

## **4123:1-3-07 Cranes, hoists, and derricks.**

(A) Reserved.

(B) Definitions.

(1) "Derrick" means an apparatus consisting of a mast or equivalent members held at the top by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

(2) "Derrick, a-frame" means a derrick in which the boom is hinged from a crossmember between the bottom ends of two upright members spread apart at the lower ends and united at the top, the upper ends of the boom being secured to the upper junction of the side members and the side members braced or guyed from the junction point.

(3) "Derrick, basket" means a derrick without a boom, similar to a gin pole, with its base supported by ropes attached to corner posts or other parts of the structure. The base is at a lower elevation than its supports. The location of the base of a basket derrick can be changed by varying the length of the rope supports. The top of the pole is secured with multireeved guys to position the top of the pole to the desired location. By varying the length of the upper guy lines, the load is raised and lowered by ropes through the sheave or block secured to the top of the pole.

(4) "Derrick, breast" means a derrick without a boom, the mast consisting of two side members spread farther apart at the base than at the top, tied together at the top and bottom by rigid members, the top held from tipping by guys and the load raised and lowered by ropes through a sheave or block secured to the top crosspieces.

(5) "Derrick, Chicago boom" means an ordinary derrick boom so installed as to utilize a building column or tower hoist as the mast, and to depend upon the structural steel beam connections or bracing to take the place of the stiff legs. The lower end of the boom is attached to the building columns by means of a combination hinge pin and swivel pin to a heavy steel plate clamp attached to the column. The derrick is completed with load fall line and boom fall line.

(6) "Derrick, gin pole" means a derrick consisting only of a mast with guys so arranged as to permit leaning the mast in any direction, the load being raised or lowered by ropes leading through sheaves or blocks at the top of the mast.

(7) "Derrick, guy" means a fixed derrick consisting of a mast capable of being rotated, supported in a vertical position by three or more guys and a boom whose bottom end is hinged or pivoted to move in a vertical plane, with lines between the head of the mast and the head of the boom for raising and lowering the boom lines from the head of the boom for raising and lowering the load.

(8) "Derrick, stiff leg" means a derrick similar to a guy derrick except that the mast is supported or held in place by two or more stiff members capable of

resisting either tensile or compressive forces. Sills are generally provided to connect the lower ends of the two stiff legs to the foot of the mast.

(9) "Derrick, tripod" means a derrick consisting of three upright legs or members securely fastened together at the top, supporting a hoisting mechanism and operating ropes. The legs can be spread to various angles.

(10) "Hoist, mast" means a hoist having no less than two upright parallel members forming the mast, on which the cage is suspended outside of the parallel members. The entire unit is portable, but not self-propelled.

(11) "Hoist, material" means a hoist for raising and lowering material only, with the hoisting of persons being prohibited.

(12) "Hoist, personnel" means a mechanism for use in connection with construction, alteration, maintenance, or demolition of buildings, structures, or other work. It is used for hoisting and lowering employees or material or both, is equipped with a car that moves on guide members during its vertical movement, and includes a hoistway.

(13) "Hoist tower" means a tower constructed of sections forming a shaftway in which a cage or platform travels.

(14) "Prime mover" means equipment used as the primary source of power, such as engines and motors.

#### (C) Cranes.

##### (1) Load rating chart.

A substantial and durable manufacturer's load rating chart with clearly legible letters and figures shall be maintained in each crane and securely fixed to the crane cab in a location easily visible to the operator while seated at the operator's control station. The data and information to be provided on such charts shall include, but not necessarily be limited to, the following data:

(a) A full and complete range of manufacturer's approved crane load ratings at all stated operating radii and boom angles, and for all permissible boom lengths, jib lengths, and angles, also alternate ratings for use and non-use of optional equipment on the crane such as outriggers and extra counterweights which affect ratings.

(b) An operating manual shall be provided, showing recommended parts of hoist reeving, size and type of rope for various crane loads and the operating manual shall be maintained with the equipment.

##### (2) Boom hoist.

When using the manufacturer's recommended boom hoist reeving with rated loads suspended, the boom hoist shall be capable of raising the boom, holding it stationary without attention from the operator, and lowering it only when coupled to its prime mover.

(a) The boom hoist drum shall have sufficient rope capacity to operate the boom at all positions from horizontal to the highest angle recommended when using the manufacturer's reeving and rope size.

(i) No less than two full wraps of rope shall remain on the drum with the boom point lowered to the level of the crane supporting surface.

(ii) The drum end of the rope shall be anchored by a clamp securely attached to the drum or a wedge socket arrangement approved by the crane manufacturer.

(b) The drum diameter shall be sufficient to provide a first layer rope pitch diameter of no less than fifteen times the nominal diameter of the rope used.

### (3) Main hoist mechanism.

Load hoist drums shall have sufficient rope capacity with recommended rope size and reeving to perform crane service within the range of boom lengths, operating radii and vertical lifts stipulated by the manufacturer.

(a) No less than two full wraps of rope shall remain on the drum when the hook is in its extreme low position.

(b) The drum end of the rope shall be anchored by a clamp securely attached to the drum or a wedge socket arrangement approved by the crane or rope manufacturer.

### (4) Ropes.

(a) The hoisting rope shall be of a construction recommended for crane service. Non-rotating rope shall not be used for boom hoist reeving or multiple reeving.

(b) Socketing shall be done in the manner specified by the manufacturer of the assembly.

(c) If a load is supported by more than one part of the rope, the tension in the parts shall be equalized.

(d) Wherever exposed to temperatures at which fiber cores would be damaged, rope having an independent wire rope or wire strand core, or other temperature damage-resistant core shall be used.

(e) Replacement rope shall be the same size, grade and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a rope manufacturer due to actual working condition requirements.

(f) Factor of safety.

The employer shall, when re-reeving boomed equipment, provide ropes which will meet the manufacturer's specifications and the factor of safety shall be no less than three and one-half.

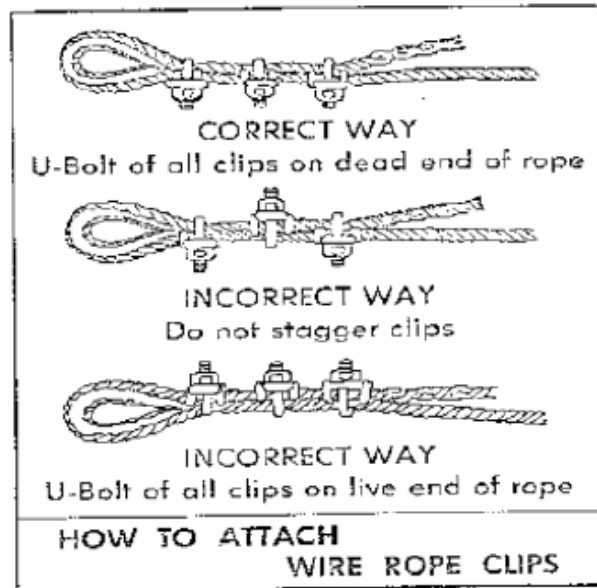
(g) Splicing.

The splicing of all wire ropes shall conform to the manufacturer's specifications and in no case, whether of ordinary or preformed wire rope, shall the overall length of splice be less than thirty-two times the rope diameter in feet and the length of the tucked ends shall be no less than twenty-four times the rope diameter in inches.

(h) Fastening.

Wire rope shall not be secured by knots. Thimbles shall be used where wire rope is looped. Wire rope clips shall conform to the manufacturer's specifications. The loop ends of wire rope clips shall be on the dead end of the wire rope and the grooved plate of the wire rope clip shall take the load of the pulling part for which it is designed. In looping or in short bends, wire rope clips and turnback of rope shall conform to the following table and spacing of clips shall be uniform between the loop and the dead end.

CLIP SIZE	MINIMUM NUMBER OF CLIPS	AMOUNT OF ROPE TO TURN BACK
1/8	2	3-1/4
3/16	2	3-3/4
1/4	2	4-3/4
5/16	2	5-1/4
3/8	2	6-1/2
7/16	2	7
1/2	3	11-1/2
9/16	3	12
5/8	3	12
3/4	4	18
7/8	4	19
1	5	26
1-1/8	6	34
1-1/4	7	44
1-3/8	7	44
1-1/2	8	54
1-5/8	8	58
1-3/4	8	61
2	8	71
2-1/4	8	73
2-1/2	9	84
2-3/4	10	100
3	10	106



07-8

(5) Reeving accessories.

Eye splices shall be made in accordance with the requirements of paragraph (C)(4)(g) of this rule and thimbles shall be used in all eye splices.

(6) Sheaves.

(a) Sheave grooves shall be smooth and free from surface defects.

(b) Sheaves carrying wire ropes shall be provided with close-fitting guards or other suitable devices to guide the rope back into the groove when the load is applied again.

(7) Cabs.

(a) Construction.

(i) Power driven cranes shall be provided with a cab to protect the operator in case the cable should break or material fall from the dipper or bucket.

(ii) All windows shall be of safety glass or equivalent.

(iii) A clear passageway shall be provided from the operator's station to an exit door on the operator's side.

(b) Platform to cab.

(i) Principal walking surfaces shall be of an anti-skid type.

(ii) Outside platforms shall be provided with standard guardrails.

(8) Roof.

Where necessary for rigging or service requirements, a ladder or steps shall be provided to give access to the cab roof.

(9) Booms.

(a) Boom stops shall be provided on all mobile cranes.

(b) A boom angle indicator shall be provided.

(c) All repairs on booms, boom sections and jibs shall meet the manufacturer's specifications.

(10) Exhaust pipes.

All exhaust pipes shall be guarded or insulated in areas where employees are exposed to contact in the performance of normal duties. (See rule 4121:1-3-18 of the Administrative Code for ventilating exhaust gases.)

(11) Miscellaneous equipment.

(a) Fuel tanks shall be equipped with a self-closing filler cap. Where gasoline is the fuel, a flame arrestor shall be provided.

(b) An effective warning and operating signal device shall be provided.

(c) Means shall be provided for the operator to visually determine the levelness of the crane.

(d) Barricades shall be provided to prevent an employee from being struck or crushed by the rotating superstructure of the crane.

(D) Hoists.

(1) General requirements.

(a) Rated load capacity - posting.

Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

(b) Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.

(c) The installation of live booms on hoists is prohibited.

(d) The use of endless belt type manlifts on construction sites is prohibited.

(e) Hoist platforms.

Blocking and cleats shall be provided on hoist platforms when wheelbarrows or other rolling equipment is transported.

(f) Landing platforms.

(i) Landing platforms shall be of sufficient strength to support the maximum working loads imposed upon them, and no less than seventy-five pounds per square foot, without exceeding the allowable working stresses specified in the appendix to this rule.

(ii) Standard guard railing, toeboards and side screens shall be provided on both sides of landing platforms.

(iii) Clearance between adjacent edges of the hoist platform and the landing platform shall not exceed two inches.

(2) Material hoists.

(a) Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement, "No Riders Allowed".

(b) No employee shall be required to ride on material hoists except for the purposes of inspection and maintenance.

(c) All entrances of the hoistway shall be guarded by substantial gates or bars which shall guard the full width of the landing entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes.

(i) Bars shall be no less than two-inch by four-inch wooden bars or the equivalent, located two feet from the hoistway line. Bars shall be

located no less than twenty-six inches or more than forty-two inches above the floor.

(ii) Gates or bars protecting the entrances to hoistways shall be equipped with a latching device.

(d) Overhead protective covering of two-inch planking, three-fourths-inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material hoist cage or platform.

(e) The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking no less than two inches thick. The support for the overhead protection shall be of equivalent strength.

(f) Hoist towers may be used with or without an enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met:

(i) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of one-half-inch mesh, "No. 18 U. S. Gauge" wire or equivalent, except for landing access.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with one-half-inch mesh of "No. 14 U. S. Gauge" wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A six-foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.

(g) Car arresting devices shall be installed to function in case of rope failure.

(h) Material hoists shall be securely fastened to the structure at no less than twenty-five-foot intervals.

### (3) Personnel hoists.

(a) Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of no less than ten feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of ten feet above the level of such floors or scaffolds.

(b) Towers inside of structures shall be enclosed on all four sides throughout the full height.

(c) Towers shall be anchored to the structure at intervals not exceeding twenty-five feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical the tower shall be anchored by means of guys made of wire rope no less than one-half inch in diameter, securely fastened to anchorage to ensure stability.

(d) A minimum of two and one-half square feet shall be provided for each person riding on hoist car.

(e) Whenever a hoist tower extends twenty-five feet or more above the roof line or last possible tie-ins to the structure, it shall be guyed.

(f) Hoistway doors or gates shall be no less than six feet six inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to employees on the car.

(g) Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit which have car gates or doors.

(h) A door or gate shall be provided at each entrance to the car which shall guard the full width and height of the entrance opening.

(i) Overhead protective covering of two-inch planking, three-fourths-inch plywood or other solid material of equivalent strength shall be provided on the top of every personnel hoist.

(j) Doors or gates shall be provided with electric contacts which do not allow movement of the hoist when door or gate is open.

(k) Cages of all hoists upon which employees are permitted to ride shall be equipped with a down speed governor to operate the car safely.

(l) Safeties shall be capable of stopping and holding the car and rated load when traveling at governor tripping speed.

(m) Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead.

(n) Internal combustion engines for direct drive are prohibited.

(o) Normal and final terminal stopping devices shall be provided.

(p) An emergency stop switch shall be provided in the car and marked "STOP".

(q) Ropes.

(i) The minimum number of hoisting ropes used shall be three for traction hoists and two for drum-type hoists.

(ii) The minimum diameter of hoisting and counterweight wire ropes shall be one-half inch.

(iii) Factor of safety.

MINIMUM FACTORS OF SAFETY  
FOR SUSPENSION WIRE ROPES

ROPE SPEED IN FEET PER MINUTE:	MINIMUM FACTOR OF SAFETY:
50-----	7.60
75-----	7.75
100-----	7.95
125-----	8.10
150-----	8.25
175-----	8.40
200-----	8.60
225-----	8.75
250-----	8.90
300-----	9.20
350-----	9.50
400-----	9.75
450-----	10.00
500-----	10.25
550-----	10.45
600-----	10.70

(r) Following assembly and erection of hoists, and before they are put in service, an inspection and test of all functions and safety devices shall be made at full rated capacity under the supervision of the manufacturer or the manufacturer's authorized representative. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested no less often than at three-month intervals. Records shall be maintained and kept on file for the duration of the job.

(s) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.

(i) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with three-fourths-inch mesh of "No. 14 U. S. Gauge" wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading.

(ii) These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding thirty-five miles per hour it shall be inspected and put in operable condition before re-use.

(iii) Wire rope shall be taken out of service when any of the following conditions exist:

(a) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(b) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(c) Evidence of any heat damage from any cause;

(d) Reductions from nominal diameter of more than three-sixty-fourths-inch for diameters to and including three-fourths-inch, one-sixteenths-inch to one and one-eighth inches inclusive, three-thirty-seconds-inch for diameters one and one-fourth inches to one and one-half inches inclusive;

(e) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

(4) Overhead hoists.

(a) The safe working load of the overhead hoist, as determined by the manufacturer, shall be indicated on the hoist, and this safe working load shall not be exceeded.

(b) The supporting structure to which the hoist is attached shall have a safe working load no less than one and one-half times that of the hoist.

(c) The support shall be arranged so as to provide for free movement of the hoist and shall not restrict the hoist from lining itself up with the load.

(d) The hoist shall be installed only in locations that will permit the operator to stand clear of the load at all times.

(e) All overhead hoists in use shall meet the applicable requirements for construction, design, installation, testing, maintenance, and operation as prescribed by the manufacturer.

(E) Proximity to overhead electric conductors.

When it is necessary to move or operate cranes, derricks, or any other type of hoisting apparatus or construction equipment within ten feet of an electrical conductor carrying one hundred ten volts or more, the employer shall:

(1) Arrange with the owner of the conductor, or the owner's authorized representative, to deenergize the conductor, or

(2) Arrange with the owner of the conductor, or the owner's authorized representative, to move the conductor, or

(3) Arrange with the owner of the conductor, or the owner's authorized representative, to guard the conductor from accidental contact and the employer shall designate an employee to act as signalman to direct the operator in the movement of derricks, cranes, or any other type of hoisting apparatus or construction equipment, or

(4) Install an insulated type guard about the boom or arm of the equipment and a dielectric insulator link between the load and the block and the employer shall designate an employee to act as a signalman to direct the operator in the movement of derricks, cranes, or any other type of hoisting apparatus or construction equipment.

(F) No employee shall be permitted to pass or be under loads handled by power shovels, derricks, or hoists. Employees who are not engaged in vehicle loading shall be required to stand back from any such vehicle during the loading.

(G) Derricks.

The following types of derricks are covered by the requirements in this section wherever such requirements apply to the specific type of derrick: gin poles, tripod derricks, A-frame derricks, Chicago boom derricks, stiff leg derricks, breast derricks and guyed masts. (See appendix to this rule for diagrams of derricks.)

(1) Design.

(a) Derricks and all appurtenances thereof, including anchorage, shall be designed to carry the maximum working loads to be imposed upon them and shall provide a factor of safety of no less than four, including wind loads calculated on the basis of the following table:

**Wind loads to be used in design of derricks**

<b>Height Zone (Feet)</b>	<b>Wind Load (lbs./sq. ft. of Vertical Surface)</b>
Less than 20 .....	10
20 to less than 30 .....	15
30 to less than 50 .....	20
50 to less than 100 .....	25
100 to less than 500 .....	30
500 to less than 1200 .....	35
Over 1200 .....	40

NOTES:

1. For cylindrical sections in excess of two inch diameter, multiply by factor of 0.80.
2. For cylindrical sections two inches or less in diameter, multiply by factor of 1.00.
3. For flat sections, multiply by factor of 1.30.
4. When height under consideration is fifty feet or more, interpolate wind load for such height from table.
5. Design shall be checked for wind loading in all directions. No allowance shall be made for sheltering from adjacent structures.

(b) All equipment shall be designed and erected in a substantial manner and securely fastened in place.

(2) Foundations and anchoring.

(a) Foundations.

Derricks shall be set upon substantial foundations.

(b) Anchoring and securing.

(i) Independent of building or structure.

(a) Derricks independent of a building or structure shall be substantially anchored at the top of each corner post and at intermediate intervals of no more than forty feet with no less than three-eighths-inch steel wire rope or material of equal or greater strength. Anchorage for the guys of derricks shall be designed to resist the loads imposed.

(b) Under no circumstances shall less than four guys be used on a derrick supported solely by guys.

(c) The anchoring of derricks shall be such as to ensure that with the boom in any position, the righting moment will exceed the overturning moment, imposed under service conditions with rated load or under storm conditions.

(ii) Secured to building or structure.

Derricks shall be securely fastened to the building or structure, at intervals of no more than forty feet.

(3) Hoist hooks.

Hoist hooks used with bucket, cage or skip shall be equipped with a safety latch designed to prevent the load from being accidentally detached.

(4) Braking systems.

Derricks shall be provided with a brake which will operate in case of power failure. The braking system shall be capable of holding the maximum rated load at any point of the lift.

(5) Protection from falling material or objects.

A substantial overhead guard shall be provided which will protect the operator of the derrick from falling material and objects.

(6) Running lines.

Running lines and pinch points where a wire rope runs onto sheaves, blocks or pulleys of derricks, located six feet or less from the ground or working level shall be guarded, except when loads are moved horizontally.

Effective Date: 11/1/79

Prior Effective Dates: 4/1/68

[Scroll down for Appendixes]

## **Appendix to Rule 4123:1-3-07**

### **Table I**

Structural Timber – Unit Working Stresses

## In Pounds per Square Inch

Species	Bending Extreme Fiber		Horizontal Shear			Compression Perpendicular to Grain		Compression Parallel with Grain	
	Dry	Wet	Dry	or	Wet	Dry	Wet	Dry	Wet
Ash White.....	1,120	800	100			500	300	880	720
Beech and Birch, Yellow	1,200	800	100			500	300	960	720
Cedar-Red	720	600	64			200	125	560	520
Cedar-White	600	480	56			175	100	440	360
Chestnut	760	560	72			300	150	640	480
Cypress-Southern	1,040	720	80			300	200	880	640
Douglas Fir-Coast Region	1,200	800	72			345	215	880	680
Hemlock Western	1,040	720	60			300	200	720	640
Hickory	1,520	960	112			600	350	1,200	800
Maple-Sugar or Black	1,200	800	110			500	300	960	720
Oak-White or Red	1,120	800	100			500	300	800	640
Pine-Norway	880	640	68			300	150	640	560
Pine-White, Yellow and Sugar	720	600	68			250	125	600	520
Pine-Southern Yellow Dense	1,400	935	103			380	235	1,020	800
Poplar-Yellow	800	640	64			250	125	640	480
Redwood	960	640	56			250	125	800	600
Spruce-Red, White or Sitka	880	640	68			250	125	640	520
Tamarack-Eastern	960	720	76			300	200	800	640

These stresses are for short columns in which "L" is less than 15 d. For longer columns the allowable stress equals allowable bending stress from the table times  $1 - L/60d$ , in which L is length of column; d is least dimension. The formulas used in determining the allowable loads in Tables I and II are as follows:

### Formulas for Calculations

$$\text{Formula for bending} \quad W = \frac{B D^2}{9 L} F$$

$$\text{Formula for shear} \quad W = \frac{4 B D S}{3}$$

Legend:

**W – Allowable total load in pounds uniformly distributed**

**B – Breadth of beam in inches**

**D – Depth in beam in inches**

**L – Length of span in feet**

**F – Extreme fiber stress in bending in pounds, per square inch**

**S – Allowable shear in direction of grain in pounds per square inch.**

**Column Formula 10/12**

$$C = F \left( 1 - \frac{L}{60 d} \right)$$

**Applies only where column height is 15 or more times the least dimension of the column.**

Legend:

**C – Allowable unit compressive stress per square inch**

**F – Extreme fiber stress in bending in pounds per square inch**

**L – Effective length of column in inches**

**d – Least dimension of column in inches.**

**Table II**  
 Allowable Loads for Planks  
 In Pounds

Total allowable uniformly distributed loads for timber planks supported at ends. The allowable concentrated load shall be one-half the distributed load.

Based on unit stress of 1,000 pounds per square inch.

<b>PLANKS</b>								
Nom. Size Inches	6x2	8x2	10x2	12x2	14x2	8x3	10x3	12x3
Actual Size Inches	5 <sup>5</sup> / <sub>8</sub> x 1 <sup>5</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub> x 1 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>2</sub> x 1 <sup>5</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub> x 1 <sup>5</sup> / <sub>8</sub>	13 <sup>1</sup> / <sub>2</sub> x 1 <sup>5</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub> x 2 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>2</sub> x 2 <sup>5</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub> x 2 <sup>5</sup> / <sub>8</sub>
<b>Area Sq.In.</b>	<b>9.15</b>	<b>12.20</b>	<b>15.45</b>	<b>18.70</b>	<b>21.95</b>	<b>19.70</b>	<b>25.0</b>	<b>30.2</b>
<b>Span In Feet</b>								
4	410	550	700	850	990	1440	1820	2200
5	330	440	560	680	790	1150	1460	1770
6	280	370	470	560	660	960	1220	1470
7	240	320	400	480	570	820	1040	1260
8	210	280	350	420	500	720	910	110
9	180	250	310	380	440	640	810	980
10		220	280	340	400	580	730	880
11		200	250	310	360	520	660	800
12		180	230	280	330	480	610	740
13			220	260	310	440	560	680
14			200	240	280	410	520	630
15			180	230	270	380	490	590
16				210	250	360	460	550
17				200	240	340	430	520
18				200	220	320	400	490
19					210	300	380	460
20					200	290	370	440

**Table III**  
**Allowable Loads for Beams**  
**In Pounds**

Allowable uniformly distributed loads for timber beams supported at ends. The allowable concentrated load shall be one-half (½) the distributed load.  
 Based on unit stress of 1,000 pounds per square inch.

**BEAMS**

Nom. Size Inches	2x4	2x6	2x8	2x10	2x12	2x14	4x4	4x6	6x6
Actual Size Inches	5 <sup>5</sup> / <sub>8</sub> x1 <sup>5</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub> x1 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>2</sub> x1 <sup>5</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub> x1 <sup>5</sup> / <sub>8</sub>	13 <sup>1</sup> / <sub>2</sub> x1 <sup>5</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub> x2 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>2</sub> x2 <sup>5</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub> x2 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub> x5 <sup>1</sup> / <sub>2</sub>
Area Sq. In.	<b>5.90</b>	<b>9.15</b>	<b>12.20</b>	<b>15.45</b>	<b>18.70</b>	<b>21.95</b>	<b>13.15</b>	<b>20.4</b>	<b>30.2</b>
<b>Span In Feet</b>									
4	600	1430	2540	4070	5970	8230	1330	3190	4600
5	480	1140	2030	3260	4780	6580	1060	2550	3690
6	400	950	1700	2720	3980	5490	890	2120	3080
7	340	820	1450	2320	3410	4700	760	1820	2630
8	300	710	1270	2040	2990	4110	660	1590	2300
9		630	1130	1810	2650	3660	590	1420	2050
10		570	1010	1630	2390	3290	530	1270	1840
11		520	290	1480	2170	3000	480	1160	1670
12		470	840	1360	1990	2740	440	1060	1530
13			780	1250	1840	2530	560	980	1410
14			720	1160	1710	2350	520	910	1310
15			670	1090	1590	2190	490	850	1220
16			630	1020	1490	2060	460	800	1150
17				960	1400	1930	430	750	1080
18				900	1320	1820	400	710	1020
19				860	1260	1730	380	670	970
20				810	1200	1640	370	640	930
<b>Allowable Load For Shear at 100 lb./sq. in</b>	<b>800</b>	<b>1230</b>	<b>1640</b>	<b>2080</b>	<b>2520</b>	<b>2950</b>	<b>1770</b>	<b>2740</b>	<b>4050</b>

\* Allowable load for any other value of unit shear may be obtained by proportion.

**Table IV**  
**ALLOWABLE LOADS FOR COLUMNS**  
**In Pounds**

Based on unit stress of 1,000 pounds per square inch

COLUMNS							
Nom. Size Inches	2 × 4	2 × 6	2 × 8	4 × 4	4 × 6	6 × 6	8 × 8
Actual Size Inches	1½ × 3½	1½ × 1½	1½ × 7½	3½ × 3½	3½ × 5½	5½ × 5½	7½ × 7½
Area Sq. In.	5.90	9.15	12.20	13.15	20.4	30.2	56.2
Unbraced Height In Feet							
4	3,000	4,600	6,200	.....	.....	.....	.....
6	1,500	2,400	3,200	8,800	13,700	.....	.....
8	100	150	200	7,300	11,400	21,400	.....
10	.....	.....	.....	5,900	9,100	19,200	41,000
12	.....	.....	.....	4,400	6,900	17,100	38,000
14	.....	.....	.....	3,000	4,700	14,800	35,000
16	.....	.....	.....	1,500	2,300	12,700	32,000
18	.....	.....	.....	.....	.....	10,400	29,000
20	.....	.....	.....	.....	.....	8,300	26,000

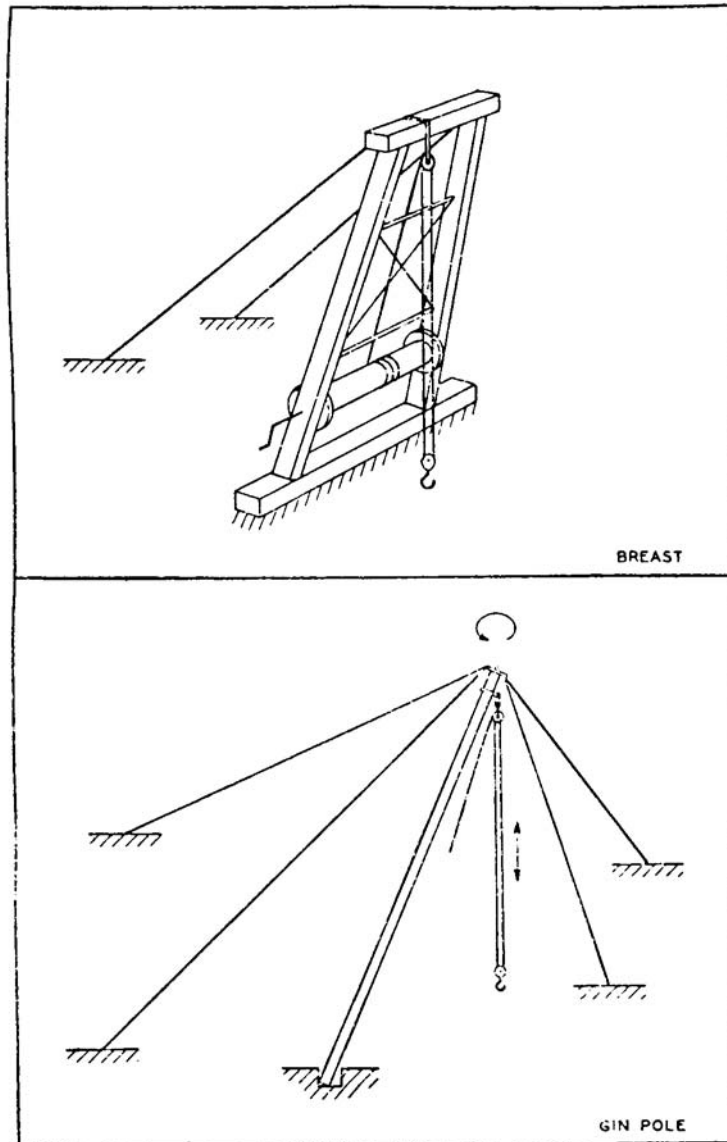
Allowable loads given in this table are for column lengths where  $\frac{L}{D}$

exceeds 15 and are computed by the formula

$$W = \text{Area} \times 1,000 \left[ 1 - \frac{L}{60d} \right] \quad \text{For shorter columns, allowable loads are}$$

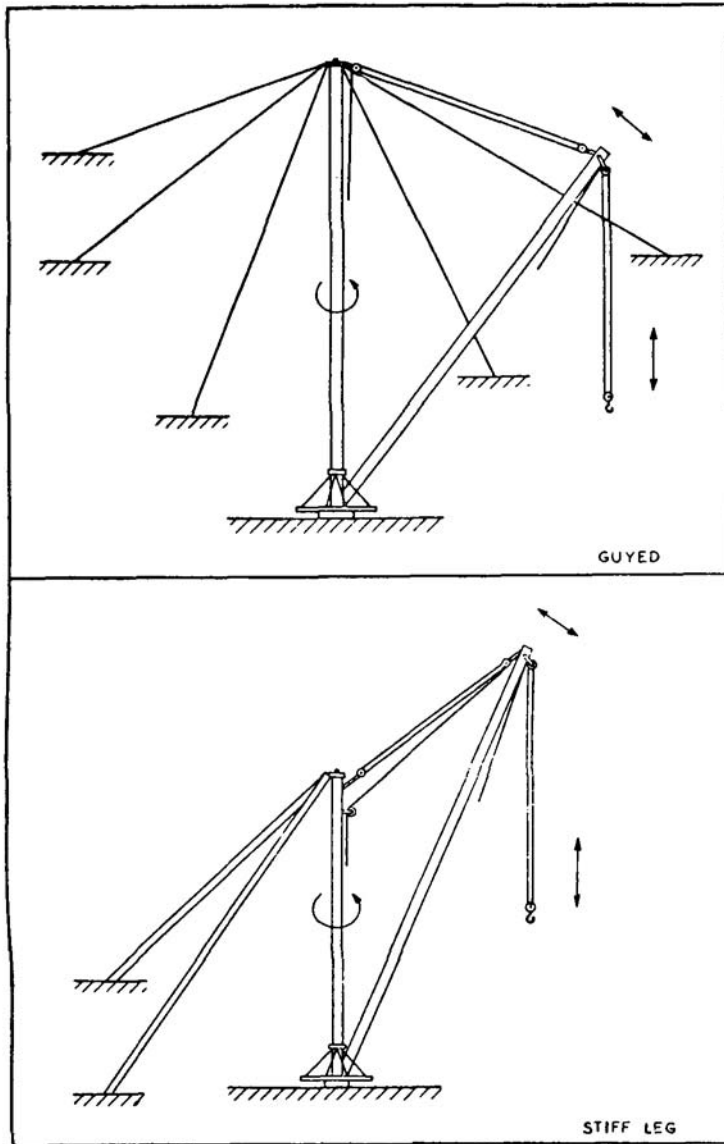
obtained as product of column area and allowable compressive stress.

APPENDIX TO RULE 4121:1-3-07—Continued  
Types of Derricks



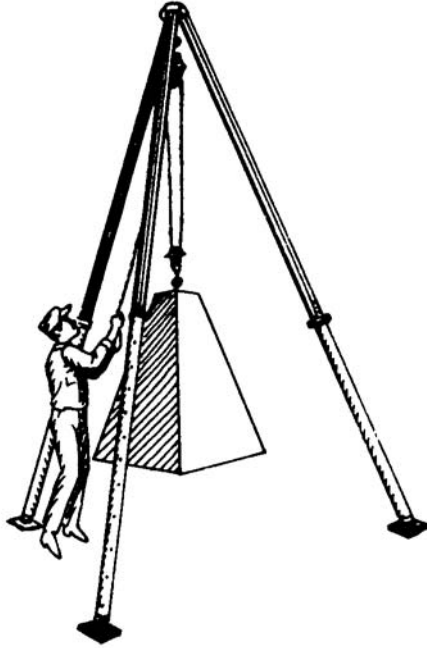
BREAST AND GIN POLE

APPENDIX TO RULE 4121:1-3-07—Continued  
Types of Derricks

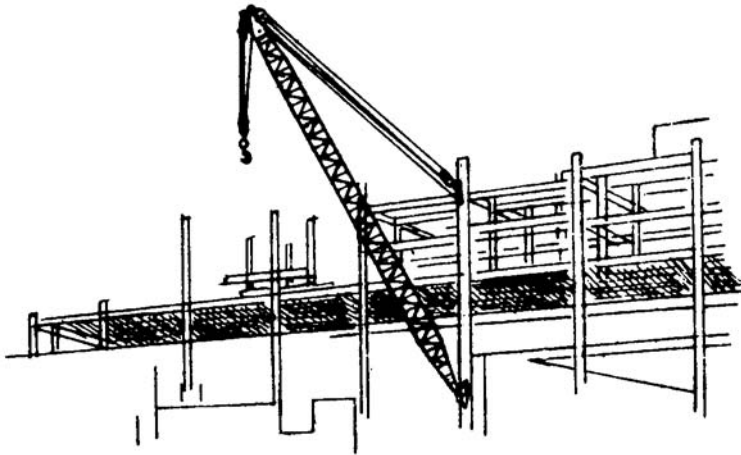


GUYED AND STIFF LEG

**APPENDIX TO RULE 4121:1-3-07—Continued**  
**Types of Derricks**

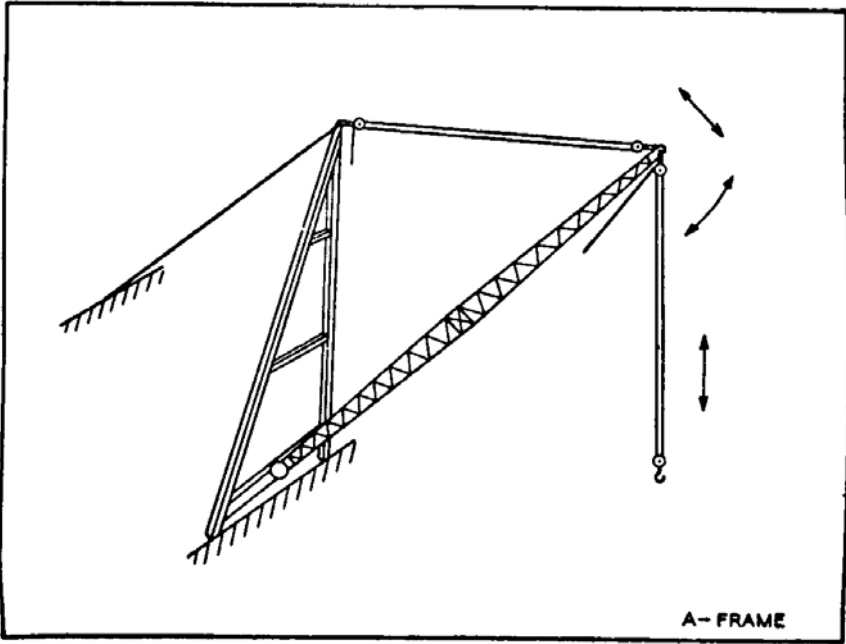


**Tripod Derrick**



**Chicago Boom Derrick**

**APPENDIX TO RULE 4121:1-3-07—Concluded**  
**Types of Derricks**



**A-FRAME**