



CAN/CSA-B167-96
safety Standard for
Maintenance and Inspection of
Overhead Cranes, Gantry
Cranes, Monorails, Hoists, and
Trolleys

A National Standard of Canada
(Reaffirmed 2002)

Please Note: Δ Refers to a formally approved
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Preface

This is the second edition of CSA Standard B167, *Safety Standard for Maintenance and Inspection of Overhead Cranes, Gantry Cranes, Monorails, Hoists, and Trolleys*, and is intended to coexist with the first edition until CSA Standard Z202 is published (see below). The first edition, published in 1964, was titled *General Purpose Electric Overhead Travelling Cranes* and covered both the design and testing aspects of cranes. This current edition deals only with the safety aspects involved in testing and inspecting these devices. The intent was to define a set of standards dealing with inspection and maintenance safety, as a distinct consideration from design. The design and testing aspects are to be included in CSA Standard Z202, which is under development.

The requirements result from a consensus of the Committee members, who represent a broad spectrum of interests.

It should be understood that this Standard covers a minimum level of safety. It does not have the force of law unless adopted officially by the various jurisdictions. The user is therefore advised to consult the jurisdiction having authority as to the extent of the adoption of this Standard, since it may have been adopted as written, with exemptions, or with additions.

This Standard was prepared by the Technical Committee on General Purpose Electric Overhead Travelling Cranes under the jurisdiction of the Standards Steering Committee on Public Safety and was approved by both Committees. Although initially published only as a CSA Standard, it will be submitted for approval as a National Standard of Canada to the Standards Council of Canada.

December 1996

Notes:

- (1) Use of the singular in this Standard does not exclude the plural (and vice versa) when the sense allows.
- (2) Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.
- (3) This publication was developed by consensus, which is defined by CSA Regulations Governing Standardization as "*substantial agreement reached by concerned interests. Consensus includes an attempt to remove all objections and implies much more than the concept of a simple majority, but not necessarily unanimity.*" It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of the publication.
- (4) CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.
- (5) All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, Standards Development, 178 Rexdale Boulevard, Etobicoke, Ontario M9W 1R3.

Requests for interpretation should

- (a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;
- (b) provide an explanation of circumstances surrounding the actual field condition; and
- (c) be phrased where possible to permit a specific "yes" or "no" answer.

Interpretations are published in CSA's periodical Info Update. For subscription details, write to CSA Sales Promotion, Info Update, at the address given above.

B167-96

Safety Standard for Maintenance and Inspection of Overhead Cranes, Gantry Cranes, Monorails, Hoists, and Trolleys

1. Scope

1.1 General

This Standard specifies the minimum requirements for inspection, testing, and maintenance of overhead cranes, monorails, hoists, trolleys, jib cranes, gantry and wall cranes, and other equipment having the same fundamental characteristics.

1.2 Log Book

Equipment covered by this Standard shall have a register in the form of a log book, for recording all findings as a result of inspections, maintenance, repairs, and modifications. The log book shall be available for review during the entire life of the equipment.

2. Definitions

2.1

The following definitions apply in this Standard.

Critical components -- those components which may affect the safe load-carrying capacity of the equipment within the scope of the original design and through its full-rated capacity.

Designated -- selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

Overload -- any load greater than the rated load.

Qualified -- a person who, by possession of a recognized degree or a certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

Rated load (capacity) -- the maximum load designated by the manufacturer for which a crane or individual hoist is designed and built.

Special service -- that equipment which is not being used in the classification for which it has been designed or is subject to adverse conditions or environment

Out of service -- that equipment which has been idle for more than one month but less than one year.

3. Reference Publication

3.1

This Standard refers to the following publication and where such reference is made it shall be to the edition listed below.

CSA Standard

W59-1989,

Welded Steel Construction (Metal Arc Welding).

4. Inspection

4.1 Experience

A crane inspector shall have a minimum 10 000 h of experience relating to the inspection, maintenance, repairs, and modification of equipment described in Clause 1.1, which shall include training in and knowledge of applicable legislation, safety practices, and standards. It is acceptable that crane inspection be performed by a team having combined equivalent qualifications under the supervision of a crane inspector or Professional Engineer.

4.2 Inspection Criteria

Critical components that affect the safe operation of a hoist or crane, as specified (listed) by the manufacturer, shall be inspected in accordance with the inspection criteria or procedures indicated by the manufacturer.

If such a list is not available, or if there is any doubt as to whether a component is safety-related, a Professional Engineer shall make a list of critical components and provide inspection criteria and procedures for each critical component.

4.3 Inspection Records

A dated and signed report shall be kept in the log book on critical components, determining that the hoist or crane is capable of lifting, lowering, supporting, and operating at the maximum rated load.

Verification shall be provided that the supporting structure has been designed and installed to support the maximum rated load.

The log book shall be available to any person involved in the inspection, maintenance, and/or operation of the lifting equipment.

4.4 Inspection Classification

4.4.1 Initial Inspection

4.4.1.1 General

Prior to initial use, all new, reinstalled, modified, or rebuilt equipment (as per Clause 1.1) shall be inspected by (a) crane inspector(s) to ensure compliance with the applicable provisions of this Standard and CSA Standard Z202, as well as to ensure that the supporting structure has been approved by a Professional Engineer to carry the maximum rated load.

Note: *Until the publication of CSA Standard Z202, the applicable requirements of CSA Standard B167-1964 shall be used.*

4.4.1.2 Keeping Records

Records of the initial inspection, outlining the date, inspector's name, and summary of the findings, shall be kept and made available to the operator or crane inspector(s), or both.

4.4.2 Inspections

4.4.2.1 Inspections for Cranes in Regular Use

Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspections should be performed. The intervals are dependent upon the nature of the components of the crane, as outlined in Clause 4.2, and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are designated as operational and periodic, with respective intervals between inspections as defined in more detail by the classification criteria in CSA Standard Z202.

4.4.2.2 Inspections for Cranes Not in Regular Use

Cranes that are not in regular use shall be inspected before being placed into service.

- (a) A crane that is used in infrequent service, or is out of service, shall be inspected in accordance with Clause 4.4.4.1.
- (b) A crane that has been out of service for more than one year shall be inspected in accordance with Clause 4.4.5.3.

4.4.3 Service Classes

4.4.3.1 Class A (Standby or Infrequent Service)

This service class covers cranes that may be used in installations such as powerhouses, public utilities, turbine rooms, motor rooms, and transformer stations, where precise handling of equipment at slow speeds with long, idle periods between lifts are required. Capacity loads may be handled for initial installation of equipment and for infrequent maintenance.

4.4.3.2 Class B (Light Service)

This service class covers cranes that may be used in repair shops, light assembly operations, service buildings, light warehousing, etc, where service requirements are light and the speed is slow. Loads may vary from no load to occasional full-rated loads, with 2–5 lifts per h, averaging 2.6 m (10 ft) per lift.

4.4.3.3 Class C (Moderate Service)

This service class covers cranes that may be used in machine shops or papermill machine rooms, etc, where service requirements are moderate. In this type of service, the crane will handle loads that average 50% of the rated capacity, with 5–10 lifts per h, averaging 3 m (15 ft), not over 50% of the lift at rated capacity.

4.4.3.4 Class D (Heavy Service)

This service class covers cranes that may be used in heavy machine shops, foundries, fabricating plants, steel warehouses, container yards, lumber mills, etc, and standard duty bucket and magnet operations where heavy-duty production is required. In this type of service, loads approaching 50% of the rated capacity will be handled constantly during the working period. High speeds are desirable for this type of service, with 10–20 lifts per h, averaging 3 m (15 ft), not over 65% of the lifts at rated capacity.

4.4.3.5 Class E (Severe Service)

This service class requires a crane capable of handling loads approaching a rated capacity throughout its life. Applications may include magnet, bucket, and magnet/bucket combination cranes for scrap yards, cement mills, lumber mills, fertilizer plants, container handling, etc, with 20 or more lifts per h at or near the rated capacity.

4.4.3.6 Class F (Continuous Severe Service)

This service class requires a crane capable of handling loads approaching rated capacity continuously under severe service conditions throughout its life. Applications may include custom-designed specialty cranes essential to performing the critical work tasks affecting the total production facility. These cranes must provide the highest reliability, with special attention to ease-of-maintenance features.

4.4.4 Operational Inspection

4.4.4.1 General

Visual examinations shall be recorded in the log book by the operator or a designated person with findings of deficiencies at the following intervals:

- (a) light service — Classes A and B monthly;
- (b) heavy service — Classes C and D weekly to monthly;
- (c) severe service — Classes E and F daily to weekly; and
- (d) special service — as recommended by a qualified person.

4.4.4.2 Inspection Targets

Items such as the following shall be examined for defects, malfunctions, and damage at intervals as defined in Clause 4.4.4.1. This includes observations during operation for any defects or damage that might appear between periodic inspections; the resolution of such defects found in this inspection shall be made by a qualified person:

- (a) all operational functions;
- (b) leakage in lines, tanks, valves, pumps, and other parts of air or hydraulic systems;
- (c) deformed, worn, or cracked hooks;
- (d) hook latches, if so equipped;
- (e) hoist ropes;
- (f) limit device(s) for function;
- (g) function labels for operator control; and
- (h) all brakes.

4.4.5 Periodic Inspection

4.4.5.1 General

Visual examination of equipment, as defined in Clause 1.1, shall be conducted by a crane inspector making a record of apparent conditions, as defined in Clause 4.4.5.2, to provide the basis for a continuing evaluation at intervals defined below:

- (a) light service — Classes A and B annually;
- (b) heavy service — Classes C and D semi-annually;
- (c) severe service — Classes E and F quarterly;
- (d) special service — as recommended by a Professional Engineer or crane manufacturer, or both; and
- (e) out of service — prior to being put back into service.

4.4.5.2 Verification

Verification shall be provided that the supporting structure has been designed, approved, and installed to carry the maximum load as rated. The verification shall be accomplished by one of the following methods:

- (a) a report bearing the seal and signature of a Professional Engineer stating that the supporting structure as installed is capable of handling the maximum load as rated;
- (b) the crane inspector has reviewed the applicable drawings bearing the seal and signature of a Professional Engineer that confirms the installed supporting structure has been designed and approved by a Professional Engineer to support the maximum load as rated; or
- (c) an affidavit in the log book by the owner or employer that the supporting structure has been designed and approved by a Professional Engineer and installed to carry the maximum load as rated.

4.4.5.3 Inspection Targets

Complete inspections of the crane shall be performed at intervals as defined in Clause 4.4.5.1. Any deficiencies such as those listed below shall be examined and determination made as to whether they will affect the safe operation of the crane:

- (a) deformed, cracked, or corroded members;
- (b) loose bolts or cracked welds;
- (c) sheaves and drum cracks, distortion, and wear;
- (d) worn, corroded, cracked, or distorted parts, such as pins, exposed or open bearings, bushings, shafting, couplings, gears, bumpers, and trolley stops;
- (e) glazing, scoring, warpage, contamination, or wear of electrical and mechanical brakes;
- (f) visible damage to hook, retaining nut, and safety latch;
- (g) deformed hook or worn hooks for compliance with manufacturer's recommendations;
- (h) evidence of pitting or deterioration of electrical contacts;
- (i) interference with the free operation of buttons and controls;
- (j) damaged insulation on the electrical wire, cables, and controls;
- (k) inadequate performance or reliability of limit switch;
- (l) worn and/or damaged trolley and bridge wheel assemblies;
- (m) nonperformance of load brake or controlled lowering device;
- (n) wear, cracks, or corrosion of wire rope, load chain, end clamps, or rope clips;
- (o) missing or loose bolts in the supporting structure; and
- (p) rope reeving for noncompliance with crane manufacturer's specifications.

In addition to the deficiencies listed herein, this inspection shall also include the requirements of Clause 4.4.4.2.

4.4.5.4 Overload Conditions

Equipment defined in Clause 1.1 shall always be operated within the rated capacity. However, if at any time during the operation of said equipment it has been accidentally overloaded, the equipment shall be removed from service until an inspection can be performed in accordance with Clauses 4.4.4, 4.4.5.1, 4.4.5.2, and 4.4.5.3.

4.5 Hazardous Conditions

Any hazardous conditions disclosed by the inspection requirements of Clause 4.4 shall be corrected by the owner or employer of the equipment before the equipment is placed in service.

5. Testing

5.1 Operational and Running Tests

Prior to initial use, for all new, reinstalled, modified, or rebuilt equipment (as defined in Clause 1.1), the following functional items and components shall be tested to ensure compliance with CSA Standard Z202:

- (a) all motions;
- (b) limit switches at full speed;
- (c) limiting and indicating devices (if provided);
- (d) all circuits, controls, interlocks, and sequence of operation; and
- (e) each crane motion, holding brakes, and travel brakes, with the hook carrying
 - (i) rated capacity – during these tests the specified speeds are to be attained, provided the power supply to the crane is as specified; and
 - (ii) 125% of the rated capacity – during this test the specified speeds need not be attained but the crane shall show itself capable of dealing with the load without difficulty.

Prior to initial use, the vertical deflection of all new, reinstalled, modified, or rebuilt equipment (as defined in Clause 1.1) shall be measured. The vertical deflection of the girder produced by the weight of the trolley and the rated load shall not exceed the maximum allowed by the applicable design specification.

The rated capacity and 125% of the rated capacity tests must be performed with the crane or hoist installed on its supporting members (runway or monorail).

A test report shall be prepared, including test results and readings. The test report shall be retained in the log book.

6. Maintenance

6.1 Experience

All repairs shall be performed by, or under the supervision of, a person having a minimum of 8 000 h experience related to the repair of equipment defined in Clause 1.1.

6.2 Preventive Maintenance, Repairs, and Adjustments

6.2.1 Maintenance Program

A preventive maintenance program shall be established, based on the specification and operating requirements of the crane. Dated and signed records shall be kept readily available.

6.2.2 Replacement Parts

Replacement parts shall meet or exceed the original manufacturer's specifications.

6.2.3 Welding

All welding shall conform with the requirements of CSA Standard W59.

6.3 Maintenance Procedures

6.3.1 Initial Procedures

Before adjustments and repairs are started on a crane, the following procedures shall be taken:

- (a) All motion controllers shall be placed in the off position. Main switch (crane disconnect) shall be operated to the open position, checked, deenergized, locked-out, and tagged.

(b) Before performing maintenance on the crane power-collector system, or any other crane component within the area of the building-power distribution system to the crane, the power source shall be deenergized, locked, and tagged. Where it is not practical to disconnect and lock out the power supply to live electrical installation, equipment, or power lines, the power distributing system shall be guarded to prevent contact, in accordance with the applicable local legislation or regulations, or both.

(c) Consideration shall be given to the power distribution system when mobile lifting equipment is used to access the crane from floor elevation. Mobile cranes, tools, and other equipment, which are capable of conducting electricity and endangering the safety of workers, shall not be used in proximity to any live electrical installation or equipment with which they might make electrical contact.

6.3.2 Safety Barriers

Markings and barriers shall be utilized in instances where maintenance work creates a hazardous area on the floor beneath the crane.

6.3.3 Isolation from Other Cranes

Where other cranes are in operation on the same runway, rail stops or other means shall be provided to prevent interference with the crane being maintained.

6.3.4 Restricting Runways

When work is being carried out on a crane in one of two adjacent crane runways, and the runways are not separated or protected, or if any hazard from the adjacent operations exists, access to the adjacent runway shall be restricted.

6.3.5 Final Procedures

After adjustments and repairs have been made, the crane shall not be restored to service until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.