CSA Z91-02 Health and Safety Code for Suspended Equipment Operations

This document contains extracts from the CSA Z91-02 Standard relating to fall protection anchorages. For complete data, refer to the actual standard.

As indicated by the title change, the scope of this edition of the Standard has been significantly expanded from the previous editions. The focus has broadened from one skilled trade group (window cleaners) to all persons whose profession demands that they work from equipment(for example, swing stages, bosun's chairs, and inspection cages) suspended from the side of buildings or large structures.

This Standard outlines the safe use of suspended equipment for the purposes of building maintenance, repairs, cleaning, renovation work, and inspections. It was prepared by knowledgeable and experienced persons employed in those areas and industries that are involved in building maintenance operations and construction trades.

The Standard is recommended for adoption by federal, provincial, and municipal authorities and by provincial safety associations. It is also recommended for use by architects, engineers, and contractors engaged in constructing commercial, industrial, residential, or multi-use buildings and by companies engaged in building maintenance operations.

PARAGRAPH REFERENCE	REQUIREMENT
Scope 1.1	This Standard includes requirements for the safe operation of various types of suspended equipment used to gain access to interior or exterior, or both, sides of buildings or structures. Much of the equipment referred to in this Standard is designed, installed, inspected, and tested in accordance with CAN/CSA-Z271. It does not include crane-suspended platforms or baskets (see CAN/CSA-Z150), multi-point bridge platforms, or hanging scaffolds.
1.2	This Standard specifies the safety requirements for suspended equipment and rolling stages normally used for (but not limited to) window cleaning operations, general cleaning, repair, painting, maintenance, inspection, and construction operations and similar work **Note:** *This coverage of a wide range of professional trades is greatly expanded from the focus on window cleaning in previous editions of the Standard.*
Fall Protection 4.9	Persons working on a surface within 2 m of an unprotected edge, where they may fall onto a hazardous substance or object, or at a height of 3 m or more above the ground, the adjacent roof level, or an acceptable landing without the protection of guardrails or other devices to guard against falls, shall wear a fall-arrest full body harness with lanyard. The fall protection system shall be attached to anchors, or to substantial members on the building, at all times.
Inspection and Maintenance Records 5.1	Before using any suspended equipment or permanently installed support systems, operators should verify that maintenance or inspection logs, or both, indicate that the system has been subjected to required maintenance or inspections, or both. If the inspection logs are not present or do not indicate that the required maintenance and inspection have been performed, the equipment should not be used until these requirements can be assured.
5.2.3.	Suspension lines shall be in line with the point of suspension for their entire length unless the suspension system is designed specifically for angled line work.
5.2.4.	Where the suspension height exceeds 90 m, mechanical winch equipment shall be used to raise or lower the lines.

Lifeline and Tie-back Anchors

5.4.1 Tie-back and lifeline anchors shall be in accordance with CAN/CSA-Z271

5.4.2 Lifelines and suspension system tie-backs shall be secured to separate anchors except as noted in Clouse 5.4.3

5.4.3. Double-eye anchor system may be used to secure both a tie-back and a lifeline, provided that the anchor system has been designed for the application of dual loading (both in form and in strength).

5.4.4. Lifeline and tie-back anchors for portable outriggers should be located in line with the point of suspension whenever practical but shall not be offset more than 3 m measured horizontally from running at the right angle to the building face at the point of suspension. The angle created by the offset distance shall not exceed 25° (see Figure 1).

Note: *When the tie-back is not in line with the outrigger, additional lunes may be used to secure the outrigger.*

5.4.5 The tie-back anchor elevation for a portable outrigger shall not be more than 1 m above the point of suspension.

5.4.6. Where the requirements of Clouse 5.4.4 cannot be met, line deflectors attached at the perimeter of the structure may be used where the offset angle of a lifeline exceeds 25°.

Deflectors shall be engineered to resist all applied loading and shall support the line(s) in a manner that does not reduce the strength of the line or cause damage to the line.

Note: *the applied loading is considered to be derived from the 22.2 kN (5000 lbf) tie-back anchpr load requrement specified in CAN/CSA-Z271.*

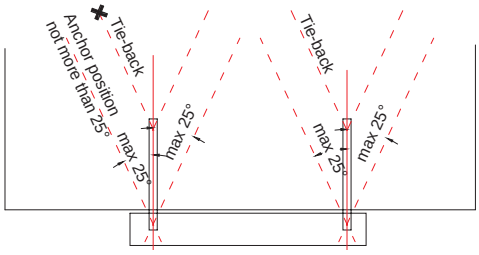

Figure 1
Tie-Back Angles (Plan View)
(see Clause 5.4.4.)

Support Systems

5.5.1 Roof supports, hangers, and support systems components for suspended equipment shall conform to the requirements of CAN/CSA-Z271.

5.5.2 The supports shall be located so as to maintain the structural integrity and stability of the suspended equipment.

5.5.3 Where there is a risk of equipment falling over the edge of the roof during set-up, it shall be secured before installation.

5.5.4 During movement of unsecured portable equipment along the roof perimeter, the centre of gravity of the equipment shall be not higher than 1 m above the walking surface. During installation, the centre of gravity shall remain within the building or structure, and the equipment shall be secured by a safety cable prior to raising it above the 1 m level.

5.5.5 Unless protected by a parapet wall, or guardrail, not less than 1 m high, workers shall be secured by a fall-arrest system before moving within 2 m of the work surface edge.

5.5.7 Outrigger beams and parapet wall clamps shall be installed and tied back to the anchors in a secure manner. Tie-backs shall be 8 mm (5/16 in) wire rope or other lines of equivalent strength. Tie-backs shall be installed at right angles to the face of the building wherever possible.

5.5.8 Outrigger beams and other portable suspension supports shall not be made of wood and shall be counter-balanced or otherwise secured to support a mass no less than 4 times the static load, or 4 times the hoist capacity when using electrically powered hoists.

Note: *The static load for manually operated platforms is considered to be the total of the platform dead weight, including the hoists and accessories, divided by the number of suspension ropes plus the full-rated live load capacity of the platform*

5.5.9 Supports shall be labeled to indicate maximum capacity. Counterweighted systems shall be labeled to indicate counterweight requirements. The weight of each counterweight used shall be permanently marked on the body of the counterweight.

5.5.10 Where counterweights are used, they shall be securely attached to the outrigger beams and shall be made of solid, non-brittle material.

5.5.11 A parapet wall or other part of the building on which the support system is to be placed shall be verified and documented as being structurally adequate to support the suspension system loads by a professional engineer before rigging.

Suspended Working Units	
5.6.1	Suspended platforms shall be designed and constructed in accordance with CAN/CSA-Z271.
5.6.2	When equipment is used on suspension heights exceeding 45 m (148 ft), stabilization provisions in accordance with CAN/CSA-Z271 shall be used.
5.6.3	Descent control-supported bosun's chair systems shall not be used at suspension heights in excess of 46 m unless stabilization of the working unit is provided. If stabilization is provided, the suspension height shall not exceed 92 m. Workstation stabilizing devices such as suction cups are acceptable for this purpose.
5.6.4	Operating and maintenance instructions shall be provided with suspended working units. Operators shall read and understand operating instructions before using equipment.
Skylights	
6.1.1	Special safety precautions shall be followed when working on or under skylights.
6.1.2	The creation of a work plan, paying particular attention to the evaluation of the conditions, shall precede work on or under skylights.
6.1.3	Workers shall not walk on or place any significant loads on any overhead glass or frames, or both, in a skylight or atrium unless the glazing system has been engineered to safely permit this access method.
6.1.4	Complete fall protection shall be used whenever a worker is exposed to a fall of 3 m or more.
Working from Operable Windows	
6.2.1	Reaching out of a window may be done if no more than the worker's upper body is extended out of the window and both feet are firmly on the floor.
6.2.2	The worker shall not place any body weight on the window or the window frame while reaching out.
6.2.3	Complete fall protection shall be used if the preceding conditions cannot be met.
Rigging from Sloped Roofs and from Multiple Roof Levels	
6.4	Complete fall protection shall be used whenever a worker is engaged in rigging or handling equipment on a sloped roof and is exposed to a fall of 3 m or more. Fall-arrest equipment shall be used when re-rigging equipment from drop to drop on sloped roofs.
Rigging over Guardrails	
6.5	When primary or secondary support lines are to be rigged over a guardrail (surface), the guardrail shall be engineered to support the applied loads.
Securing Equipment	
6.6	All items shall be tied back to an anchor when a falling danger exists.
Transfer Techniques	
6.7	Whenever a worker is moving from one working position to another (stage to stage, stage to balcony, chair to chair, equipment to ledge) and the worker is exposed to a fall of 3 m or more, complete fall protection shall be used.
Periodic Inspection and Testing of Permanently Installed Equipment	
7.2.1.1.	All permanently installed systems shall be inspected and tested by a professional engineer, or a qualified person under the supervision of a professional engineer, prior to being placed in service to ensure compliance with this Standard, CAN/CSA-Z271, and the design drawings. See Clause 8.3.8.1 of CAN/CSA-Z271.
7.2.1.2.	A similar inspection shall be performed following an alteration to an existing installation.

Visual Inspection Prior to Use 7.2.2 7.2.3.1.	A visual inspection of the equipment shall be performed by the user prior to assembly and use, and during use, of the equipment. Those components that have defects shall be withdrawn from service for corrective action. Periodic inspection and/or testing of the equipment shall be in accordance with the recommendations of the manufacturer. The equipment manufacturer's recommendations shall be followed for testing, servicing, and inspection. Deficiencies shall be corrected before the equipment is put into service. See Clause 8.3.8.3.4 of CAN/CSA-Z271
Structural Components 7.2.4.1 7.2.4.2 7.2.4.3	Structural components of the equipment and attachments to the structure shall be inspected or tested, or both, at intervals not exceeding 12 months unless more frequent inspections are required by the manufacturer of the system. See Clause 8.3.8.3.5 of CAN/CSA-Z271. The inspection and testing shall be performed by professional engineer or a qualified person under the supervision of a professional engineer. The inspection shall include, but not be limited to, a) a review of the design drawings to ensure compliance with current regulations, standards, and engineering standards; b) an inspection of the system to ensure compliance with the engineered drawings; and c) an inspection of all exposed, visible, and accessible components of the system for signs of distress.
Damaged Equipment 7.2.5	Equipment involved in an accident or failure shall be inspected for damage by a qualified person. If damage or excessive wear is observed, the equipment shall be replaced.
Inspection and Testing Of New Anchor Systems 7.3.1.1 7.3.1.2	All anchor systems shall be inspected and tested by a professional engineer, or a qualified person under the supervision of a professional engineer, prior to being placed in service to ensure compliance with this Standard, Clause 6.3 of CAN/CSA-Z271, and the design drawings. A similar inspection shall be performed following an alteration to an existing installation.
Inspection and Testing Of Existing Anchor Systems 7.3.2.1 7.3.2.2	All anchor systems shall be inspected at intervals not exceeding 12 months. The inspection shall include, but not be limited to, a) a review of the design drawings to ensure compliance with current regulations, standards and engineering standards; b) an assessment of the system to ensure compliance with the engineered drawings; c) an inspection of all exposed, visible, and accessible components of the system for signs of distress; and d) an inspection of all adhesive and expansion fasteners.
Special Requirements for Adhesive or Expansion Fasteners 7.3.3.1 7.3.3.2	Systems incorporating adhesive or expansion fasteners shall also have 100% of the anchors load tested at intervals not exceeding five years and in accordance with Clause 6.3.2. b) of CAN/CSA-Z271. Load testing of adhesive or expansion fasteners shall be witnessed and documented by a professional engineer or a qualified person under the supervision of a professional engineer.

Inspection Reports	
7.4.1	The results of the inspection, testing, and servicing performed shall be documented and filed with the equipment log.
7.4.2	A professional engineer shall prepare a report on all inspections with findings and recommendations for repairs or alterations, or both.
7.4.3	A suspension system shall not be used until it has been repaired and documented.
7.4.4	A professional engineer shall provide the building/equipment owner with a signed and sealed inspection report upon satisfactory inspection of the system. This report shall also be filed in the equipment log.
Equipment Log	
8.1.1	An equipment log shall be kept by the owner of the equipment.
8.1.2	The equipment log shall contain, but not be limited to, the following information: a) a description and operating instructions (applied to permanently installed equipment only), including i) system description ii) intended usage iii) operating instructions for the equipment; and iv) rigging plans for permanently installed equipment: b) installation records (applied to permanently installed equipment only), including i) the original installation date; ii) the manufacturer of the equipment; iii) the installer of the equipment; iv) equipment drawings, including, but not limited to, 1) equipment/roof plan; and 2) equipment installation details; and v) initial inspection report; and c) records of inspection and maintenance (applied to both temporary and permanently installed equipment), including i) annual inspection report(s); ii) modifications made to the equipment, including the date and nature of the modifications; iii) the name of the company performing the modifications; iv) maintenance requirements of the equipment ;and v) maintenance records, including the date and nature of the modifications and the name of the company performing the maintenance.
Roof Plans	
8.2.1	A roof plan (see example in Figure 2) showing the location of all the permanently installed components and equipment shall be provided by the building owner. As a minimum, the plan shall include, but not be limited to, a) a plan view showing essential structural members, including anchors; b) details of the equipment and its installation; c) the safe working loads of the equipment and any use restrictions on the equipment; and d) all relevant obstructions and structures or other obstacles that impede the safe use or operation, or both, of the equipment.
8.2.2	The roof plan shall be signed and sealed by professional engineer to ensure compliance with this Standard and with CAN/CSA-Z271.
8.2.3	A legible copy of the roof plan shall be posted at every entrance to a roof level.