hoisting machines shall be designed, installed, and maintained to vertically raise and lower the rated load plus the weight of equipment and ropes.

18.2 The hoisting machine shall be equipped with brakes capable of stopping and holding 125 percent of rated hoisting capacity under all operating conditions.

18.3 The hoisting machine shall be secured in position so as to prevent lateral movement, shifting, or dislodgement.

18.4 The location and arrangement of the hoisting machine, tower, and related sheaves shall be such that proper wrapping of the wire rope on the drum will be assured to prevent "overriding," fouling, improper spacing, or any other condition which will cause damage to the wire rope or hoisting machine.

18.5 Hoisting machines shall not be left unattended with the load suspended.

18.6 Adequate blocking and bracing shall be provided between the hoisting machine and the tower to prevent the transmission of any un-

Table 5
Minimum Number of Wire Rope Clips
to Be Used

Rope Diameter (Inches)	Minimum Number of Clips	Amount of Rope to Turn Back in from Thimble (Inches)	Torque (Foot- Pounds)
$\frac{1}{8}$	2	$3\frac{1}{4}$	—
$\frac{3}{16}$	2	$3\frac{3}{4}$	—
$\frac{1}{4}$	2	$4\frac{3}{4}$	15
$\frac{5}{16}$	2	$5\frac{1}{2}$	30
$\frac{3}{8}$	2	$6\frac{1}{4}$	45
$\frac{7}{16}$	2	$6\frac{3}{4}$	65
$\frac{1}{2}$	3	11	65
$\frac{9}{16}$	3	$11\frac{1}{4}$	95
$\frac{5}{8}$	3	12	95
$\frac{3}{4}$	4	18	130
$\frac{7}{8}$	4	$21\frac{1}{2}$	225
1	4	24	225
$1\frac{1}{8}$	5	28	225
$1\frac{1}{4}$	5	30	360
$1\frac{3}{8}$	6	$37\frac{1}{2}$	360
$1\frac{1}{2}$	6	$40\frac{1}{2}$	360
$1\frac{5}{8}$	6	$43\frac{1}{2}$	345

balanced lateral forces to the tower resulting from the pull of the hoisting ropes.

18.7 When hoisting machinery is set on an elevated platform, such platforms shall be of substantial construction, properly engineered, and provided with guardrails and toe boards which conform to USA Standard Safety Requirements for Floor and Wall Openings, Railings, and Toe Boards A12.1-1967.

18.8 Wire hoisting ropes within seven feet of floor or ground shall be guarded by an enclosure or fence.

18.9 All gears on hoisting machines shall be completely guarded.

18.10 Not more than one platform, winch head, boom, or bucket shall be operated at the same time by any one hoisting machine.

18.11 Brake drums shall be kept free of oil, grease, or any other substance which reduces their efficiency.

18.12 Mechanical brakes shall be so installed as to stop movement of the winding drum, and equipped with a positive acting latch or other mechanical device, designed as part of the hoist, which will hold the brake in the engaged position.

18.13 Each manually operated hoisting machine shall be equipped with an effective pawl and ratchet capable of holding the rated load capacity when it is suspended.

18.14 Internal-combustion-engine exhaust pipes shall be arranged to exhaust away from workmen so the gases will be dissipated harmlessly. A muffler shall be installed to reduce the noise.

18.15 Only approved safety cans shall be used for fueling internal-combustion engines. When gravity-type fuel systems are used, a cut-off valve shall be installed between the internal-combustion engine and the fuel-supply tank.

18.16 Open light, flames, or spark-producing devices shall be kept at a safe distance while refueling internal-combustion engines, and no person shall smoke or carry lighted smoking materials in the immediate area. The engine shall be stopped during refueling.

18.17 A fire extinguisher which meets the requirements of USA Standard Installation of

Portable Fire Extinguishers Z112.1-1966 (NFPA No. 10-1966) shall be part of the hoisting equipment.

18.18 The operation of every hoist shall be controlled by an electrically or mechanically designed signal system. Manual signals may only be used when visibility and distance permit, and the signals can be relayed directly to the hoist operator. See Appendix A for recommended signal systems.

18.19 The platform, cage, or bucket shall be brought to its lowest position, the hoisting machine shall be shut down and positively secured against accidental start-up when men climb the hoist tower or work on any part of the tower below the cathead. The platform, cage, or bucket may be used to raise workmen for authorized maintenance and repairs that cannot be done otherwise.

18.20 All hoisting equipment, including brakes, gears, levers, and wire rope, shall be visually inspected daily. All broken, worn, or defective parts shall be repaired or replaced when discovered.

18.21 Electrical equipment shall be effectively grounded. Ground cables shall be enclosed or shielded as necessary, and shall be tagged for identification.

18.22 Each automatically operated electrical-motor-driven hoist shall be provided with a mechanical automatic motor brake, or equivalent device, to hold the load automatically in case of power failure.

19. Operation Qualification

When required by the enforcing authority each operator, before starting the job and at least annually thereafter, shall obtain a physician's certificate of fitness.

20. Protection of Operator

20.1 Where the operator of hoisting machinery is exposed to dust or other air-borne material in such quantities as to interfere with the safe operation of the hoist, the operator shall be provided with proper goggles and a Bureau of Mines approved respirator for the purpose, or

a wooden or canvas screen shall be erected to minimize the exposure.

20.2 The operator of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than two inches thick. The support for the overhead protection shall be of equal strength.

20.3 The area occupied by the hoisting machine and its operator shall be protected from the elements and shall be heated in cold weather.

20.4 No open-flame heaters shall be allowed inside any operator's enclosure. All other types shall be properly vented.

20.5 Heating systems using liquefied petroleum gases shall be installed in compliance with USA Standard Storage and Handling of Liquefied Petroleum Gases Z106.1-1967.

21. Signal Systems

21.1 Hoisting machines shall be operated in response to manual signals, telephone communications, or to a visible or audible code signal. Any of these may be used separately or in combination. Refer to Appendix A.

21.2 Operators and signalmen shall be able to comprehend signals readily and to execute them properly. Refer to Appendix A.

22. Indicators

22.1 Hoisting ropes shall be accurately marked, or equivalent means taken, to indicate when the load has reached specific positions, including top and bottom landings.

23. Electric Motors

23.1 Motor installations shall be made in accordance with provisions of applicable local codes and the National Electrical Code, USA Standard C1-1965 (NFPA 70-1965).

23.2 Only enclosed switches with grounded cases and fuses or circuit breakers shall be used.

23.3 Control panels shall be enclosed and un-

authorized persons shall not be permitted access to such panels.

23.4 An emergency means shall be provided within reach of the operator to cut off the electric power.

24. Landings and Runways

24.1 Landing platforms and runways that connect the hoistway or tower to the building shall be designed and constructed to sustain safely the maximum intended load. If floors or platforms are covered with metal, they shall have nonslip surfaces.

24.2 Railings and toe boards which conform to USA Standard A12.1-1967 shall be placed on the open sides of runways connecting the tower to the structure.

24.3 All landing platforms where workmen may be exposed to falling objects shall be provided with a solid overhead protection composed of two-inch planking or the equivalent.

24.4 A barricade, shall be required at the building face, which extends a minimum distance of six feet laterally along the outer edge of the building, from each side of the landing or runway. The barricade shall extend a minimum distance of 36 inches above the level of the landing, runway or structure floor. The material used for the barricade shall be the equivalent of No. 18 U. S. gauge wire with openings not exceeding ½-inch mesh or equivalent.

24.5 Working platforms of ample size and strength, and railings and toe boards which conform to USA Standard A12.1-1967, shall be built at each level where men are required to work, such as bucket dumps, hopper headers, and similar places.

24.6 Access to and around landings and the area around the hoisting machine shall be kept clear of rubbish and waste material.

24.7 Materials shall not be stored on landing platforms or landing runways.

24.8 All hoistway entrance barriers and gates shall be painted with diagonal black and yellow stripes.

25. Capacity Statement and Design

25.1 All material hoist towers, masts, etc, shall be substantially constructed and of such design that maximum intended loads will not stress any members beyond safe limits established by applicable engineering formulas.

25.2 The design shall also provide ample

strength for loads imposed by the use of booms attached to a tower or mast. Where auxiliary equipment or other load-bearing devices, in addition to that of the loaded platform or bucket, is supported by the tower, the tower shall be built to withstand these additional loads and stresses safely. The rated load, specified by the manufacturer, shall not be exceeded.

Appendix

(The following Appendix is not a part of USA Standard Safety Requirements for Material Hoists, A10.5-1969, but is included for information purposes only.)

A1. Introduction

One or a combination of several types of signal systems may be used: Manual signals, audible signals, or electrical signals. Whatever the system in use, a copy of the signals shall be posted in a conspicuous place on or near each landing and at the hoist operator's position. The height of the tower and the number of wells in the tower shall be the determining factor in selecting the type of signals for safe operation.

A2. Hand Signals

A2.1 One-Hand Signals to Hoist Operators.

- (1) Hoist: Forearm vertical and forefinger pointing upward, move hand in small horizontal circle.
- (2) Lower: Arm extended and palm down, move hand in small vertical circle.
- (3) Stop: Arm extended horizontally and palm down, hold position rigidly.
- (4) Emergency stop: Both arms extended horizontally but move hands rapidly right and left.
- (5) Dog off load: With forearms extended vertically, clasp and unclasp fists several times.

A2.2 Two-Hand Signals to Hoist Operators.

- (1) Hoist: Hold both arms horizontal at sides, fully extended, move upward and return.
- (2) Lower: Let arms hang at sides, fully extended, move out and return.
- (3) Stop: Hold both arms horizontal at sides fully extended; hold position rigidly.
- (4) Emergency stop: Hold both arms horizontal at sides, fully extended; move both arms rapidly from back to front.
- (5) Dog off load: Clasp fingers of one hand with fingers of the other, palms facing each other.

A3. Audible Signals

Audible signals shall not be used when there are surrounding noises of the same, or nearly the same, frequency and octave level. Signals given by means of a whistle, bell, horn, or other audible means are as follows:

- (1) Hoist: Two short blasts or gongs.
- (2) Lower: Three short blasts or gongs.
- (3) Slow: Four long blasts or gongs.
- (4) Stop: One short blast or gong.
- (5) Emergency stop: Series of short blasts or gongs.
- (6) Dog off load: One long blast or gong.

A4. Electrical Signals

An electrical signal system utilizing bells or lights may be used. A bell signal system that does not register landing calls shall use the signals indicated in the preceding paragraph to control movement of the platform or bucket.

A4.1 Light Systems. One of two types of light systems, either a general system or a specific call system, may be installed.

A4.1.1 General Systems. The necessary light or lights shall be so located at the hoist operator's station that they are readily visible to him at all times. A call button must be installed at each landing. Control of the hoist platform or bucket is governed by the following light signals:

- (1) Hoist: Two lights or two light flashes.
- (2) Lower: Three lights or three light flashes.
- (3) Stop: One light or one light flash.
- (4) Emergency stop: Series of light flashes.
- (5) Dog off load: One long light or lighting of separate dog-off light.

A4.1.2 Specific Call Systems. A light to indicate each floor landing shall be installed in the most visible position at the hoist operator's

station. A call signal button shall be installed at each landing. When the platform or bucket is needed at a certain floor, the call signal button registers that location on the proper light at the operator's station. Signals for movement may be given by audible or visible means.

A5. Electrical Intercommunication Systems

A5.1 Electrical intercommunication systems may be installed. The wiring for such systems shall comply with the pertinent provisions of

the National Electrical Code, USA Standard C1-1965 (NFPA 70-1965).

A5.2 Speakers shall be so located at the hoist operator's position that he can communicate with all stations. A speaker shall also be located at each landing so that communication can be maintained with the hoist operator.

A5.3 Mechanical and electrical signal systems shall be inspected daily. Excessively worn or damaged parts shall be replaced immediately.

A5.4 All wires, cords, or other devices used in connection with signal systems shall be protected against unauthorized or unintentional use, breakage, or interference.



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