

TABLE OF CONTENTS

PART 5 - CRANES, HOISTING AND LIFTING

	Page
DEFINITIONS .....	5-1
STANDARDS.....	5-1
GENERAL.....	5-3
EQUIPMENT OPERATION.....	5-7
LIFTS .....	5-8
WIRE ROPE CLIPS AND TERMINATION EFFICIENCY .....	5-10
HOOKS, PINS AND SHEAVES .....	5-11
SLINGS.....	5-11
ALLOY STEEL CHAIN SLINGS.....	5-13
SYNTHETIC WEB SLINGS .....	5-14
METAL MESH SLINGS.....	5-14
BELOW-THE-HOOK LIFTING DEVICES.....	5-15
BRIDGE, GANTRY AND OVERHEAD TRAVELING CRANES.....	5-15
MOBILE CRANES, BOOM TRUCKS AND AERIAL LADDER CRANES .....	5-16
WIRE ROPE ON MOBILE CRANES.....	5-17
GUYLINES.....	5-18
TOWER CRANES.....	5-18
CONSTRUCTION MATERIAL HOISTS .....	5-21
PILE DRIVING AND DREDGING.....	5-23
ROOFER'S HOISTS .....	5-23
GIN POLES AND A-FRAMES.....	5-23
AUTOMOTIVE HOISTS AND VEHICLE SUPPORTS.....	5-23

## PART 5 – CRANES, HOISTING AND LIFTING

### DEFINITIONS

**5.01** In this part, the following definitions apply:

“aerial ladder crane”

means a unit providing crane capability and aerial ladder capability in one unit, which may be used for hoisting loads, for access or as a working platform;

“chimney hoist”

means a temporary hoist used for transporting personnel or materials during the construction of a chimney or similar structure;

“construction material hoist”

means a material hoist consisting of a guiding and supporting structure and hoist equipment that is not a permanent part of a building, structure or other work, and that is installed and used during construction, alteration or demolition to raise and lower materials;

“design factor”

means the theoretical reserve capability of a product, usually determined by dividing the breaking strength by the working load limit;

“miscellaneous material hoist”

means a permanently installed material hoist not described elsewhere in this regulation and not governed by the *Elevator and Fixed Conveyances Act*.

“proof test”

means a test applied to a product to determine material or manufacturing defects;

“rigging”

means fibre ropes, wire ropes, chains, slings, attachments, connecting fittings and associated components;

“safe working load”

means the load a crane or hoist may safely lift in a particular situation taking into account such factors as wind load, extremes of temperature and load sail area, and may be equal to or less than the rated capacity or rated load;

“working load limit”

means the maximum weight or force that a product is authorized by the manufacturer to support in a particular service.

### STANDARDS

#### General

**5.02** Cranes or hoists shall be designed, constructed, erected, disassembled, inspected, maintained and operated as specified by the manufacturer or a professional engineer, and meet the requirements of the applicable standards listed in this Part or other similar standards acceptable to the director, except as otherwise required by these Regulations.

#### Standards

**5.03** Equipment used for hoisting and lifting shall meet the following design and safety standards:

- (1) A bridge, jib, monorail, gantry or overhead traveling crane shall meet the design requirements of
  - (a) *CSA Standard C22.1-06, Canadian Electrical Code, Part 1, Section 40*

- and *CSA Standard C22.2 No. 33-M1984, Construction and Test of Electric Cranes and Hoists*,
- (b) *ANSI Standard MH27.1, Crane, Underhung and Monorail Systems*,
  - (c) *Crane Manufacturers Association of America (CMAA) Specification #70, Specifications for Electric Overhead Traveling Cranes*, or
  - (d) *Crane Manufacturers Association of America (CMAA) Specification #74, Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist*.
- (2) A bridge, jib, monorail, gantry or overhead traveling crane shall meet the safety requirements of
- (a) *CSA Standard B167-96, Safety Standard for Maintenance and Inspection of Overhead Cranes, Gantry Cranes, Monorails, Hoists and Trolleys*,
  - (b) *ANSI Standard B30.2-2001, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*,
  - (c) *ANSI Standard B30.11, Cranes, Monorails and Underhung*,
  - (d) *ANSI Standard B30.16-2003, Overhead Hoists (Underhung)*, or
  - (e) *ANSI Standard B30.17-2003, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)*.
- (3) A mobile crane, telescoping or articulating boom truck or aerial ladder crane shall meet the requirements of
- (a) *CSA Standard Z150-98, Safety Code on Mobile Cranes*,
  - (b) *ANSI Standard B30.5, Cranes, Mobile and Locomotive*, or
  - (c) *ANSI Standard B30.22-2000, Articulating Boom Cranes*.
- (4) A tower or hammerhead crane shall meet the requirements of *CSA Standard Z248-04, Code for Tower Cranes*.
- (5) A portal, tower or pillar crane shall meet the requirements of *ANSI Standard B30.4-2003, Portal, Tower and Pedestal Cranes*.
- (6) A construction material hoist shall meet the requirement of *CSA Standard Z256-M87, Safety Code for Material Hoists*.
- (7) A chimney hoist shall meet the requirements of *ANSI Standard A10.22-1990, Rope-Guided and Non-Guided Workers' Hoists – Safety Requirements*.
- (8) A base mounted drum hoist shall meet the requirements of *ANSI Standard B30.7-2001, Base Mounted Drum Hoists*.
- (9) A guy, stiffleg, basket, breast, gin pole, Chicago boom, shearleg or A-frame derrick shall meet the requirements of *ANSI Standard B30.6-2003, Derricks*.
- (10) A side boom tractor used for pipe laying or similar operations shall meet the requirements of *ANSI Standard B30.14-1991, Side Boom Tractors*.

**NOTE:** For subsections (1) to (10) in Section 5.03, the director may accept other similar standards.

**NOTE:** Permanently installed passenger and freight elevators, permanently installed platform-type material hoists that operate on more than one level or floor, personnel hoists operating within rails and installed above ground for construction purposes, dumbwaiters, escalators, moving walks, stage lifts, amusement rides, permanently installed handicapped lifts, motorized rotating platforms carrying people and lifts covered by *CSA Standard B311-02, Safety Code for Man-Lifts* are governed by the *Elevator and Fixed Conveyances Act and Regulations*.

## GENERAL

<b>Identification of crane and components</b>	<b>5.04</b>	A crane or hoist shall be permanently identified by <ol style="list-style-type: none"><li>the legible display of the manufacturer's name, model and serial number on the structure, and</li><li>each major interchangeable structural component being legibly and uniquely marked to identify compatibility with the crane or hoist.</li></ol>
<b>Rated capacity</b>	<b>5.05</b>	(1) The rated capacity of a crane or hoist shall be determined by the original equipment manufacturer or a professional engineer in accordance with the applicable design and safety standard, and shall not be exceeded.
<b>Capacity markings</b>		(2) The rated capacity of a monorail crane shall be permanently marked on the hoist and at 10 m (33 ft.) intervals on the monorail beam.  (3) The rated capacity of a crane or hoist shall be permanently indicated on the superstructure, hoist and load block of the equipment and indicated in SI (metric) units on a crane or hoist manufactured after the effective date of these Regulations, except where rated capacity is affected by the <ol style="list-style-type: none"><li>vertical or horizontal angle of a boom or jib,</li><li>length of a boom or jib,</li><li>position of a load-supporting trolley, or</li><li>use or position of outriggers to increase the stability of the structure.</li></ol>
<b>Load chart</b>		(4) Where the rated capacity is affected by a factor listed in subsection (3), a legible load chart, showing the rated capacity in all permitted working positions and configurations of use, shall be <ol style="list-style-type: none"><li>permanently posted on the equipment, or</li><li>issued to the equipment operator, who must have it available at all times when operating the equipment.</li></ol>
<b>Boom angles</b>		(5) A crane or hoist with a boom movable in the vertical plane shall have a device to indicate the boom angle if the rated capacity is affected by the boom angle and the device must be readable by the operator at the control station.
<b>Boom extension</b>		(6) A crane or hoist shall have a means or device to indicate the boom extension or load radius if the rated capacity of the equipment is affected by boom extension or load radius.
<b>Equipment capacities</b>		(7) The rated capacity of a crane or hoist with reeved-in lifting devices, except for mobile cranes, shall be the net capacity of the equipment.  (8) The rated capacity of a hoist shall not exceed the capacity of the structure supporting the hoist.  (9) Selector switches or other effective means shall be provided to ensure that the supporting structure is not overloaded by multiple hoists installed on the supporting structure.
<b>Manufacturer's manual</b>	<b>5.06</b>	(1) The manufacturer's manual for each crane and hoist shall be reasonably and readily available at the workplace where the equipment is being used.  (2) The manual shall include approved methods of erection, dismantling, maintenance and operation of the component parts and of the assembled crane or hoist.
<b>Inspection, maintenance and repairs</b>	<b>5.07</b>	Cranes and hoists shall be inspected and maintained, as specified by the manufacturer's manual, unless otherwise approved by the original equipment manufacturer or a professional engineer, and records kept of the inspections and maintenance.

- (1) Maintenance of each crane and hoist shall ensure that every component is capable of carrying out its original design function with an adequate margin of safety.
  - (2) A crane or hoist shall not be used until any condition that could endanger workers is remedied.
- Records**
- (3) Records of inspection and maintenance meeting the requirements of these Regulations shall be kept by the equipment operator and other persons inspecting and maintaining the equipment for
    - (a) a crane or hoist with a rated capacity of 1,000 kg (2,200 lbs.) or more,
    - (b) a crane or hoist used to support a worker,
    - (c) a tower crane,
    - (d) a mobile crane, boom truck or aerial ladder crane,
    - (e) a side boom tractor or pipe layer,
    - (f) a construction material hoist,
    - (g) a chimney hoist, and
    - (h) any other type of hoisting equipment specified by the director.
- Modifications**
- 5.08**
- (1) Any repair or modification of a crane or hoist shall be certified by a professional engineer or the original equipment manufacturer as having returned the component to a condition capable of carrying out its original design function with an adequate margin of safety.
  - (2) Modifications affecting the rated capacity of a crane or hoist shall be assessed and the rated capacity adjusted by the original equipment manufacturer or a professional engineer.
  - (3) Modifications to a crane or hoist and maintenance history shall be recorded in the inspection and maintenance records system, and the equipment manuals revised as necessary to ensure that adequate and appropriate information is available for safe use, operation and maintenance of the equipment.
- Certification**
- 5.09**
- The rated capacity of a crane or hoist shall be certified by a professional engineer in accordance with criteria from the applicable design or safety standard if
- (a) the original or rated capacity of the equipment cannot be determined,
  - (b) the continued safe use of the equipment cannot be assured because of its age or history,
  - (c) repairs or modifications have been made to load-carrying components,
  - (d) modifications have been made which affect the rated capacity, or
  - (e) the crane or hoist has been in contact with an electric arc or current.
- Access and egress**
- 5.10**
- (1) Workers shall be provided with safe access and egress to the operator's position and to maintenance locations on a crane or hoist.
  - (2) Where the normal safe means of egress is not always available to the operator during crane operations, an alternative safe means shall be provided for the operator to get from the operating position to a safe area in the event of a power failure or other emergency.
- Audible warning**
- 5.11**
- (1) Effective audible warning devices shall be installed and used on a crane or hoist unless the hoisting equipment is operated using a pendant control and the operator walks near the load.
  - (2) The operator of a crane or hoist shall sound a warning signal prior to moving the load when it is necessary to alert workers to hoisting operations.
- Drop stops**
- 5.12**
- (1) Each top-running crane, under-running crane and monorail hoist shall be

		fitted with a means to limit the drop of trolley and bridge truck frames to 0.025 m (1 in.) if a wheel or axle fails.
		(2) Drop stops must be able to support the trolley and bridge with the crane or hoist loaded up to its rated capacity and be certified by the original equipment manufacturer or a professional engineer.
		(3) End stops shall be provided on crane and hoist tracks and rails to prevent the equipment running off the end of the rail or track.
		(4) The end stops shall contact the truck frame, or shall be a height at least half the diameter of the wheels, if the wheels contact the stops.
<b>Fenders</b>	<b>5.13</b>	(1) Fenders shall be provided on a crane or hoist that operates on rails if there is a possibility of injury to workers.
		(2) The fenders shall be capable of deflecting any object expected to be in the path of the wheel.
<b>Boom stops</b>	<b>5.14</b>	Where a crane or hoist has a boom that may fall over backward
		(a) positive boom stops shall be provided,
		(b) a boom hoist disconnect, shut-off or hydraulic relief shall be provided to automatically stop the boom hoist when the boom reaches the maximum boom operating angle specified by the manufacturer, before the boom stops are contacted, and
		(c) a jib on a crane or hoist shall be restrained from backward overturning.
<b>Two block prevention</b>	<b>5.15</b>	Where a crane or hoist is being used to hoist personnel, the load line shall have
		(a) a device to prevent two-blocking, if the equipment has a telescoping boom, or
		(b) a device to warn the operator of impending two-blocking if the equipment has a boom with a fixed length.
<b>Hoisting molten metal</b>	<b>5.16</b>	A crane or hoist that handles molten metal shall have two holding brakes on the hoist mechanism.
	<b>5.17</b>	A running line sheave on a crane or hoist shall have a device to retain the rope in the sheave grooves.
	<b>5.18</b>	An electrically powered crane, receiving its source of energy from an ungrounded supply, shall have a ground fault indication system that is monitored on a routine basis.
<b>Controls</b>	<b>5.19</b>	(1) All controls on a crane or hoist shall have their function clearly identified and maintained in good condition.
		(2) All load movement controls on a crane or hoist manufactured after the effective date of these Regulations must return to neutral when pressure from the operator is released.
		(3) Controls not operated from a cab shall be located to provide a safe distance between the operator and the load being lifted.
		(4) A pendant control for a crane or hoist shall be supported independently from its electrical conductors.
<b>Operator protection</b>	<b>5.20</b>	The operator of a crane or hoist shall be protected against hazardous conditions such as falling or flying objects and excessive heat or cold.
<b>Cabs</b>	<b>5.21</b>	Cabs of cranes or hoists shall meet the following standards or operating requirements:
<b>Windows</b>		(1) Cab windows on mobile cranes shall be of safety glazing materials meeting the requirements of <i>ANSI/SAE Z26.1, Safety Glazing Materials for Glazing</i>

*Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways,*  
or other standard acceptable to the director.

- (2) Cab windows on a crane or hoist that is not a mobile crane shall be laminated glass, tempered glass, wired glass or clear polycarbonate plastic.
- (3) Operator cab windows shall provide an unobstructed field of vision toward the load hook and window wipers shall be fully functional.
- Seats** (4) The operator's seat on a crane or hoist must allow the operator to safely operate the equipment and must be kept in good condition.
- Storage** (5) The operator's cab of a crane or hoist shall be free of loose tools, material and equipment.
- (6) Adequate storage facilities shall be provided if it is necessary to keep tools or equipment in the cab.
- (7) A fire extinguisher having at least 10 BC rating shall be immediately available in the cab of each crane.
- Qualified riggers**      **5.22** (1) Rigging and slinging work shall be done by or under the direct supervision of a qualified person familiar with the rigging to be used and with the code of signals for hoisting operations.
- (2) Loads to be unhooked by a worker shall be safely landed and supported before the rigging is detached.
- Use of rigging** (3) Rigging and fittings shall be used only for the purposes for which they were designed and manufactured.
- (4) The load applied to any rigging or rigging assembly shall not exceed the working load limit.
- Worker positioning** (5) No one shall remain within the bight of any running line under tension, or in a position where they could be struck by a line were it to break, come loose or be tightened.
- (6) A worker shall be positioned in the clear to prevent exposure to moving logs, saplings, root wads, chunks, rigging or other material before any load is moved.
- (7) A worker shall keep clear of rigging that is stopped by an obstruction until the rigging has been slackened to reduce the hazard.
- Design identification**      **5.23** (1) Rigging fittings shall be marked with the manufacturer's identification, product identifier and the working load limit or sufficient information to readily determine the working load limit.
- (2) The working load limit of existing fittings that do not meet the requirements of subsection (1) shall be determined by a qualified person and marked on the fitting, and such fittings shall be removed from service within one year of the effective date of these Regulations.
- Design factors of safety** (3) The design factors based on breaking strengths for rigging components shall be at least equal to the values given in Table 5-1, except as otherwise specified in this Part.

<b>Table 5-1 Design Factors for Rigging</b>	
<b>Component</b>	<b>Design Factor</b>
Nylon fibre rope sling	9
Polyester rope sling	9
Polypropylene rope sling	9
Alloy steel chain sling	4
Wire rope sling	5
Metal mesh sling	5
Synthetic web sling	5
Chain fittings	5
Wire rope sling fittings	5
Non-rotating wire ropes	as specified by manufacturer, but not less than 5
Conventional wire rope	5
Other	fittings as specified by manufacturer

(4) Where the design factors specified by subsection (3) are reduced for a dedicated rigging assembly, they shall be designed and certified by a professional engineer for a specific lift, and the dedicated assembly shall be re-rated according to the requirements of subsection (3) for any continued use.

**Lifting workers**

(5) The design factor for any rigging assembly used to support workers shall be at least 10.

**EQUIPMENT OPERATION**

**Operator qualifications 5.24** (1) Only a qualified person who has been instructed and authorized shall operate a crane or hoist.

(2) A worker shall demonstrate competency, including familiarity with the operating instructions for the particular crane or hoist, safe rigging practices, and the code of signals for hoisting operations.

**Training requirements 5.25** On and after December 31, 2008, the operator of mobile cranes or articulating boom cranes must meet the following training requirements:

(1) For cranes with a rated capacity from 900 kg up to and including 7,300 kg (1 ton to 8 ton) operators shall successfully complete a 35 hour course acceptable to the director, which includes the safe operation of the crane.

(2) For cranes with a rated capacity over 7,300 kg and up to and including 13,600 kg (8 ton to 15 ton), operators shall successfully complete a 70 hour course acceptable to the director, which includes the safe operation of the crane.

(3) For cranes with a rated capacity over 13, 600 kg (15 ton), operators shall

(a) have provided documented proof of crane operating experience of at least 500 hours, for a review, examination and acceptance of qualifications by a certifying agency acceptable to the director, and have successfully completed a 70 hour course acceptable to the director, which includes the safe operation of the crane, or



- (b) have crane operator trade certification issued by a provincial or territorial apprenticeship board that is acceptable to the director, or
- (c) in the case of a trainee with less than 500 hours operating experience
  - i. have successfully completed a 70 hour course acceptable to the director, which includes the safe operation of the crane, and
  - ii. operate the crane under the direct supervision of a qualified person who meets the requirements of subsections (a) or (b).

**Certification of tower crane operators**      **5.26**      On and after December 31, 2008, the operator of a tower crane shall have

- (a) successfully completed a certified crane operator's course offered by a provincial or territorial apprenticeship board or be an indentured apprentice, or
- (b) have equivalent qualifications to operate a tower crane, determined by a provincial or territorial apprenticeship board or other certifying body acceptable to the director.

**Start of shift inspection**      **5.27**      (1) An operator shall inspect the crane or hoist at the beginning of each shift and test control and safety devices as specified by the manufacturer and these Regulations.

(2) Any defects found during inspection or use of a crane or hoist shall be recorded in the inspection and maintenance record system and reported immediately to the supervisor, who determines the course of action to be taken.

(3) Where a defect affects the safe operation of the crane or hoist, the equipment shall not be used until the defect has been remedied.

**Load weight**      **5.28**      (1) The weight of each load to be hoisted by a crane or hoist shall be determined and communicated to the equipment operator and to any other worker involved in the hoisting operation.

(2) Where the weight of a load to be lifted cannot be determined, the crane or hoist to be used for the lift shall have a load weight indicator or a load limiting device.

**Calibration**      (3) Load weight devices, including load moment indicators on cranes or hoists, shall be calibrated as specified by the manufacturer or at more frequent intervals where required, and the date of calibration shall be recorded in the inspection and maintenance records system.

**LIFTS**

**Unsafe lift**      **5.29**      (1) The operator of a crane or hoist shall ensure that

- (a) no load is moved if there is any doubt the load can be safely handled,
- (b) a load does not contact the boom of a crane or hoist and the boom does not contact a structure, and
- (c) where contact as described in subsection (b) occurs,
  - i. it is reported to a supervisor,
  - ii. a qualified person inspects the point of contact,
  - iii. any damage such as a cracked weld or a bent or dented member is assessed, repaired as necessary, and
  - iv. the damaged or repaired area is certified by a professional engineer as safe for use, prior to the crane returning to service.

**Contact with loads and structures**

**Swing hazards**      (2) A worker shall not remain within range of the swing of the load or equipment when a hazard is created by the swing movement of the load, cab, counterweight or any other part of the crane or hoist, and the equipment shall not be moved when any worker is so exposed.

<b>Position of equipment</b>		<p>(3) Equipment shall be positioned so that no moving part of the equipment comes within 0.6 m (2 ft.) of any obstruction in any area accessible to workers.</p> <p>(4) If the clearance required by subsection (3) cannot be provided, entry to such areas shall be prevented by barriers or other effective means.</p>
<b>Multiple crane lift</b>	<b>5.30</b>	<p>(1) A multiple crane lift shall be under the direction of a qualified supervisor who is responsible for safe operations.</p> <p>(2) Written procedures shall be prepared for any multiple mobile crane lift</p> <p style="margin-left: 20px;">(a) if the load on any one crane will exceed 75% of its rated capacity, or where other factors make the lift complex, or</p> <p style="margin-left: 20px;">(b) where three or more cranes are used at one time to hoist a load.</p> <p>(3) Multiple crane lift procedures shall address rigging details, wind speed, hoist line speed, crane travel speed, load distribution and other considerations as necessary.</p> <p>(4) Multiple crane lift procedures shall be communicated to all workers involved in the lift before commencing hoisting operations.</p> <p>(5) Effective communication shall be established and maintained between all workers involved during a multiple crane lifting operation.</p>
<b>Traveling with a load</b>	<b>5.31</b>	<p>When traveling with a load on a crane</p> <p style="margin-left: 20px;">(a) the load shall be carried as close to the ground or grade as possible, and the load rigged to control load swing,</p> <p style="margin-left: 20px;">(b) a worker, designated as a signaller, shall walk ahead of a moving load, warning workers and others to keep clear, and</p> <p style="margin-left: 20px;">(c) the crane shall be designed for that purpose and loaded within its limits.</p>
<b>Loads over work areas or workers</b>	<b>5.32</b>	<p>(1) Work shall be arranged to prevent passing loads over workers.</p> <p>(2) If no practicable alternative exists, a crane or hoist operator may pass a load over workers, but only when the workers have been warned of the danger by an audible alarm.</p> <p>(3) A worker shall not stand or pass beneath a suspended load.</p> <p>(4) A load shall not be suspended from the load hook of a crane or hoist when an operator is not at the controls.</p> <p>(5) The hook or load block of a crane or hoist shall be positioned directly over the load to prevent side loading of the crane.</p>
<b>Signals</b>	<b>5.33</b>	<p>(1) The crane or hoist operator shall act only on directions from a designated and qualified signaller whenever the operator does not have a clear and unobstructed view of the load hook and load throughout the whole range of the hoisting operation.</p> <p>(2) When controlling hoisting operations, the signaller and operator shall use</p> <p style="margin-left: 20px;">(a) hand signals that conform to the code of signals used for hoisting operations, or</p> <p style="margin-left: 20px;">(b) two-way radio or other audio or video systems, acceptable to the director, if distance, atmospheric conditions or other circumstances make the use of hand signals hazardous or not practicable.</p> <p>(3) Multi-channel radios shall not be used to direct crane or hoist movement.</p>
<b>Dedicated radio system</b>		
<b>Riding hook or load</b>	<b>5.34</b>	<p>No worker shall ride on a load, sling, hook or any other rigging equipment, unless it is a basket certified for that purpose.</p>
<b>Induced voltage</b>	<b>5.35</b>	<p>Unless the work to be performed is being done in accordance with Part 9 –</p>

Electrical Safety or the *Yukon Electrical Protection Act*, before a crane or hoist is operated near an electrical source such as a radio transmitter or energized high-voltage equipment

- (a) the crane or hoist shall be effectively grounded,
- (b) any induced electric charge on the load shall be dissipated by applying grounding cables or by other effective means before workers contact the load, and
- (c) flammable materials shall be removed from the immediate work area.

**High voltage electrical conductors**      **5.36**      A crane or hoist shall be positioned and operated to prevent any part of the equipment, load line or load from coming within the minimum distance of energized high-voltage electrical conductors or exposed energized electrical equipment as required in Table 9-1 in Part 9 – Electrical Safety.

#### **WIRE ROPE CLIPS AND TERMINATION EFFICIENCY**

**Capacity reduction**      **5.37**      The working load limit of wire rope shall be reduced in accordance with the efficiency rating for the type of termination as specified by the manufacturer. A competent person or the manufacturer shall determine the efficiency rating for the type of wire rope termination being used and the working load limit of the wire rope shall be reduced accordingly.

**Cable clips**      **5.38**      (1) U-bolt and double saddle type wire rope clips shall be installed and used as specified by the manufacturer.

**Number and positioning**      (2) Where the manufacturer's specifications cannot be determined, a competent person shall determine the number of U-bolt clips and the installation torque.

**Types**      (3) Malleable cast-iron wire rope clips shall not be used for hoisting or other critical applications unless approved by the manufacturer for that purpose.

**Restriction on fold back eyes**      **5.39**      (1) A wire rope termination using a swaged fold back eye shall  
(a) be identified with a serial number or other unique identification code, and

(b) be proof tested before being placed in service.

(2) A record of the proof test shall be kept available for the service life of the wire rope termination.

(3) A swaged sleeve used for a fold back eye shall be warranted for the intended application by the manufacturer of the sleeve.

(4) A swaged fold back eye termination shall be identified with the working load limit as required by section 5.44(7).

**Wire rope rejection criteria**      **5.40**      Wire rope shall be permanently removed from service where

(a) in running wire ropes, there are 6 or more randomly distributed wires broken in one rope lay or 3 or more wires are broken in one strand in one lay,

(b) in stationary wire ropes, such as guylines, there are 3 or more broken wires in one lay in sections between end connections, or more than one broken wire within one lay of an end connection,

(c) the effects of corrosion or wear exceed  $\frac{1}{3}$  of the original diameter of outside individual wires,

(d) there is kinking, bird-caging or any other damage resulting in distortion of the rope structure,

(e) there is heat or arc damage,

(f) there are reductions of normal rope diameter, from any cause, in excess of  
i. 0.0004 m ( $\frac{1}{64}$  in.) for diameters up to and including 0.008 m ( $\frac{5}{16}$  in.),

- ii. 0.001 m (<sup>3</sup>/<sub>64</sub> in.) for diameters greater than 0.008 m (<sup>5</sup>/<sub>16</sub> in.) up to and including 0.019 m (3/4 in.),
- iii. 0.002 m (<sup>1</sup>/<sub>16</sub> in.) for diameters greater than 0.019 m (<sup>3</sup>/<sub>4</sub> in.) up to and including 0.029 m (1-1/8 in.), or
- iv. 0.003 m (<sup>3</sup>/<sub>32</sub> in.) for diameters greater than 0.029 m (1-1/8 in.),
- (g) in the case of wire rope with non-rotating construction
  - i. the rejection criteria in subsections (a-f) are met,
  - ii. there are two randomly distributed broken wires in six rope diameters, or
  - iii. there are four randomly distributed broken wires in 30 rope diameters,
- (h) a rigging component or wire rope has been contacted by an electric arc, unless certified safe for continued use by a professional engineer,
- (i) rigging and fittings have been repaired by welding, unless certified safe for continued use by a professional engineer, or
- (j) alloy steel chain has been welded or annealed.

### HOOKS, PINS AND SHEAVES

- |                                |             |  |
|--------------------------------|-------------|--|
| <b>Safety latch</b>            | <b>5.41</b> | (1) A hook shall have a safety latch or other means that will retain slings, chains or other similar parts under slack conditions.   |
| <b>Shackles</b>                |             | (2) A shackle-pin, heel-pin or a similar device shall be secured so it cannot be dislodged.  |
|                                |             | (3) The pin in a screw-pin type shackle shall be wired or otherwise secured against rotation when used in applications that may cause the pin to loosen.   |
|                                |             | (4) A shackle-pin shall not be replaced with a bolt or other makeshift fitting.  |
| <b>Sheave</b>                  |             | (5) A sheave shall <ul style="list-style-type: none"> <li>(a) be correctly sized for the rope,</li> <li>(b) have a device to retain the rope within the groove, and</li> <li>(c) be removed from service if it has a damaged groove or flange.</li> </ul>  |
| <b>Hook rejection criteria</b> | <b>5.42</b> | A worn or damaged hook shall be permanently removed from service if <ul style="list-style-type: none"> <li>(a) the throat opening, measured at the narrowest point, has increased by more than 15% of the original opening,</li> <li>(b) the hook has twisted more than 10 degrees from the original plane of the hook,</li> <li>(c) the hook has lost 10% or more of its cross-sectional area,</li> <li>(d) the hook is cracked or otherwise defective, or</li> <li>(e) wear or damage exceeds any criteria specified by the manufacturer.</li> </ul> |

### SLINGS

- |                   |             |   |
|-------------------|-------------|---|
| <b>Standards</b>  | <b>5.43</b> | (1) Wire rope, alloy steel chain, metal mesh, synthetic fibre rope and synthetic fibre web slings shall meet the requirements of <i>ASME B30.9, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings</i> , or other standard acceptable to the director. |
| <b>Inspection</b> |             | (2) Slings and attachments shall be visually inspected before use on each shift, and if defective, equipment shall be immediately removed from service.   |
| <b>Storage</b>    |             | (3) A sling shall be stored to prevent damage when not in use.  |
|                   |             | (4) A sling with a knot shall not be used.  |
| <b>Padding</b>    |             | (5) When a sling is applied to a sharp edge of a load, the edge or the sling shall be protected to prevent damage to the sling.   |

- Damage** (6) A sling with damaged end fittings shall not be used.
- Construction** (7) Wire rope of non-rotating type construction or Lang's lay type construction shall not be used in a sling.
- Temperature**
  - (8) A wire core rope sling shall not be exposed to or used at a temperature above 205 degrees C (400 degrees F) unless otherwise specified by the manufacturer.
  - (9) A fibre core wire rope sling shall not be exposed to or used at a temperature above 100 degrees C (212 degrees F) unless otherwise specified by the manufacturer.
- Makeshift components** (10) Makeshift couplers, shorteners, hooks or other load-bearing attachments for slings, including those made from concrete reinforcing steel, shall not be used unless the working load limit has been determined and certified by a professional engineer.
- Working load limit** **5.44**
  - (1) The working load limit of any individual component of the assembly shall not be exceeded when the working load limit of a sling assembly is determined.
  - (2) The working load limit of a sling with more than 3 legs shall be limited to the working load limit of any 3 legs of the sling.
  - (3) The load carried by any single leg of a bridle sling shall not be greater than the working load limit of the leg.
  - (4) If a sling is used to lift at any angle from the vertical
    - (a) the design factors required by this part shall be maintained, and
    - (b) a qualified person or the manufacturer shall determine the required reduction of the working load limit of the sling, or it must be reduced according to Table 5-2.

<b>Table 5-2</b>	
<b>Working Load Limit Reductions For Slings At An Angle</b>	
<b>Angle between the sling leg and vertical</b>	<b>Reduce working load limit to</b>
up to 30 <sup>0</sup>	90% of the working load limit
over 30 <sup>0</sup> up to 45 <sup>0</sup>	70% of the working load limit
over 45 <sup>0</sup> up to 60 <sup>0</sup>	50% of the working load limit
over 60 <sup>0</sup>	Not permitted unless part of an engineered lift

- (5) The working load limit of a sling used under adverse conditions, such as chemically active environments, shall be reduced according to the manufacturer's specifications.
- (6) Before any new, repaired or altered sling having welded couplers or other welded load-bearing attachments is placed in service, the sling shall have been proof tested by the manufacturer.
- (7) A wire rope sling with a swaged or poured socket or a pressed fitting shall be permanently identified with
  - (a) its working load limit,
  - (b) the angle upon which the working load limit is based, and
  - (c) the name or mark of the sling manufacturer.
- Selection for lifts** **5.45** (1) A sling shall be selected and used in a manner that prevents slipping or overstressing of the sling or the load.

- (2) A load consisting of two or more pieces of material over 3 m (10 ft.) long shall be slung using a two legged sling arrangement positioned to keep the load horizontal during the lift, and each sling shall be choked around the load with a double wrap.
- (3) For a multiple piece lift
  - (a) each member of the lift that is being delivered to a different spot shall be independently slung back to the main load hook or master link using graduated length slings,
  - (b) a lifted member shall not support another lifted member, and
  - (c) a crane with power controlled lowering shall be used.

**ALLOY STEEL CHAIN SLINGS**

**Markings**

- 5.46** (1) An alloy steel chain sling shall be permanently identified with
- (a) the size,
  - (b) the manufacturer's grade and the working load limit,
  - (c) the length and number of legs, and
  - (d) the name or mark of the sling manufacturer.

**Hoisting**

- (2) Chain used for hoisting shall be approved by the chain manufacturer for hoisting.
- (3) Proof coil and transport chain shall not be used for hoisting.

**Defects**

- (4) A chain sling shall be removed from service or repaired by a qualified person to the original manufacturer's specification or to the specifications of a professional engineer if the chain has defects such as stretch, deformation, cracks, nicks, gouges, corrosion or burned links.
- (5) A chain sling shall be permanently removed from service when the chain link wear is more than the maximum allowed by the manufacturer.
- (6) Where the manufacturer does not specify removal criteria, a chain shall be permanently removed from service when the chain size at any point of the link is reduced to the values given in Table 5-3.

<b>Table 5-3 Allowable Chain Wear</b>			
<b>Chain size</b>		<b>Minimum allowable chain size at any point of link</b>	
metres	inches	metres	inches
0.0063	$\frac{1}{4}$	0.0059	$\frac{15}{64}$
0.01	$\frac{3}{8}$	0.008	$\frac{19}{64}$
0.013	$\frac{1}{2}$	0.01	$\frac{25}{64}$
0.016	$\frac{5}{8}$	0.012	$\frac{31}{64}$
0.019	$\frac{3}{4}$	0.015	$\frac{19}{32}$
0.022	$\frac{7}{8}$	0.018	$\frac{45}{64}$
0.025	1	0.021	$\frac{13}{16}$
0.029	$1-\frac{1}{8}$	0.023	$\frac{29}{32}$
0.032	$1-\frac{1}{4}$	0.025	1
0.035	$1-\frac{3}{8}$	0.028	$1-\frac{3}{32}$
0.038	$1-\frac{1}{2}$	0.030	$1-\frac{3}{16}$
0.044	$1-\frac{3}{4}$	0.036	$1-\frac{13}{32}$

- Inspection** (7) A chain sling shall be thoroughly inspected at least once each year and a record of the inspection maintained.

### **SYNTHETIC WEB SLINGS**

- Markings** 5.47 (1) Synthetic fibre web slings shall be permanently identified with the
- (a) manufacturer's name or mark,
  - (b) manufacturer's code or stock number,
  - (c) working load limits for the types of hitches permitted, and
  - (d) type of synthetic web material.
- Temperature restriction** (2) Synthetic fibre web slings shall not be exposed to a temperature above 82 degrees C (180 degrees F) unless permitted by the manufacturer.
- Removal from service** (3) A synthetic fibre web sling shall be removed from service when
- (a) the length of an edge cut exceeds the web thickness,
  - (b) the penetration of abrasion exceeds 15% of the webbing thickness taken as a proportion of all plies,
  - (c) abrasion occurs on both sides of the webbing and the sum of the abrasion on both sides exceeds 15% of the webbing thickness taken as a proportion of all plies,
  - (d) warp thread damage up to 50% of the sling thickness extends to within one-quarter of the sling width of the edge or exceeds one-quarter of the width of the sling,
  - (e) warp thread damage to the full depth of the sling thickness extends to within one-quarter of the sling width of the edge or the width of damage exceeds one-eighth of the width of the sling.
  - (f) weft thread damage allows warp thread separation exceeding one-quarter of the width of the sling and extends in length more than twice the sling width,
  - (g) any part of the sling is melted or charred, or is damaged by acid, caustic or other substance,
  - (h) stitches in load-bearing splices are broken or worn,
  - (i) end fittings are excessively pitted, corroded, cracked, distorted or broken, or
  - (j) any combination of lesser amounts of the above types of damage has a similar total negative effect on the integrity of the sling.

### **METAL MESH SLINGS**

- Markings** 5.48 (1) A metal mesh sling shall be permanently identified with
- (a) the manufacturer's name or mark, and
  - (b) the working load limit for vertical basket hitch and choker hitch configurations.
- Removal from service** (2) A metal mesh sling shall be removed from service if any of the following damage is visible:
- (a) a broken weld or a broken brazed joint along the sling edge,
  - (b) a broken wire in any part of the mesh,
  - (c) reduction in wire diameter of 25% due to abrasion or 15% due to corrosion,
  - (d) lack of flexibility due to distortion of the mesh,
  - (e) distortion of the choker fitting so that the depth of the slot is increased by more than 10%,

- (f) distortion of either end fitting so that the width of the eye opening is decreased by more than 10%,
- (g) a 15% reduction of the original cross-sectional area of metal at any point around the hook opening or end fitting,
- (h) visible distortion of either end fitting, or
- (i) a cracked end fitting.

#### **BELOW-THE-HOOK LIFTING DEVICES**

- |                      |             |  |
|----------------------|-------------|--|
| <b>Spreader bars</b> | <b>5.49</b> | (1) Spreader bars and other specialized below-the-hook lifting devices shall be constructed, inspected, installed, tested, maintained and operated according to the requirements of <i>ASME Standard B30.20-1993, Below-the-Hook Lifting Devices</i> , or certified by a professional engineer or other similar standard acceptable to the director.         |
| <b>Markings</b>      |             | (2) A nameplate or other permanent marking shall be on a spreader bar or specialized below-the-hook lifting device and display the <ul style="list-style-type: none"> <li>(a) manufacturer's name and address,</li> <li>(b) serial number,</li> <li>(c) weight of the device, if more than 45 kg (100 lbs.), and</li> <li>(d) working load limit.</li> </ul> |
|                      |             | (3) A spreader bar and any other specialized below-the-hook lifting device shall be considered part of the lifted load.  |

#### **BRIDGE, GANTRY AND OVERHEAD TRAVELING CRANES**

- |                              |             |   |
|------------------------------|-------------|---|
| <b>Load testing</b>          | <b>5.50</b> | (1) A bridge, gantry or overhead traveling crane installed after the effective date of these Regulations, or such a crane or its runway that has been significantly modified shall be load tested before being put into service as follows: <ul style="list-style-type: none"> <li>(a) all crane motions shall be tested under loads of 100% and 125% of the rated capacity for each hoist on the crane, and the crane shall be able to safely handle a load equal to 125% of the rated capacity.</li> <li>(b) all limit-switches, brakes and other protective devices shall be tested when the crane is carrying 100% of the rated capacity,</li> <li>(c) structural deflections shall be measured with loads of 100% and 125% of the rated capacity and not exceed the allowable deflections specified by the applicable design standard, and</li> <li>(d) the load shall travel over the full length of the bridge and trolley runways during the 100% and 125% load tests, and only the parts of runways that have been successfully load tested shall be placed into service.</li> </ul> |
| <b>Records</b>               |             | (2) A record of all load tests shall be maintained giving details of the tests, verification of the loads used, and signed by the person conducting the tests.  |
| <b>Replacement equipment</b> |             | (3) A replacement crane or hoist, load tested in the manufacturer's facility, shall be installed on an existing runway only if the replacement unit has a rated capacity and gross weight equal to or less than the previously tested rating for the runway.  |
|                              |             | (4) Where the runway referred to in subsection (3) has been modified, it shall be recertified by a professional engineer prior to returning to service.   |
| <b>Up-travel limit</b>       | <b>5.51</b> | (1) A bridge, gantry or other overhead traveling crane shall have a device that prevents hook travel beyond the safe upper limit at all design hoist speeds.  |



- (2) The up-travel limit device required by subsection (1) shall be tested as each shift starts, and the test results recorded in the equipment record system.
  - (3) A bridge, gantry, or overhead traveling crane operated by a pendant or remote control, shall have markings on the crane structure or building visible to the operator, clearly indicating the direction of hook, bridge and trolley motions that are compatible with the markings on the controls.
- Electrical conductors**      **5.52**    (1) Electrical conductors for the bridge and trolley shall be located or guarded to prevent contact by workers.
- (2) An electrically powered crane, other than a monorail crane built prior to January 1, 1985, shall have a means for the operator to safely interrupt the main electric circuit under any load condition.
- Manually powered hoists**      **5.53**    (1) A manually powered hoist shall have a ratchet and pawl, load brake, or other mechanism to hold the load at any height.
- (2) The crank handle for a crank operated winch without automatic load brakes shall be
- (a) prevented from slipping off the crankshaft while hoisting, and
  - (b) removed from the crankshaft before the load is lowered.

**MOBILE CRANES, BOOM TRUCKS AND AERIAL LADDER CRANES**

- Carrier vehicle**              **5.54**    The carrier vehicle of a mobile crane, boom truck or aerial ladder crane shall meet the applicable requirements of Part 6 – Mobile Equipment.
- Load weight indicators**    **5.55**    (1) A mobile crane or boom truck with a rated capacity of 10 tonnes (11 tons) or more shall
- (a) have a device that measures and indicates the weight of the load on the load hook, or
  - (b) disengage crane functions preventing the mobile crane or boom truck from lifting beyond the rated capacity, and
  - (c) have a load indicating device that meets the requirement of *ANSI/SAE Recommended Practice J376-APR85, Load Indicating Devices in Lifting Crane Service*, or other similar standard acceptable to the director.
- Level turntable**              **5.56**    (1) A mobile crane or boom truck shall be operated with the turntable level, except as permitted by the manufacturer.
- (2) Level-indicating devices shall be provided to permit the operator to determine whether the crane turntable or boom truck frame is level within the limits specified by the manufacturer.
- Outriggers and stabilizers**   **5.57**    (1) Outrigger beams, jacks and stabilizers shall be deployed as specified by the crane or boom truck manufacturer, if required to meet load chart requirements.
- (2) Outrigger beams on a crane or boom truck shall be marked to indicate when the necessary extension has been achieved.
- (3) Outrigger beams on a crane or boom truck shall be secured against retraction where required by the manufacturer.
- (4) Floats shall be secured to the outrigger jacks of a crane or boom truck when outriggers are used.
- Tires**                              **5.58**    When the lifting equipment of a mobile crane or boom truck is supported on rubber tires, the tires shall be of the type, condition and inflation specified by the manufacturer.

**Supporting surface**      **5.59**      (1) Mobile crane or boom trucks shall only be used on a surface capable of supporting the equipment and any hoisted load without failure.

(2) When using a mobile crane or boom truck adjacent to an excavation, slope or backfilled area, a safe location for the equipment used in the hoisting operations shall be determined by the operator prior to making a lift.

**Travel with a load**      **5.60**      A loaded mobile crane or boom truck shall only travel if the load is within the limits set by the crane manufacturer

**Inspection intervals**      **5.61**      (1) Mobile cranes or boom trucks, and aerial ladder cranes shall be inspected and certified by a professional engineer

(a) prior to initial service,

(b) after any damage and subsequent repair, and

(c) if the crane has been overstressed.

(2) Mobile cranes, boom trucks and aerial ladder cranes shall be inspected in accordance with good engineering practice at intervals not exceeding 12 months, and certified as safe for use by a professional engineer, the crane manufacturer or the crane manufacturer's authorized representative.

(3) When mobile cranes, boom trucks or aerial ladder cranes are temporarily located at a remote workplace at the time of the inspection in subsection (2), the annual inspection and certification required by subsection (2) shall not be delayed more than 3 months.

(4) A crane boom used for driving piles with a vibratory hammer shall be inspected in accordance with good engineering practice, and certified safe for continued use by a professional engineer at least every 3 months, and before being returned to lifting service.

(5) A crane boom used with a vibratory pile extractor or for dynamic compaction shall be inspected in accordance with good engineering practice, and certified safe for continued use by a professional engineer at least monthly, and before being returned to lifting service.

(6) A telescopic boom on a mobile crane or boom truck shall be completely disassembled and inspected in accordance with good engineering practice at the intervals specified in a standard acceptable to the director, and certified safe for use by a professional engineer or the manufacturer.

#### **WIRE ROPE ON MOBILE CRANES**

**Safety factors**      **5.62**      (1) The owner and supplier of a mobile crane shall ensure that, unless otherwise specified by the crane or wire rope manufacturer, the minimum design factor on a mobile crane, based on the breaking strength for wire rope, shall be

(a) for conventional wire rope

i. 2.5 for pendant lines, 3 for boom hoist reeving and 3.5 for load lines during erection,

ii. 3 for pendant lines, 3.5 for boom hoist reeving and 3.5 for load lines at all times except during erection, and

iii. 5 for wire rope of non-rotating construction.

(2) Natural fibre rope shall not be used for hoisting with a powered hoist.

**Wedge socket**      **5.63**      (1) Where a wedge socket is used as a wire rope termination on a mobile crane, the dead end of the rope shall be secured to prevent release of the wedge or rope slippage at the socket.

- Lubrication** (2) Wire rope on a mobile crane shall be lubricated periodically as specified by the manufacturer, to prevent strength loss due to premature wear or corrosion.
- Secured to drum** (3) A rope on a mobile crane shall be secured to its winding drum, unless the line is purposely designed to automatically disengage from the drum.
- Fastening to drum** (4) A rope on a mobile crane shall not be fastened to a drum by a knot tied in the rope.
- Spooling** (5) Rope on a mobile crane shall be spooled onto a drum according to the manufacturer's instructions.
- 5 wraps** (6) At least five full wraps of rope shall remain on winding drums when the load hook is in the lowest position.
- Splicing** (7) Pulling and pulled lines shall be connected by a suitable splice, or a cable pulling sock shall fully enclose both line ends whenever a worker may be endangered by failure of the connection between the two lines while reeving lines through sheaves or blocks.
- Guides** (8) Workers shall not use their hands or feet or any hand-held object to guide the rope onto a drum except as permitted by subsection (9).  
(9) Where a steel guide bar is used to guide rope onto a drum in an emergency
  - (a) the line speed shall be kept as low as practicable, and
  - (b) the worker shall be positioned to be clear of the drum.

**GUYLINES**

- Capacity** 5.64 (1) The strength of each guyline and its anchor shall exceed the breaking strength of the load-line rigging arrangement.
- Angle** (2) A guyline anchor shall be placed so that the interior angle, between the guyline and the horizontal plane, does not exceed 45°.
- Loading** (3) Guylines shall be arranged so that the hoisting line pull in any direction is shared by 2 or more guys.
- Alternate** (4) Where guylines and anchor systems must deviate from the requirements of subsections (2) and (3), they shall be certified by a professional engineer.

**TOWER CRANES**

- Tower crane support** 5.65 Prior to the erection of a tower crane, a professional engineer shall certify
  - (a) that the foundation is adequate to support the crane,
  - (b) the design of shoring and bracing to support a tower crane, and later shall certify that the shoring and bracing has been constructed according to the design, and
  - (c) the connections to, and any bracing or shoring of, a building or structure necessary to support the tower crane, if the tower crane is supported partially or fully by, or connected to, a building or structure.
- Certification** 5.66 The erector of a tower crane shall
  - (a) verify in writing that the crane has been erected according to the manufacturer's specifications or according to the instruction of a professional engineer before the crane is put in service.
  - (b) provide certification from a professional engineer if a tower crane is not erected according to the manufacturer's specifications certifying that it is safe for use before the crane is put in service.

- (c) provide certification from a professional engineer before a tower crane is used following repositioning of the mast, certifying that the parts of the crane affected by the climbing process have been properly installed and any required re-shoring for, and bracing to, the supporting structure is in place, and
  - (d) refer to the unique identification used to identify the structural components of tower cranes when referring to structural components in reports for inspection and testing, and certifications for repairs and modifications.
- Structural inspection and repair**      **5.67**
- (1) Before erecting a tower crane, the structural components shall be
    - (a) inspected to determine their integrity by a qualified person using non-destructive testing (NDT) methods meeting the requirements of the Canadian General Standards Board (CGSB) or other methods acceptable to the director, and
    - (b) be repaired as necessary and such repairs certified by a professional engineer as safe for use.
  - (2) Every 12 months a tower crane shall
    - (a) have its structural components inspected to determine their integrity by a qualified person using NDT methods meeting the requirements of the CGSB or other methods acceptable to the director, and
    - (b) after the inspection required by paragraph (a), be certified by a professional engineer as safe for use.
  - (3) If a tower crane is scheduled to be dismantled within 15 months of erection, it shall be inspected and certified prior to the next erection of the crane, after permission is received from the director for the delay.
- Housekeeping**
- (4) Tower crane structures shall be kept clean and free of concrete and other debris that can hinder inspection, and the base area shall be clear of debris and accumulation of water.
- Records**
- (5) The manufacturer's manual and current records pertaining to operation, inspection and repair of a tower crane shall be kept at the workplace while the crane is erected.
- Counterweights**      **5.68**
- (1) Counterweights used on a tower crane shall be as specified by the original equipment manufacturer or by a professional engineer.
  - (2) Counterweight elements used on a tower crane shall be weighed and the weight clearly and durably marked on each element.
  - (3) The weight of the counterweights installed on a tower crane shall be entered in the equipment record system, or on the erector's checklist and be available at the workplace.
- Limit devices**      **5.69**
- (1) A tower crane shall have automatic travel limit switches and automatic overload protection devices that prevent
    - (a) overloading at any trolley position,
    - (b) the load block from traveling beyond the highest allowable position specified by the manufacturer, and
    - (c) the trolley from traveling beyond the allowable limit specified by the manufacturer.
  - (2) Tower crane limit devices shall be tested at the start of every shift or more frequently if specified by the crane manufacturer, and a permanent record of the test shall be kept.
  - (3) Any malfunction of a tower crane's automatic limit or safety device shall be remedied before the crane is used again.

<b>Test blocks</b>	<b>5.70</b>	<ul style="list-style-type: none"> <li>(1) Blocks for testing overload protection devices on a tower crane shall be available at the tower crane site.</li> <li>(2) The weights of test blocks shall be as specified by the crane manufacturer, and the weight shall be accurately determined and durably and legibly marked on each block.</li> <li>(3) Lifting eyes in test blocks for a tower crane shall conform to the requirements of this Part.</li> </ul>
<b>Freedom to slew</b>	<b>5.71</b>	<ul style="list-style-type: none"> <li>(1) Tower cranes shall be able to slew 360° at all times and maintain the clearances required by subsection (3), unless otherwise specified by the crane manufacturer.</li> <li>(2) Where an unattended crane is allowed to slew, the empty load block shall be raised near its top position and located at minimum radius.</li> </ul>
<b>Minimum clearance</b>		<ul style="list-style-type: none"> <li>(3) A tower crane shall have a minimum vertical clearance of 1 m (3.3 ft.) and a lateral clearance of 0.3 m (1 ft.) between any component of the tower crane and any obstruction, under all load conditions.</li> </ul>
<b>Access ladders</b>	<b>5.72</b>	<ul style="list-style-type: none"> <li>(1) An access ladder shall be fixed in position on the mast and crown of a tower crane.</li> <li>(2) An access ladder on a tower crane shall be able to support two 1.1 kN (250 lbs.) point loads between any two consecutive attachment points, and there shall be a minimum horizontal distance of 0.15 m (6 in.) between the rung and the object to which the ladder is attached.</li> <li>(3) Landing platforms shall be provided at least every 9 m (30 ft.) on the access ladder.</li> <li>(4) Each section of access ladder shall be offset horizontally from adjacent sections or the landing platforms shall have trap doors.</li> <li>(5) Where a section of a ladder on a tower crane has a climb exceeding 6 m (20 ft.) in length, that section of ladder shall have <ul style="list-style-type: none"> <li>(a) a ladder safety cage 0.68 m to 0.76 m (27 in. to 30 in.) in diameter, installed from a point 3 m (10 ft.) from the landing, or</li> <li>(b) a ladder safety fall arrest device.</li> </ul> </li> </ul>
<b>Jib access</b>	<b>5.73</b>	<p>Each tower crane jib shall have a continuous catwalk from the mast to the tip, meeting the following requirements:</p> <ul style="list-style-type: none"> <li>(a) the catwalk shall be at least 0.3 m (12 in.) wide and constructed with a non-skid surface,</li> <li>(b) a handline approximately 1 m (39 in.) high and a midline shall be provided on both sides of the catwalk, not more than 0.3 m (12 in.) from the outside edge of the catwalk and be supported at an interval not exceeding 3 m (10 ft.), and</li> <li>(c) the handline and midline shall be wire rope of at least 0.01 m (<sup>3</sup>/<sub>8</sub> in.) diameter, or</li> <li>(d) where adequate handlines are not provided, alternative means of fall protection such as a horizontal lifeline system shall be provided in accordance with Part 1 – General.</li> </ul>
<b>Hoisting rope</b>	<b>5.74</b>	<ul style="list-style-type: none"> <li>(1) The hoisting rope on a tower crane shall be shortened by the removal of 3 m (10 ft.) at the dead end after every 3 months of use unless otherwise specified by the manufacturer.</li> <li>(2) The hoisting rope on a tower crane shall be properly seized before cutting.</li> </ul>
<b>Weather limitations</b>	<b>5.75</b>	<ul style="list-style-type: none"> <li>(1) An anemometer, readable by the operator at the crane controls, shall be mounted on the crown, apex or operator's cab of each tower crane.</li> </ul>

- (2) Tower crane operations shall stop when
  - (a) the wind speed exceeds the maximum permitted wind speed for safe operation of the crane as specified by the manufacturer, or
  - (b) the operator determines a load cannot be handled safely because of wind.
- (3) In the absence of manufacturer's specifications for maximum permitted wind speed during crane operation, the maximum allowable wind speed in which a tower crane is used shall be 50 km/h (30 mph) or less if a load cannot be handled safely because of wind.
- (4) Tower crane operations shall stop when the ambient temperature drops below -18 degrees C (0 degrees F) or as otherwise specified by the crane manufacturer or a professional engineer.

### **CONSTRUCTION MATERIAL HOISTS**

- |                          |             |  |
|--------------------------|-------------|--|
| <b>Installation</b>      | <b>5.76</b> | (1) Before a heavy duty construction material hoist is used a professional engineer shall certify that it has been properly installed or that support sections or other devices have been properly added or removed.   |
| <b>Capacity</b>          |             | (2) The net rated capacity of each construction material hoist shall be clearly and durably marked upon the hoist structure in letters or figures at least 0.05 m (2 in.) high in a location visible to workers involved with operation of the hoist.  |
| <b>No riders</b>         |             | (3) Each hoist shall prominently display a notice stating that no person may ride on the equipment.  |
| <b>Interlocks</b>        |             | (4) A construction material hoist more than 21 m (70 ft.) in height shall have an interlock system that <ul style="list-style-type: none"> <li>(a) prevents movement of the hoist platform when a gate is open at any landing, and</li> <li>(b) prevents all gates from opening, except the gate of the landing where the platform is located.</li> </ul>  |
| <b>Covered entrance</b>  |             | (5) A substantial covering shall be provided over a construction material hoist platform entrance if there is a possibility of material falling into the platform entrance area.   |
| <b>Platforms</b>         |             | (6) A construction material platform shall have guardrails and toeboards installed, as outlined in Part 1 – General.   |
| <b>Runway</b>            |             | (7) A runway to a construction material hoist shall have a substantial floor at least equal in width to the loading side of the hoist platform, curbs and guardrails, if 1.2 m (4 ft.) or more above grade.<br><br>(8) A construction material hoist tower shall be erected, maintained and dismantled by or under the direct supervision of qualified personnel.  |
| <b>Brakes and limits</b> | <b>5.77</b> | (1) Where a construction material hoist winch drum is fitted with a ratchet-and-pawl mechanism, the mechanism shall be clearly visible and accessible to the operator.<br><br>(2) Electrically operated brakes on a construction material hoist shall apply automatically if there is a power failure.<br><br>(3) A construction material hoist shall have devices to prevent the platform, loaded up to rated capacity, from falling if the hoisting rope fails.<br><br>(4) A construction material hoist shall have devices that automatically stop the platform at the upper and lower limits of travel and effectively prevent |

platform motion under overload conditions.

- (5) Motor thermal overload protection devices shall not be used to meet the requirements of subsection (4).
- (6) A construction material hoist powered by an internal combustion engine, or a hoist without automatically applied brakes, shall have spring-loaded pawls that engage ratchets on the winch drums.

**Operators**

**5.78**

- The hoist operator shall be authorized to operate the equipment and shall
- (a) demonstrate competency to the supervisor, including familiarity with operating instructions and signal codes used with the equipment,
  - (b) ensure that safety devices are working properly before operating the hoist and keep the load within safe limits,
  - (c) not leave the construction material hoist controls unattended unless the platform is at grade level, and
  - (d) engage the pawls whenever material is being placed on or removed from the construction material hoist platform.

**Testing and inspection**

**5.79**

- (1) Control devices for a construction material hoist, including hoist control switches, hoist drum brakes, and hoist signal systems, shall be tested on each shift and be in safe condition before use.
- (2) Safety devices for a construction material hoist, including upper and lower travel limit switches, landing door interlocks and rope guides, shall be tested weekly.
- (3) Slack-cable and load-limit devices shall be tested monthly, unless more frequent testing is specified by the manufacturer of the construction material hoist.
- (4) A construction material hoist installation shall be inspected weekly unless the manufacturer specifies more frequent inspections.
- (5) A permanent record of each test and the test result shall be maintained and readily available for review by a safety officer or the hoist operator.

**Signal systems**

**5.80**

- (1) Where hand signals are used to control construction material hoist operations
  - (a) the hoist shall not exceed 21 m (70 ft.) in height, and
  - (b) the operator shall have a clear and unobstructed view of all hoist landings and of the signaller.
- (2) A signal system, designed to inform the operator of the level from which each signal originates and the platform motion required, shall be installed at all hoist landings and at the operator's position if the operator of a construction material hoist does not have a clear and unobstructed view, or if the hoist is more than 21 m (70 ft.) in height.
- (3) Means shall be provided to indicate the floor level of the construction material hoist platform if the hoist is over 21 m (70 ft.) in height, or if all hoist landings are not clearly visible to the operator.
- (4) The hoist operator shall not move the construction material hoist platform until informed by a signal that the equipment is clear for movement.
- (5) The following signals shall be used if a bell or a light is used to signal the movement of a construction material hoist platform:
  - 1 bell or light..... Stop
  - 2 bells or lights..... Raise
  - 3 bells or lights..... Lower
  - 4 bells or lights..... All clear





- Hoist installation** (3) An automotive lift, shop crane, jack or other vehicle support shall be assembled and installed by a qualified person, in accordance with the manufacturer's instructions and recommendations.
- Modifications** (4) The operation, inspection, maintenance and modification of a vehicle support or lift shall be in accordance with the manufacturer's instructions or the written instructions of a professional engineer.
- Inspection** (5) An automotive hoist or lift shall be inspected and tested at least monthly, or more often if required by the manufacturer.
- Records of inspection and maintenance** (6) An inspection and maintenance record shall be kept at the workplace for each hoist or lift and every inspection, maintenance, repair or modification logged into the record system.
- Load limit marked** (7) The manufacturer's rated load capacity or that of a professional engineer shall be marked on each hoist, lift, jack, shop crane, axle stand, ramp or other vehicle support and the load limit shall not be exceeded.
- Controls** (8) The controls for an automotive hoist or lift shall require constant pressure when raising or lowering the unit and the control lever shall return to the neutral position when pressure is released.

# INDEX

## PART 5 – CRANES, HOISTING AND LIFTING

	Page
<b>ALLOY STEEL CHAIN SLINGS</b> .....	<b>5-13</b>
Defects .....	5-13
Hoisting .....	5-13
Inspection .....	5-14
Markings.....	5-13
<b>AUTOMOTIVE HOISTS AND VEHICLE SUPPORTS</b> .....	<b>5-23</b>
Controls .....	5-24
Hoist installation .....	5-24
Inspection .....	5-24
Load limit marked .....	5-24
Modifications .....	5-24
Records of inspection and maintenance.....	5-24
Standards for hoists.....	5-23
Standards for portable lifting devices .....	5-23
<b>BELOW-THE-HOOK LIFTING DEVICES</b> .....	<b>5-15</b>
Markings.....	5-15
Spreader bars.....	5-15
<b>BRIDGE, GANTRY AND OVERHEAD TRAVELING CRANES</b> .....	<b>5-15</b>
Electrical conductors .....	5-16
Load testing.....	5-15
Manually powered hoists .....	5-16
Records .....	5-15
Replacement equipment.....	5-15
Up-travel limit .....	5-15
<b>CONSTRUCTION MATERIAL HOISTS</b> .....	<b>5-21</b>
Brakes and limits .....	5-21
Capacity .....	5-21
Covered entrance .....	5-21
Installation .....	5-21
Interlocks .....	5-21
No riders.....	5-21
Operators .....	5-22
Platforms .....	5-21
Runway .....	5-21
Signal systems .....	5-22
Testing and inspection.....	5-22
<b>DEFINITIONS</b> .....	<b>5-1</b>
<b>EQUIPMENT OPERATION</b> .....	<b>5-7</b>
Calibration .....	5-8
Certification of tower crane operators.....	5-8
Load weight .....	5-8
Operator qualifications.....	5-7
Start of shift inspection .....	5-8
Training requirements.....	5-7
<b>GENERAL</b> .....	<b>5-3</b>
Access and egress .....	5-4
Audible warning.....	5-4

Boom angles .....	5-3
Boom extension.....	5-3
Boom stops .....	5-5
Cabs .....	5-5
Capacity markings .....	5-3
Certification .....	5-4
Controls .....	5-5
Design factors of safety .....	5-6
Design identification .....	5-6
Drop stops .....	5-4
Equipment capacities .....	5-3
Fenders .....	5-5
Hoisting molten metal .....	5-5
Identification of crane and components .....	5-3
Inspection, maintenance and repairs.....	5-3
Lifting workers .....	5-7
Load chart .....	5-3
Manufacturer's manual.....	5-3
Modifications .....	5-4
Operator protection.....	5-5
Qualified riggers .....	5-6
Rated capacity.....	5-3
Records .....	5-4
Seats .....	5-6
Storage.....	5-6
Two block prevention.....	5-5
Use of rigging .....	5-6
Windows .....	5-5
Worker positioning.....	5-6
<b>GIN POLES AND A-FRAMES .....</b>	<b>5-23</b>
Cap and sheaves.....	5-23
Inclined poles .....	5-23
<b>GUYLINES .....</b>	<b>5-18</b>
Alternate .....	5-18
Angle .....	5-18
Capacity .....	5-18
Loading.....	5-18
<b>HOOKS, PINS AND SHEAVES .....</b>	<b>5-11</b>
Hook rejection criteria.....	5-11
Safety latch.....	5-11
Shackles.....	5-11
Sheave .....	5-11
<b>LIFTS .....</b>	<b>5-8</b>
Contact with loads and structures.....	5-8
Dedicated radio system .....	5-9
High voltage electrical conductors .....	5-10
Induced voltage .....	5-9
Loads over work areas or workers.....	5-9
Multiple crane lift.....	5-9
Position of equipment.....	5-9
Riding hook or load.....	5-9
Signals.....	5-9
Swing hazards .....	5-8
Traveling with a load.....	5-9
Unsafe lift .....	5-8

<b>METAL MESH SLINGS</b> .....	<b>5-14</b>
Markings .....	5-14
Removal from service .....	5-14
<b>MOBILE CRANES, BOOM TRUCKS AND AERIAL LADDER CRANES</b> .....	<b>5-16</b>
Carrier vehicle .....	5-16
Inspection intervals .....	5-17
Level turntable .....	5-16
Load weight indicators .....	5-16
Outriggers and stabilizers .....	5-16
Supporting surface .....	5-17
Tires .....	5-16
Travel with a load .....	5-17
<b>PILE DRIVING AND DREDGING</b> .....	<b>5-23</b>
Exhaust .....	5-23
Hose restraints .....	5-23
Leads .....	5-23
Operating procedures .....	5-23
Roofs .....	5-23
<b>ROOFER'S HOISTS</b> .....	<b>5-23</b>
Counterweights .....	5-23
Operator .....	5-23
<b>SLINGS</b> .....	<b>5-11</b>
Construction .....	5-12
Damage .....	5-12
Inspection .....	5-11
Makeshift components .....	5-12
Padding .....	5-11
Selection for lifts .....	5-12
Standards .....	5-11
Storage .....	5-11
Temperature .....	5-12
Working load limit .....	5-12
<b>STANDARDS</b> .....	<b>5-1</b>
General .....	5-1
Standards .....	5-1
<b>SYNTHETIC WEB SLINGS</b> .....	<b>5-14</b>
Markings .....	5-14
Removal from service .....	5-14
Temperature restriction .....	5-14
<b>TOWER CRANES</b> .....	<b>5-18</b>
Access ladders .....	5-20
Certification .....	5-18
Counterweights .....	5-19
Freedom to slew .....	5-20
Hoisting rope .....	5-20
Housekeeping .....	5-19
Jib access .....	5-20
Limit devices .....	5-19
Minimum clearance .....	5-20
Records .....	5-19
Structural inspection and repair .....	5-19
Test blocks .....	5-20
Tower crane support .....	5-18
Weather limitations .....	5-20

<b>WIRE ROPE CLIPS AND TERMINATION EFFICIENCY .....</b>	<b>5-10</b>
Cable clips.....	5-10
Capacity reduction.....	5-10
Number and positioning.....	5-10
Restriction on fold back eyes.....	5-10
Types.....	5-10
Wire rope rejection criteria.....	5-10
<b>WIRE ROPE ON MOBILE CRANES .....</b>	<b>5-17</b>
5 wraps.....	5-18
Fastening to drum.....	5-18
Guides .....	5-18
Lubrication.....	5-18
Safety factors .....	5-17
Secured to drum .....	5-18
Splicing.....	5-18
Spooling .....	5-18
Wedge socket.....	5-17