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Technical Bulletin

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Anchorage Strength Requirements — Canada

Description

Anchorage strength requirements are dependent on the type of fall protection application. Below are anchorage application definitions and the corresponding strength requirements for each. The requirements are based on conventions used in both Canada and the United States. Some are rooted in regulations while others are rooted in the performance standards for fall protection products. Because the product standard in Canada for anchorages is without an active test protocol, anchorage strength requirements will be quoted from the various provincial, territorial and federal regulations for this publication. They will be included at the end of the document presented by jurisdiction. Other requirements will come from the conventions referred to above and can be found in the 3M fall protection product user manuals for reference.

For the purpose of this document, the following definitions represent the anchorage connectors which will be discussed as defined in CSA Z259.16-15, Design of active fall-protection systems. They include:

- Fall arrest
- Travel restraint
- Work positioning
- Rescue

Fall Arrest

Anchorage *— a secure connecting point capable of safely withstanding the impact forces applied by a fall-protection system or anchorage subsystem.*

Fall arrest *— stopping a fall.*

For the purpose of this publication, the structure to which a personal fall arrest system is attached must sustain static loads applied in the directions permitted by the fall arrest system of at least: 22.2 kN (5,000 lbs) for non-certified anchorages, or two times the maximum arresting force for certified anchorages (designed by qualified person/engineer). These are accepted parameters stated in ANSI Z359.2 and are the basis for general fall protection applications by convention in Canada. When more than one personal fall arrest system is attached to an anchorage, the strengths stated above must be multiplied by the number of personal fall arrest systems attached to the anchorage.

Restraint/Travel Restraint

Restraint anchorage *— an anchorage used in a travel-restraint system.*

Note: *Restraint anchorages can be temporary or permanent. Temporary restraint anchorages are removed at the end of the day, shift, or use, such that they will not be mistaken for a fall-arrest anchorage.*

Travel-restraint system *— a system that prevents one or more workers from reaching an unprotected edge or opening.*

The structure to which a restraint system is attached must sustain static loads applied in the directions permitted by the restraint system of at least 1,000 lbs for non-certified anchorages, or two times the foreseeable force for certified anchorages. See ANSI Z359.2. When more than one restraint system is attached to an anchorage, the strengths stated above must be multiplied by the number of restraint systems attached to the anchorage.

Positioning/Work Positioning

Positioning system *— a collection of components to support or suspend a worker at a working point.*

Note: *Positioning systems are primary systems that allow workers to have their hands free but, are not fall-protection systems. Positioning systems include suspension lines, boatswain's/bosun's chairs, descent controllers, and positioning lanyards.*

Few of the Canadian Standards or regulations quote an anchorage requirement for work positioning activities. For the purpose of this document we will refer to the OSHA and ANSI requirements from the United States. The structure to which a work positioning system is attached must sustain static loads applied in the directions permitted by the work positioning system of at least 3,000 lbs, or twice the potential impact load, whichever is greater. See 29 CFR OSHA 1926.502. ANSI Z359.2: 3,000 lbs for non-certified anchorages or two times the foreseeable force for certified anchorages. When more than one work positioning system is attached to an anchorage, the strengths stated above must be multiplied by the number of work positioning systems attached to the anchorage.

Rescue

Rescue *— the process of evacuating a worker after a fall to a safe location where he or she can receive medical attention.*

Few of the Canadian Standards or regulations quote an anchorage requirement for rescue activities. For the purpose of this document we will refer to the OSHA and ANSI requirements from the United States. The structure to which a rescue system is attached must sustain static loads applied in the directions permitted by the rescue system of at least 3,000 lbs for non-certified anchorages, or five times the applied load for certified anchorages. When more than one rescue system is attached to an anchorage, the strengths stated above must be multiplied by the number of rescue systems attached to the anchorage (re: ANSI Z359.2).

Below are the regulatory excerpts from the various occupational health and safety regulations throughout Canada. The information is presented by regional jurisdiction of the regulator, the name of the regulation and the specifics regarding the applications as they are presented. Where an application is not specifically listed in the regulation, like work positioning for example, it would be a best practice to default to the fall arrest anchorage requirement for that region.

Fall Protection Anchorage Requirements by Jurisdiction

Federal

Canada Occupational Health and Safety Regulations (SOR/86-304), Part XII, Protective Equipment and Other Preventative Measures

Protection Equipment and Procedures

Fall protection

12.09 (3) The components of a personal fall-protection system must meet the requirements set out in the following CSA Group standards:

(k) Z259.15, Anchorage connectors.

Alberta

Occupational Health and Safety Code, Alberta Regulation 87/2009, Part 9 Fall Protection

Anchors

Anchor strength — permanent

152(1) An employer must ensure that a permanent anchor is capable of safely withstanding the impact forces applied to it and has a minimum breaking strength per attached worker of 16 kilonewtons or two times the maximum arresting force in any direction in which the load may be applied.

Anchor strength — temporary

152.1(1) An employer must ensure that a temporary anchor used in a travel restraint system

(a) has a minimum breaking strength in any direction in which the load may be applied of at least 3.5 kilonewtons per worker attached,
(b) is installed, used and removed according to the manufacturer's specifications or specifications certified by a professional engineer,
(c) is permanently marked as being for travel restraint only, and
(d) is removed from use on the earliest of
- (i)the date on which the work project for which it is intended is completed, or
- (ii)the time specified by the manufacturer or professional engineer.

152.1(2) An employer must ensure that a temporary anchor used in a personal fall arrest system

(a) has a minimum breaking strength in any direction in which the load may be applied of at least 16 kilonewtons or two times the maximum arresting force per worker attached,
(b) is installed, used and removed according to the manufacturer's specifications or specifications certified by a professional engineer, and,
(c) is removed from use on the earliest of
- (i) the date on which the work project for which it is intended is completed, or
- (ii) the time specified by the manufacturer or professional engineer.

Notes

152(2) Subsection (1) does not apply to anchors installed before July 1, 2009.

152(3) Subsection (1) does not apply to the anchors of flexible horizontal lifeline systems that must meet the requirements of subsection 153(1).

British Columbia

Occupational Health and Safety Regulation, B.C. Reg. 296/97, Part 11 – Fall Protection

11.6 Anchors

(1) In a temporary fall restraint system, an anchor for a personal fall protection system must have an ultimate load capacity in any direction in which a load may be applied of at least

(a) 3.5 kN (800 lbs), or
(b) four times the weight of the worker to be connected to the system.

(2) Each personal fall protection system that is connected to an anchor must be secured to an independent attachment point.

(3) In a temporary fall arrest system, an anchor for a personal fall protection system must have an ultimate load capacity in any direction required to resist a fall of at least

(a) 22 kN (5000 lbs), or

(b) two times the maximum arrest force.

(4) A permanent anchor for a personal fall protection system must have an ultimate load capacity in any direction required to resist a fall of at least 22 kN (5 000 lbs).

Manitoba

Workplace Safety and Health Regulations, 217/2006, Part 14

Fixed support system requirements

14.14(1) The owner of a building or structure must ensure that a permanent anchorage system used as the fixed support in a travel restraint system or fall arrest system for that building meets the following requirements: **(a)** the anchor has an ultimate capacity of at least 22.2 kN in any direction in which the load may be applied for each worker attached; **(b)** the anchorage system is certified by a professional engineer as having the required load capacity;

14.14(2) When a permanent anchorage system cannot be used at a workplace, an employer must ensure that the temporary fixed support in a travel restraint system or fall arrest system meets the following requirements:

(a) when a fall arrest system without a shock absorber is used, a support used in a fall arrest system must be capable of supporting a static force of at least 8 kN without exceeding the allowable unit stress for each material used in the

(b) fabrication of the anchor point;

(c) when a shock absorber is used in a fall arrest system, the support must be capable of supporting a static force of at least 6 kN without exceeding the allowable unit stress for each material used in the fabrication of the anchor point;

(d) a support used in a travel restraint system must be capable of supporting a static force of at least 2 kN without exceeding the allowable unit stress for each material used in the fabrication of the anchor point.

New Brunswick

Regulation 19/191 under the Occupational Health and Safety Act (O.C. 91-1035)

Fall-arresting system

49.2(1) An owner of a place of employment, an employer and a contractor shall each ensure that any fall arresting system consists of the following:

(c) unless it is a horizontal life line, an anchor point that is capable of withstanding a 22 kN force or, if used under the direction of a competent person, four times the maximum load that may be generated in the fall-arresting system.

Anchor point in a fall-arresting system

49.3(1) An owner of a place of employment who permits the use of a fall-arresting system shall provide or ensure the use of a permanent or temporary anchor point that meets the requirements of paragraph 49.2(1)(c).

Anchor point for travel restraint on roofs

105.(8) The owner of a place of employment, employer and contractor shall each ensure a travel restraint system

(a) is rigged to prevent the employee from reaching an unguarded edge,

(b) is, subject to paragraph (c), attached to an anchor point capable of supporting two times the maximum load likely to be applied to it, or

(c) when it is used on a roof with a slope greater than 3 in 12, is attached to an anchor point that is capable of withstanding a 22 kN force or, if used under the direction of a competent person, four times the maximum load that may be generated in the fall-arresting system.

Newfoundland and Labrador

Regulation 5/12, Occupational Health and Safety Regulation, 2012-005, Part X Fall Protection

Fall arrest system

142. (1) A fall arrest system that is provided in accordance with section 141 shall

(a) be adequately secured to
(b) an anchorage point, or

Notes:

138. In this Part

(a) "anchorage point" means a secure point of attachment for a lifeline or lanyard

Nova Scotia

Workplace Health and Safety Regulations, OHSA S.N.S. 1996, c. 7; N.S. Reg. 143/2014

Work-positioning systems

21.11 (1) Unless otherwise prescribed in these regulations, an employer must ensure a work-positioning system is used in combination with a fall-arrest system in all of the following circumstances:

(a) the centre of gravity of the person using the work-positioning system extends beyond the edge from which a person could fall;
(b) the state or condition of the work surface creates a slipping or tripping hazard.

(2) A person must not use, and an employer must ensure a person does not use, a work-positioning system as a means of fall arrest.

Anchorages

21.15 An employer must ensure that all anchorages used as components of a fall-protection system are capable of withstanding the following forces in any direction in which the force may be applied:

(a) 22 kN, for non-engineered anchorage;
(b) 2 times the maximum arresting force anticipated, for an engineered anchorage.

Ontario

Ontario Regulation 213/91, Construction Projects

26.1 (2) Despite subsection (1), if it is not practicable to install a guardrail system as that subsection requires, a worker shall be adequately protected by the highest ranked method that is practicable from the following ranking of fall protection methods:

1. A travel restraint system that meets the requirements of section 26.4.
2. A fall restricting system that meets the requirements of section 26.5.
3. A fall arrest system, other than a fall restricting system designed for use in wood pole climbing, that meets the requirements of section 26.6.

26.7 (1) A permanent anchor system shall be used as the fixed support in a fall arrest system, fall restricting system or travel restraint system if the following conditions are met:

1. The anchor system has been installed according to the Building Code.
2. It is safe and practical to use the anchor system as the fixed support. O. Reg. 145/00, s. 14.

(2) If the conditions set out in subsection (1) are not met, a temporary fixed support shall be used that meets the following requirements:

1. Subject to paragraph 2, a support used in a fall arrest system shall be capable of supporting a static force of at least 8 kilonewtons without exceeding the allowable unit stress for each material used.
2. If a shock absorber is also used in the fall arrest system, the support shall be capable of supporting a static force of at least 6 kilonewtons without exceeding the allowable unit stress for each material used.
3. Subject to paragraph 4, a support used in a fall restricting system must be capable of supporting a static force of at least 6 kilonewtons without exceeding the allowable unit stress for each material used.
4. Paragraph 3 does not apply to a support that is used in accordance with the manufacturer's written instructions and is adequate to protect a worker.
5. A support used in a travel restraint system shall be capable of supporting a static force of at least 2 kilonewtons without exceeding the allowable unit stress for each material used. O. Reg. 145/00, s. 14.

(3) Despite the requirements listed in subsection (2), the support capacity of a temporary fixed support used in a fall protection system may be determined by dynamic testing in accordance with good engineering practice to ensure that the temporary fixed support has adequate capacity to arrest a worker's fall. O. Reg. 145/00, s. 14.

Ontario Regulation 851, Industrial Establishments

85. Where a worker is exposed to the hazard of falling and the surface to which he or she might fall is more than three metres below the position where he or she is situated,

(b) the fall arrest system described in clause (a) shall,

- (i) have sufficient capacity to absorb twice the energy and twice the load that under the circumstances of its use may be.

Ontario Regulation 854, Mines and Mining Plants

14. (1) Subject to subsection (5), where a worker is exposed to the hazard of falling more than three metres, a fall arrest system shall be used to protect the worker. R.R.O. 1990, Reg. 854, s. 14 (1).

(2) The fall arrest system required by subsection (1) shall consist of a suitable combination of a belt, a full body harness, a ~~lanyard, an anchor and a rope-grabbing device or lifeline. R.R.O. 1990, Reg. 854, s. 14 (2).~~

Fall Arrest System

Prince Edward Island

*Occupational Health and Safety Act, Fall Protection Regulations, EC633/04**3.***

(1) A fall arrest system that is provided, in accordance with subsection 2(1), to a worker at a work area as a means of fall protection shall

(a) be adequately secured to

(i) an anchor point, or
(ii) a lifeline that is
(iii) (A) securely fastened to an anchor point, or
(iv) (B) attached to a static line that is securely fastened to an anchor point that is capable of withstanding either the maximum load likely to be imposed on the anchor point or a load of 17.8 kN, whichever is greater.

Quebec

Regulation respecting occupational health and safety – Construction – CQLR c. S-2.1, r. 4

25.10.15 Anchorage system

The fall arrest connecting device of a safety harness must be secured to

(1) A single point of anchorage with one of the following characteristics:

(a) a breaking strength of at least 18 kN; or
(b) designed and installed in accordance with an engineer's plan in compliance with CSA Standard Z259.16 Design of Active Fall-Protection Systems, and having one of the following characteristics:
(c) a strength equal to twice the maximum arresting force as certified by an engineer; or
(d) Certified in accordance with EN 795 Personal Protective Equipment against Falls – Anchor devices – published by the European Committee for Standardization or with CAN/CSA Standard Z259.15 Anchorage Connectors

An anchorage system with the characteristics described in subparagraph B of subparagraph 1 or 2 of the first paragraph or in subparagraph 3 of that paragraph, must, before it is first brought into service, be inspected and tested by an engineer or a qualified person acting under the supervision of an engineer, to ensure that the system is in compliance with the design and installation plans.

Regulation respecting occupational health and safety – General Industry – CQLR c. S-2.1, r. 13

349. Securing to an anchorage system:

The fall arrest connecting device of a full body harness shall be secured to one of the following anchorage systems:

(1) a single point of anchorage with one of the following characteristics:

(a) have a breaking strength of at least 18 kN;
(b) be designed and installed in accordance with an engineer's plan in compliance with CSA Standard Z259.16 Design of Active Fall-Protection Systems, and
(c) have a strength equal to twice the maximum arrest force as certified by an engineer; or
(d) be certified in accordance with EN 795 Personal Protective Equipment against Falls – Anchor devices – published by the European Committee for Standardization or with CAN/CSA Standard Z259.15 Anchorage Connectors;

An anchorage system having the characteristics described in subparagraphs *b* of subparagraphs 1 and 2 of the first paragraph and an anchorage system referred to in subparagraph 3 of the first paragraph shall, before it is first brought into service, be

inspected and tested by an engineer or a qualified person acting under the supervision of an engineer, to ensure that the system is in compliance with the design and installation plans.

Saskatchewan

Occupational Health and Safety Regulations, 1996, S.S., c. O-1.1, Reg 1 – Part VII

Personal fall arrest systems

102 (2) An employer or contractor shall ensure that a personal fall arrest system required by these regulations:

(d) is fastened to a lifeline or to a secure anchor point that has a breaking strength of at least 22.2 kilonewtons.

Yukon

Occupational Health and Safety Regulations, O.I.C. 2006/178

Vertical Lifelines

1.40 A vertical lifeline shall meet the requirements of CSA Standard Z259.2.1-98, Fall Arresters, Vertical Lifelines and Rails, or other similar standard acceptable to the Director, and it shall be

(a) secured independently to an anchor with adequate strength.

Northwest Territories

Occupational Health and Safety Regulations R-039-2015

Personal Fall Arrest System

104. 2) An employer shall ensure that a personal fall arrest system required by these regulations

(d) is fastened to a lifeline or to a secure anchor point that has a breaking strength of not less than 22.2 kN.

Nunavut

Consolidation of Occupational Health and Safety Regulations R-003-2016

Personal Fall Arrest System

104. 2) An employer shall ensure that a personal fall arrest system required by these regulations

(d) is fastened to a lifeline or to a secure anchor point that has a breaking strength of not less than 22.2 kN.

Anchor Points and Anchor Plates

122. (1) If a worker uses a personal fall arrest system or a travel restraint system, an employer shall ensure that an anchor point or anchor plate meeting the requirements of this section is used as part of that system.

(2) An employer shall ensure that a temporary anchor point used in a travel restraint system

(a) has an ultimate load capacity of not less than 3.5 kN per worker attached in any direction that a load could be applied.

(a) An employer shall ensure that a permanent anchor point used in a travel restraint system
(i) has an ultimate load capacity of not less than 22.5 kN per worker attached in any direction that a load could be applied.

(b) If a personal fall arrest system is installed on or after one year after the date this section comes into force, an employer or supplier shall ensure that anchor points to which the personal fall arrest system is attached have an ultimate load capacity of not less than 8.75 kN per worker attached in any direction that a load could be applied.

(c) An employer or supplier shall ensure that the following types of equipment that are components of fall protection systems, and their installation, conform to the manufacturer's specifications or are certified by a professional engineer:
(i) permanent anchor points;
(ii) anchors with multiple attachment points.

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