

Part 23 Scaffolds and Temporary Work Platforms

Highlights

- Section 326 requires employers to visually inspect and tag all site-built scaffolds before initial use and at least every 21 calendar days while in use. Scaffold tag colours are green for “Safe for Use”, yellow for “Caution: Potential or Unusual Hazard”, and red for “Unsafe for Use”.
- Section 347 lists numerous standards applicable to elevating platforms and aerial devices. Elevating platforms and aerial devices must comply with the Canadian Standards Association (CSA) or American National Standards Institute (ANSI) standards referenced in this section.
- Section 349 presents requirements for fork-mounted work platforms intended to support a worker. The section also prohibits workers from being on these platform while the powered mobile equipment the platform is attached to is moving along the ground.
- Section 351 requires a professional engineer to certify a boatswain’s chair if it is not commercially manufactured.

Requirements

Section 323 CSA Standard applies

CSA Standard CAN/CSA-S269.2-M87 (R2003), *Access Scaffolding for Construction Purposes*, provides rules and requirements for the design, fabrication, erection, inspection, testing, maintenance and use of scaffolding equipment, materials and equipment where scaffolds are erected to provide working platforms for workers and materials during the construction, alteration, repair or demolition of buildings and other structures. The Standard does not apply to

- (a) suspended scaffolds or swing stages,
- (b) truck or vehicle mounted platforms,
- (c) falsework,
- (d) shoring, or
- (e) self-elevating work platforms.

The following is a *selection* of requirements within the Standard. Users of the *OHS Code* must comply with these requirements and all others in the Standard.

Used Lumber

Where lumber has been mechanically damaged (including repeated nailing of the same piece of lumber to the point that its mechanical integrity is questionable) or has deteriorated due to insects, decay, or chemical attack, the lumber must not be used unless a qualified lumber grader regrades it. (Clause 4.3)

Loads on Guardrails, Midrails and Stair Handrails

Rails must be capable of resisting, without failure, a single point load of not less than 900 newtons (202 pounds-force) applied in any direction on any span. (Clause 5.5.1)

Posts must be capable of supporting, without failure, a single point load of not less than 900 newtons (202 pounds-force) applied in any direction at the level of the top rail. (Clause 5.5.2)

General Stability of Scaffolding

The ratio of maximum height to minimum horizontal width of an access scaffold must not exceed 3:1, unless lateral support is provided as required below. (Clause 6.6.2)

External Lateral Supports

External lateral supports must be installed at vertical intervals, not exceeding 3 times the minimum width of the structure, and at every third bay of scaffolding longitudinally. (Clause 6.6.3)

External lateral supports must consist of

- (a) a rigid connection to another structure or building, or
- (b) guy wires or other supplementary devices securely fastened to adequate anchors.

External lateral supports must be installed at vertical intervals not exceeding every third tier and every third bay of scaffolding longitudinally, or 6.4 metres (21 feet), whichever is less. (Clause 6.6.3.1)

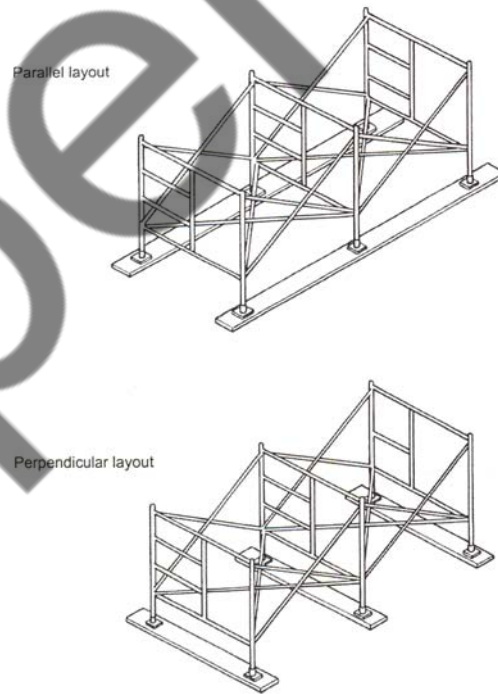
Sills

A sill is a wood, concrete or metal footing used to distribute the load from a standard or vertical post or base plate to the ground. Sills must be sound, rigid and capable of adequately supporting the maximum load to which the scaffold is likely to be subjected. Any settling or deformation of the sill should not affect the stability of the scaffold. (Clause 6.6.8.2)

To ensure proper distribution, sills must be continuous at least under two consecutive vertical legs or vertical supporting members as shown in Figure 23.1. (Clause 6.6.8.3). This CSA requirement is considered to apply to scaffolds that use rigid scaffold frames. Although Figure 23.1 shows sills made of wood, sills can also be made of materials such as concrete e.g. base plates may rest on a concrete slab that serves as a sill, and metal. Regardless of their material of construction, sills must be sound, rigid, and capable of adequately supporting the load to which the scaffold is likely to be subjected.

Continuous sills may not be practical, safe, or appropriate in situations where the terrain is uneven and cannot be leveled. A tube and clamp or similar type of scaffold that allows the use of variable lengths legs may be required to compensate for elevation variations in the surface on which the scaffold rests. In such cases the use of a continuous sill is likely impossible.

Figure 23.1 Mudsill layout



Areas Requiring Special Attention in Foundation Design

Special consideration needs to be given to the following conditions:

- (a) In the absence of soil tests and a detailed design, topsoil or other unsuitable material must be excavated to obtain an adequate bearing capacity of not less than 75 kilonewtons per square metre (1566 pounds/square foot). Topsoil or other unsuitable material must be excavated if necessary to obtain adequate bearing capacity.
- (b) When frozen ground is used as a foundation for all or part of the sills, thawing must be prevented.
- (c) Sills in areas where variable degrees of foundation compaction and bearing capacity exists, as in previously excavated ground, trenches, and backfilled areas, must be designed to span soft areas, or other appropriate measures must be taken to limit differential settlement to acceptable levels.
- (d) Sills in areas subject to erosion, such as the edges of slopes and terraces, must be protected.
- (e) Reduction of bearing capacity of the foundation due to changes in ground water elevation during construction or due to groundwater flows must be prevented.
- (f) Sills resting on thin concrete slabs, pan or waffle slabs, and slabs containing voids must be designed and located so as to safely distribute the concentrated loads.
- (g) Where the required foundation bearing capacity cannot be safely developed by other means, access scaffolding must be supported on piles providing the required load capacity. (Clause 6.6.8.6)

Leg Adjustments

Adjustment devices must be provided at the base of all uprights of frames where foundation settlement is uncertain or the support surface is uneven, sloping or stepped. Travel of adjustment devices must be mechanically limited to the maximum travel specified in the manufacturer's specifications. If extension of the device reduces allowable load, such information must also be specified in the manufacturer's specifications and established by test. (Clause 6.7.7)

Supervision and Erection Procedures

Only competent persons experienced in the erection of access scaffolding are allowed to supervise assembly of the scaffold. This ensures that the erection is carried out according to acceptable practices, such that

- (a) the requirements of the drawings or suppliers' literature are strictly complied with,
 - (b) no unusual settlement of foundations or strains in other external supports occur, and
 - (c) the correct components and materials are being used.
- (Clause 7.2.1.1)

Sills and Foundations

When foundations for access scaffolding are located in areas where the soil bearing capacity is, or is likely to become, inadequate to support the loads without detrimental settlement,

- (a) the soil beneath sills must be stabilized with cement to an adequate depth,
- (b) soil beneath sills must be removed and replaced with concrete having a low cement content,
- (c) sills must be founded on a layer of compacted gravel 150 to 300 millimetres thick, or
- (d) piles must be driven into the soil beneath the scaffolding supports to provide adequate load-carrying capacity.

(Clause 7.2.4.2)

Section 324 Design

Subsections 324(1)(a) and 324(1)(b)

Tie-ins anchor a scaffold to the structure it serves, preventing the scaffold from falling into or away from the structure. Tie-ins also improve a scaffold's lateral stability by bracing the structure. Figure 23.2 shows several of the many types of tie-ins that can be used. A reveal tie is considered to be a non-positive tie-in as it depends on friction for its holding power. A box tie is a positive tie-in because it encircles an immovable portion of the structure. Anchor bolt ties are yet another alternative.

A particular scaffold or load may require additional tie-ins. The 4.6 metre vertical and 6.4 metre horizontal intervals stated in the subsection are the minimum distances at which tie-ins must be placed. Tie-ins must never be placed at intervals greater than these minimum distances.

In some situations there may be an advantage to using tie-ins in combination with outriggers (the use of outriggers with free-standing scaffolds is discussed in section 334). When used in combination, outriggers can stabilize the scaffold up to a

maximum height equal to 3 times the scaffold's smallest base dimension. Beyond that height, tie-ins must be used as described in this section.

Subsection 324(1)(c)

Hoarding refers to tarps or other materials used to cover a scaffold. When hoarding is used, the stress on the ties stabilizing the scaffold increases due to wind loading. As a result, the number of tie-ins used must also increase. Rather than the 4.6 metre vertical and 6.4 metre horizontal intervals required for scaffolds that are not hoarded, hoarded scaffolds require tie-ins at 3 metre vertical and 3 metre horizontal intervals. Tie-ins on hoarded scaffolds must never be placed at intervals greater than these minimum distances.

Subsection 324(1)(d)

As required by Clause 7.2.3.1 of CSA Standard S269.2-M87 (R1998), *Access Scaffolding for Construction Purposes*, vertical load-carrying members must be erected and maintained within the following limits:

- (a) not more than 12 millimetres (0.47 inches) out of plumb in 3 metres (9.8 feet);
- (b) not more than 19 millimetres (0.75 inches) out of plumb in 6 metres (20 feet);
or
- (c) not more than 38 millimetres (1.5 inches) in the height of the structure.

Departures from plumb must be corrected by adjusting the devices provided for this purpose, e.g. wedges, jackscrews, etc.

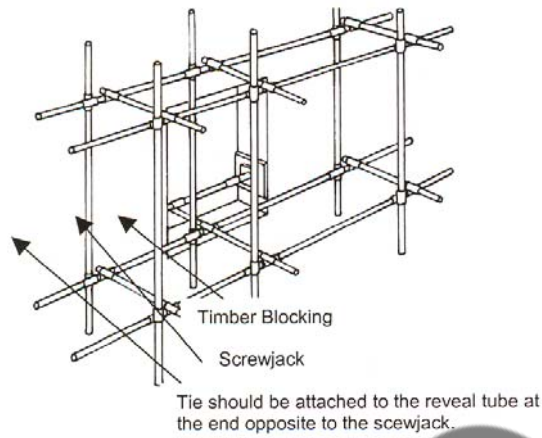
Devices such as base plates and jackscrews effectively disperse loads from scaffold vertical members to the scaffold foundation. A vertical member cannot rest directly on a mud sill, board or block of wood without an intervening load dispersing device. The compressive forces created at the end of the vertical member can easily exceed the strength of the sill, board or block, damaging it and making the scaffold unstable.

Baseplates and mudsills

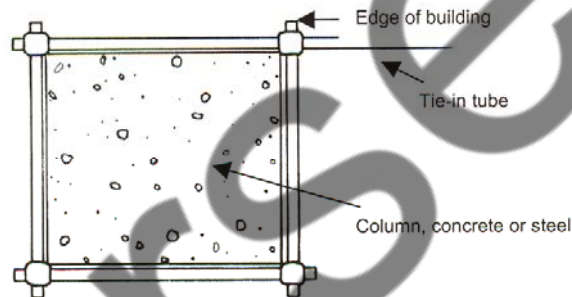
A scaffold transmits its load through its legs to its baseplates and mudsills, and then onto the foundation. By using baseplates and mudsills to control load distribution, workers erecting the scaffold can significantly decrease the likelihood of foundation failure.

Figure 23.2 Examples of typical tie-ins

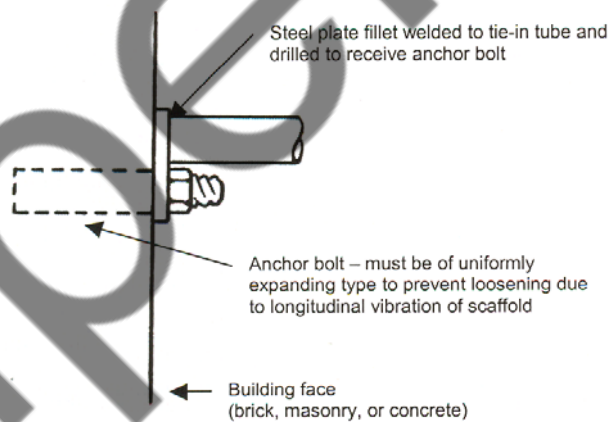
(a) Reveal tie



(b) Box tie



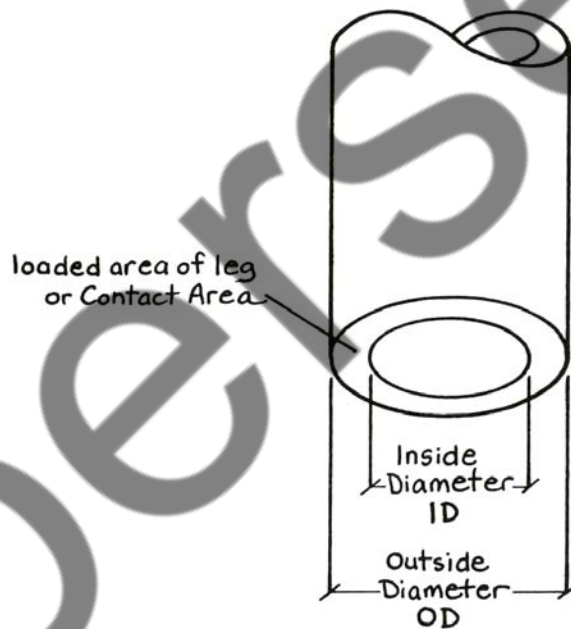
(c) Anchor bolt tie



The importance of baseplates and mudsills is even more dramatic if the leg load transmitted to a foundation without them is considered. For example, consider a light duty scaffold one tier high supporting 122 kilograms/square metre (25 pounds/square foot). Assume a total surface area of 3.7 square metres (40 square feet) between its standards. This scaffold has a maximum intended load of 454 kilograms (1000 pounds) live load. Include an estimated 227 kilograms (500 pounds) for the scaffold dead load. The total leg load is therefore 681 kilograms (1500 pounds). Using the safety ratio of 4 times the intended load means that the foundation must support 2722 kilograms (6000 pounds).

If the load is level, the 2722 kilograms (6000 pounds) load is distributed evenly through the legs to the foundation. Each leg receives 681 kilograms (1500 pounds) of the load. This load is concentrated on the extremely small surface area of the scaffold leg as shown in Figure 23.3.

Figure 23.3 Loading and cross-sectional area of the leg at the scaffold baseplate

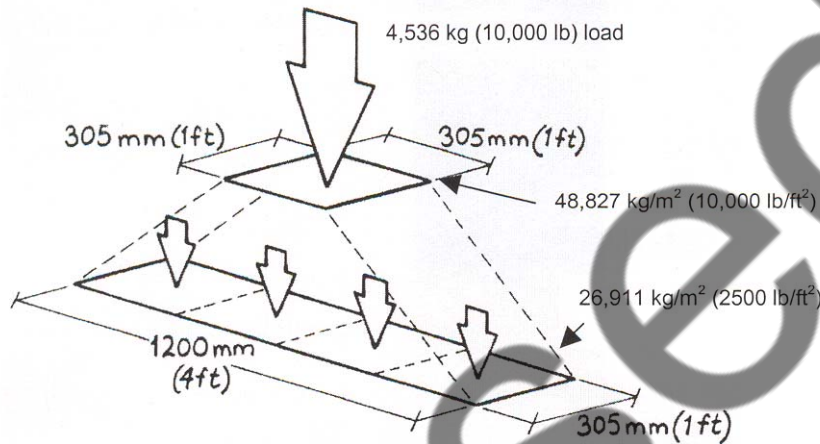


On a scaffold leg area of 25 square millimetres (1 square inch), the compressive force for a 681 kilogram (1500 pound) load is 1,054,656.5 kilograms/square metre (216000 pounds/square foot). This concentrated weight will drive the leg into any type of soil, punch it through asphalt surfaces, and even shatter wood, concrete, or stone foundations.

As weight is transferred from the small surface areas of the legs to the larger surface areas of baseplates or mudsills, the load per square unit of area decreases significantly (see Figure 23.4). For example, a 4536 kilogram (10000 pound) load on a

0.09 square metre (1 square foot) baseplate transmits 48,827 kilograms per square metres (10000 pounds per square foot) to the foundation. A 0.09 metre x 1.2 metre (1 foot x 4 foot) mudsill under the baseplate reduces the load even further to 26,911 kilograms/square metre (2500 pounds/square foot). Many soils can support a load of that weight.

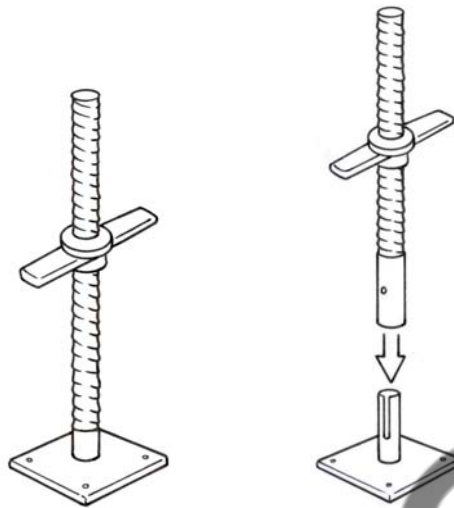
Figure 23.4 Use of baseplate and sills reduces foundation loading



Baseplates

Baseplates help distribute concentrated leg loads over a larger area. They also connect scaffold standards and mudsills. Baseplates attach to scaffold legs with pins or locking devices. Workers erecting scaffolds often put screwjacks between the scaffold legs and baseplates to allow the scaffold to be leveled (see Figure 23.5). Baseplates usually contain predrilled nail holes for attaching the plates to a mudsill. A baseplate measuring 150 millimetres by 150 millimetres provides approximately 0.023 square metres (36 square inches) of load distribution area. The load distribution area of a typical scaffold leg is approximately 25 square millimetres (1 square inch). Therefore the baseplate reduces leg load force on the foundation by a factor of 36 by distributing the load over a much larger area. A 0.04 square metre (64 square inch) baseplate reduces the force on the foundation by a factor of 64.

Figure 23.5 Baseplates help distribute the leg load



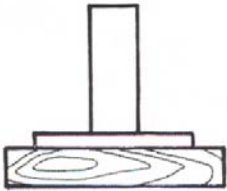
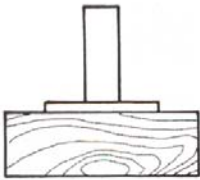
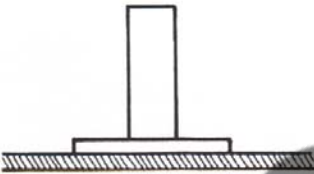

Mudsills

Normally, baseplates alone are inadequate for load distribution. Good erection practice often includes a timber mudsill under the baseplate. Mudsills serve two purposes:

- (1) *They provide a friction surface* — baseplates are smooth metal and can easily slip. A timber mudsill has more texture. It does not allow the baseplate to slip as easily. Mudsills also have more surface area than baseplates which means they have more contact with the surface they rest on.
- (2) *They distribute loads over a larger foundation area* — because mudsills have more surface area than baseplates, mudsills distribute any load placed on them over a larger area of the foundation.

Mudsills are usually made of wood and come in many sizes. Workers erecting a scaffold should choose a size according to the load and the foundation strength required. For typical scaffold work under normal conditions, a 50 millimetre x 250 millimetre (2 inch x 10 inch) wood mudsill is adequate. Table 23.1 suggests the type of mudsills that should be used under various ground conditions.

Table 23.1 Sample mudsills

Type of base	Ground conditions
 <p data-bbox="375 632 544 674">51 mm x 254 mm (2 in x 10 in) Timber</p>	<ul style="list-style-type: none"> ▪ Asphalt surface ▪ Paths ▪ Grass ▪ Clay ▪ Gravel ▪ Generally good firm ground
 <p data-bbox="386 909 555 951">76 mm x 305 mm (3 in x 12 in) Timber</p>	<ul style="list-style-type: none"> ▪ Soft or loose ground ▪ Made-up ground ▪ Wet sites ▪ All heavily loaded scaffolds ▪ On earth type surface
 <p data-bbox="380 1209 509 1251">6.4 mm (1/4 in) Plywood</p>	<ul style="list-style-type: none"> ▪ Flat concrete ▪ Level stone ▪ Steel ▪ Load bearing ▪ Brick work or similar work surface
 <p data-bbox="326 1524 610 1587">6.4 mm (1/4 in) Plywood with a suitable material to protect the surface</p>	<ul style="list-style-type: none"> ▪ Marble ▪ Mosaic ▪ Polished wood ▪ Linoleum ▪ Carpets, etc.

Subsection 324(2)

Ropes or wire ropes used in scaffolding may be exposed to potentially damaging processes such as welding operations or the cleaning of masonry surfaces with acid solutions. Where this is the case, the ropes must be made of heat or chemical resistant materials.

Subsection 324(3)

Unpainted, dressed lumber is specified so that it can be inspected visually for defects such as cracks, large knots or faults.

Subsection 324(4)

This subsection presents tie-in requirements specific to hoarded masonry walk-through scaffold frames. These scaffold frames are approximately 2.1 metres by 2.1 metres in size. For an erected masonry scaffold frame to maintain its rigidity, tie-ins should be connected to both sides of a frame as close as practicable to horizontal frame members. Restricting the tie-in points to the 3 metre spacings required by subsection 324(1)(c) places the tie-ins at less than desirable locations that can reduce the rigidity of the erected masonry scaffold and can restrict the movement of workers and materials on the scaffold.

Subsection 324(4) requires a vertical and horizontal tie-in for each 9 square metres of hoarding surface area (3 metre horizontal x 3 metre vertical interval = 9 square metres), regardless of the type of scaffold frame being used. This subsection maintains the 9 square metre surface area requirement while allowing the vertical tie-in spacing distance to vary within the range of 2 metres to 3 metres to better suit the dimensions of a masonry walk-through scaffold.

Subsection 324(4) requires that the product of the vertical tie-in spacing distance and the horizontal tie-in spacing distance equal 9 square metres. For example,

- (a) with a vertical tie-in spacing of 2 metres, the horizontal tie-in spacing must be no more than 4.5 metres ($2 \times 4.5 = 9$),
- (b) with a vertical tie-in spacing of 2.5 metres, the horizontal tie-in spacing must be no more than 3.6 metres ($2.5 \times 3.6 = 9$), or
- (c) with a vertical spacing of 3 metres, the horizontal tie-in spacing must be no more than 3 metres ($3 \times 3 = 9$).

Horizontal tie-ins will most likely be placed at every second frame [a horizontal distance of 4.2 metres (2×2.1 metres)], resulting in vertical tie-ins being spaced at 2.1 metres intervals.

Subsection 324(5)

As powered mobile equipment and vehicles move about on a work site, they can unintentionally contact unprotected scaffolding and temporary work platforms, damaging these structures and possibly injuring workers. This subsection requires that employers take reasonable measures to protect scaffolding or temporary work

platforms from being contacted. This might be achieved through selective placement of the structures to eliminate the potential for contact, or erecting or placing barriers that direct equipment and vehicles away from the structures.

Section 325 Load

Subsection 325(1) and 325(2)

This subsection requires a scaffold to be capable of safely supporting four times the load that may be imposed on it – a 4:1 safety factor. The imposed or intended load consists of two components: the live load and the dead load.

The live load is the maximum combined weight of all workers, tools and materials placed on the scaffold platform at any given time. When estimating the live load, assume a weight of 91 kilograms (200 pounds) for each worker and 22.7 kilograms (50 pounds) for the worker's tools and accessories, resulting in a combined weight of 113.7 kilograms (250 pounds) per worker on the scaffold. Multiply the number of workers on the platform by this value, adding to the result the estimated weight of any material placed on the scaffold.

The dead load is the weight of the scaffold itself and includes the weight of all bases, frames, posts, tubes, clamps, guardrails, toe boards, ladders or stairs, platforms or planks, and any accessories. The dead load is estimated by multiplying the total number of scaffold parts by the weight of each part and taking the sum of the resulting values.

Subsections 325(3) and 325(4)

Situations may arise in which a scaffold must support an evenly distributed load exceeding 367 kilograms/square metre or is of a type not described in this Part. To ensure worker safety when this is the case, the employer is required to have the scaffold designed and certified by a professional engineer and constructed, maintained and used in accordance with the engineer's certified specifications.

Subsection 325(5)

Workers must be aware of the maximum load the scaffold from which they are working is permitted to carry. Doing so ensures that workers use the scaffold as intended and do not exceed its load limit. The method by which workers are made aware of this information rests with the employer and may involve signage, verbal instructions or a posted notice.

Section 326 Tagging requirements

Subsections 326(1) through 326(5)

The tagging of scaffolds following visual inspection is a requirement new to Alberta. The requirement applies to the following types of scaffolds:

- (a) bracket scaffold;
- (b) double-pole scaffold;
- (c) needle-beam scaffold;
- (d) outrigger scaffold;
- (e) single-pole scaffold;
- (f) suspended scaffold;
- (g) swingstage scaffold; and
- (h) any similar site-assembled scaffold.

The meaning and colour-coding of scaffold tags is summarized in Table 23.2. Tags need not be solidly coloured — coloured stripes and broken lines are acceptable. When a person looks at the tag, its colour coding must clearly be green, yellow or red.

Table 23.2 Summary of scaffold inspection tag requirements

Colour of inspection tag	Wording to appear on tag
Green	"Safe for Use" or similar wording
Yellow	"Caution: Potential or Unusual Hazard" or similar wording
Red	"Unsafe for Use" or similar wording

The tags let workers know that a particular scaffold is safe for use, that a potential or unusual hazard is present, or the scaffold is unsafe for use. The yellow tag is required to describe any precautions to be taken while working on the scaffold. A scaffold being modified on a particular level requires a yellow tag. The tag alerts workers climbing onto the scaffold of the modification work and any special precautions that might affect them.

Tags must be placed at each point of entry to the scaffold. This includes access points from ground level and any access points from the structure with which the scaffold is being used. Doing so ensures that workers are aware of the status and condition of the scaffold, regardless of where they access it. Whatever their colour, tags must include:

- (a) the duty rating of the scaffold,
- (b) the date on which the scaffold was last inspected,
- (c) the name of the competent worker who inspected the scaffold,
- (d) any precautions to be taken while working on the scaffold, and
- (e) the expiry date of the tag.

Scaffolds to which this section applies must be inspected prior to initial use and at least every 21 calendar days thereafter while workers work from the scaffold or materials are stored on it. A scaffold that is erected but not immediately put into service, or not used for more than 21 consecutive calendar days, must be tagged with a red tag until inspected by a competent worker. A scaffold sitting idle may be exposed to weather or other circumstances that could make it unsafe for use. Inspection, just prior to the scaffold being put into service, confirms that it is safe for workers to use.

Subsections 326(6) and 326(7)

No worker can use a scaffold under the listed conditions unless the worker is involved in the erection, inspection or dismantling of a scaffold, and is competent to do so. Workers performing these duties are specially trained to perform this work safely.

Section 327 Vertical ladder on scaffold

Subsections 327(1) and 327(2)

Workers must safely move up and down ladders by maintaining three-point contact with the ladder at all times, and keeping their centre of gravity over the ladder rungs. Ladders are intended for workers to move up or down the scaffold – workers must not perform work from a ladder. These requirements apply to the frame of a scaffold that is designed to look like a ladder and is used as a ladder by workers.

Subsection 327(3)

A ladder attached to a scaffold and that provides access to a working level of a scaffold must meet the listed conditions. Ladders must extend at least 1 metre above the uppermost working level of the scaffold to provide workers with handholds when getting on to or off of the ladder.

The maximum unbroken length of the ladder is restricted to 9.1 metres unless a fall protection system complying with Part 9 is used (see subsection 327(5)). The 9.1 metres distance was chosen to make this maximum unbroken length consistent with the maximum unbroken length for fixed ladders described in section 130. The 9.1 metre distance is measured from the ground or between working levels.

If the ladder attached to the scaffold is more than 6.1 metres in height, it must be equipped with a ladder cage. For the purpose of the OHS Code, a ladder cage is *not* considered to be a type of fall protection. A ladder cage provides a structure against which workers can lean and rest, and for some workers it reduces their anxiety or sense of “exposure” by enclosing them. Should a worker in a ladder cage lose his or her footing and handgrip, the worker will most likely plummet to the base of the ladder unless their body becomes entangled in a ladder hoop. A properly functioning fall protection system will catch the worker in mid-air within the ladder cage, preventing them from falling to the base of the ladder. The ladder cage must begin within 2.4 metres of the ground or working level from which the unbroken length of ladder begins.

Subsection 327(4)

This subsection recognizes two ladder cage shapes and places limits on their dimensions. Circular ladder cages must have an inside diameter that measures no more than 760 millimetres. Square ladder cages must have inside dimensions that measure no more than 760 millimetres by 760 millimetres. These dimensions are large enough to allow workers to easily move up and down within the cage. Yet the dimensions are small enough to ensure that workers can comfortably lean back into the cage with their feet positioned on the rungs and rest without losing their balance.

Section 327(5)

As described in subsection 327(3), the maximum unbroken length of the ladder is restricted to 9.1 metres unless a fall protection system complying with Part 9 is used. The 9.1 metres distance was chosen to make this maximum unbroken length consistent with the maximum unbroken length for fixed ladders described in section 130. The 9.1 metre distance is measured from the ground or between working levels.

If a fall protection system complying with Part 9 is used, the maximum unbroken length of the ladder can exceed 9.1 metres and the ladder cage required by subsection 327(3)(f) is unnecessary.

Section 328 Working from a ladder

These requirements apply to the frame of a scaffold that is designed to look like a ladder and is used as a ladder by workers. Such access ladders are intended for workers to move up and down the scaffold. Workers must not perform work from such a ladder.

Section 329 Scaffold planks

Subsection 329(1)

Manufactured scaffold planks are often made of wood laminates or combinations of wood and metal. Because the planks may have properties that differ from those of conventional solid sawn lumber, manufactured planks must be used, stored, inspected and maintained according to the manufacturer's specifications.

Readers are referred to section 349 of this Explanation Guide for a discussion of the term "commercially manufactured".

Subsections 329(2) and 329(3)

Solid sawn lumber scaffold planks must be graded as scaffold grade or better. Scaffold grade planks are assessed against numerous criteria that include density, knots, splits, warps, twists, decay and dimensions. These planks are also subjected to deflection tests and are capable of supporting loads expected during scaffold work. Planks that meet the inspection criteria are stamped as "scaffold grade" and bear a grade stamp.

Subsection 329(4)(a)

Before installing a scaffold plank on a scaffold, the plank must be visually inspected to ensure it is safe for use. Normal wear and tear and storage can damage a plank to the point that it is unsafe for continued use. Reasons for removing a plank from service include decay, conditions that reduce the thickness or width of the plank, damaged welds in the case of metal planks, and cracks in metal or composite planks.

Subsection 329(4)(b)

If visual inspection reveals damage that could affect the strength of the plank, the acceptability of the plank for continued use must be confirmed by load testing or the plank must be removed from service. Using the deflection test procedures and test criteria of ANSI Standard A10.8-1988, *Construction and Demolition Operations – Scaffolding – Safety Requirements*, the deflection of a scaffold plank under its design load must not exceed the span length divided by 60.

To test a plank, the plank is placed on stable supports set at the plank's intended use span. The plank is then weighted with the intended load at the center of the span and the plank's deflection measured.

If a plank is intended to support one worker over a 2.4 metre (8 feet) span, a 113 kilogram (250 pound) load must be placed at the plank's centre and the resulting plank deflection measured. The deflection must not exceed 1/60th of 2.4 metres – a distance of 40 millimetres (1.6 inches). If the plank is to support two workers, the ANSI Standard recommends placing two 113 kilograms (250 pounds) weights on the plank, one 460 millimetres (18 inches) to the right of centre and one 460 millimetres (18 inches) to the left of centre. If the plank is to support three workers, ANSI recommends placing three 113 kilograms (250 pounds) weights on the plank, one at the centre, one 460 millimetres (18 inches) to the left of centre and one 460 millimetres (18 inches) to the right of centre.

Subsection 329(4)(c)

The minimum 150 millimetre (6 inch) distance reduces the likelihood of a plank slipping off its supporting ledger. Limiting the distance that a plank can extend beyond its supporting ledger to 300 millimetres (12 inches) discourages workers from using the extended area as part of their working platform. This reduces the chance of a worker causing the plank to flip up and out of position.

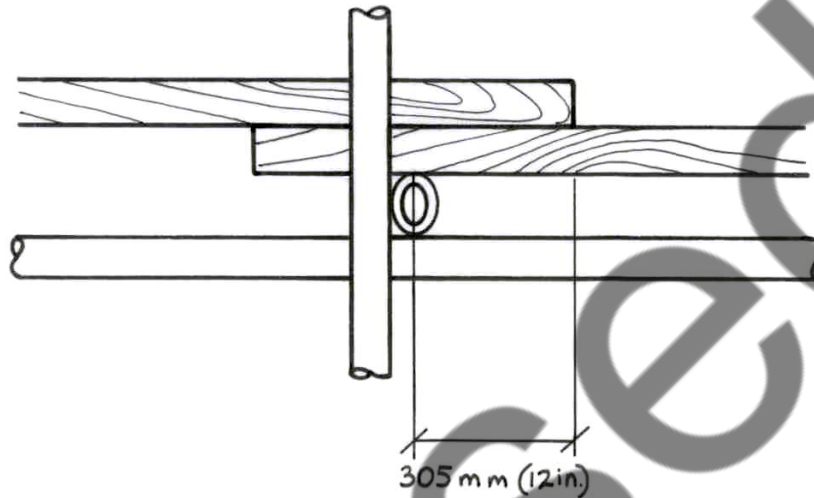
Subsection 329(4)(d)

Planks may be secured in many different ways. Some wooden planks use cleats, some steel or aluminum planks use hooks or recesses into which ledgers are positioned. The securement method must prevent movement of the plank in any direction that may create a danger to a worker.

Subsection 329(4)(5)

Scaffold planks are overlapped when scaffolds have multiple bays and a continuous work platform is required. The overlap in such cases must be at least 300 millimetres (12 inches) and occur only over supports as shown in Figure 23.6

Figure 23.6 Plank overlap



Section 330 Scaffold platform

A scaffold platform is a raised, typically flat, horizontal floor or surface that supports workers, material and equipment. This section establishes the minimum width for the platform of most scaffolds at 500 millimetres in order to provide an adequate working space. Exceptions include ladderjacks, pump jacks and similar systems where the width of the platform can be no less than 300 millimetres.

This section also requires that there be no space greater than 250 millimetres in width between any part of the platform and a structure adjacent to the platform. This is typically the wall of a building or similar structure and this space is needed for the passage of materials or equipment from one level to another. The 250 millimetre distance is measured at the point of widest separation.

Scaffold platforms should, ideally, be level in order to provide safe footing for workers. Where, for the purposes of accomplishing the work, there is a need to elevate one end of the platform, the surface of the platform must be such that workers do not slip or slide.

Scaffolds are used for a wide range of purposes and are often assembled around pipes or columns or other structures, resulting in an obstruction that workers must work around. In such cases, the platform must be constructed to prevent the creation of openings into or through which a worker might step or fall through.

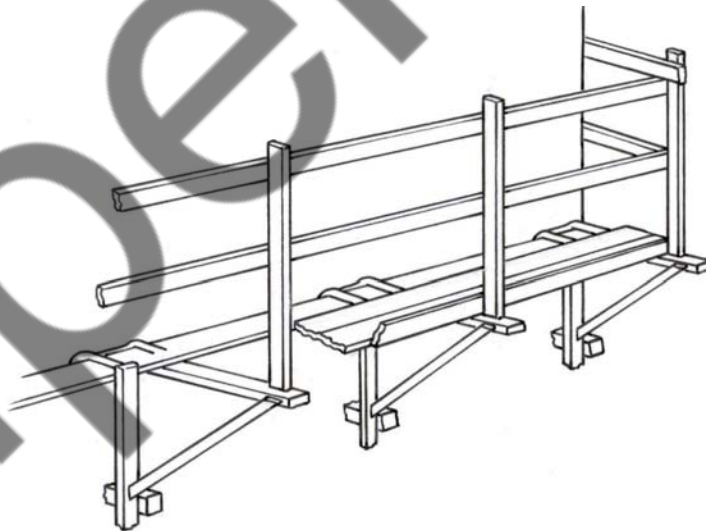
Section 331 Metal scaffolding

The requirements that apply to scaffold planks may not always apply to metal scaffolding. Such scaffolding must therefore be erected, used, inspected, maintained and dismantled according to the manufacturer's specifications.

Section 332 Bracket scaffolds

Bracket scaffolds have their brackets "hung" off of supporting structures such as the top of a structure such as a vessel wall — the scaffold supports do not rest on the ground. Planking then spans the brackets and a safe working platform is created. The scaffold must meet the requirements of this section. Figure 23.7 shows an example of a typical bracket scaffold.

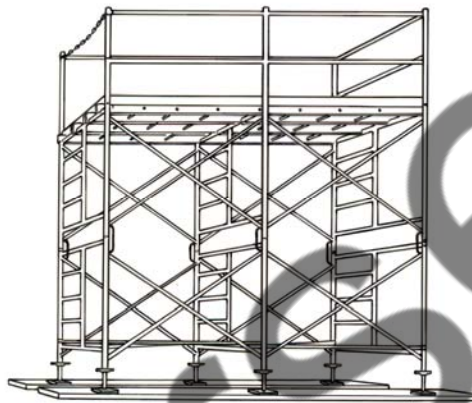
Figure 23.7 Typical bracket scaffold



Section 333 Double-pole scaffolds

This type of scaffold is supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers and diagonal bracing. Figure 23.8 shows a typical double-pole scaffold. Readers should compare this design of scaffold to the single-pole scaffold shown in the Figure 23.15.

Figure 23.8 Typical double-pole scaffold

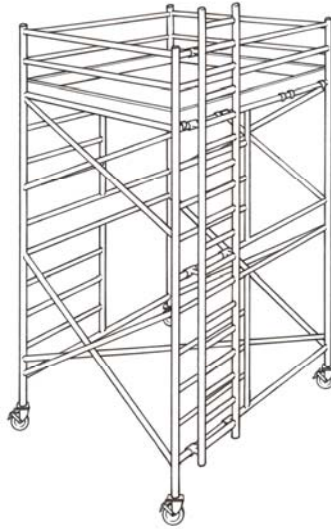


Section 334 Free-standing or rolling scaffolds

Subsection 334(1)

Figure 23.9 shows a typical manually propelled rolling scaffold. To optimize the stability of the scaffold, its maximum height is based on a height to base dimension ratio of 3:1. The height of the scaffold is limited to three times the *smallest* base dimension. Properly installed outriggers permit the height of the scaffold to be increased by increasing the smallest base dimension.

Figure 23.9 Typical manually propelled rolling scaffold



In some cases, rolling scaffolds are installed on a vehicle. When this is the case, component parts of the scaffold may loosen over time due to vibration. As a result, the scaffold should be checked regularly to make sure that all parts are securely fastened together and the scaffold is securely attached to the vehicle. When outriggers are used on such vehicle-mounted scaffolds, the outriggers must be securely attached to the frame of the vehicle.

To prevent the scaffold from rolling while workers work from the scaffold, locking wheels must be locked and non-locking wheels must be blocked.

Subsection 334(2)

This subsection permits a worker to remain on a rolling scaffold when it is in motion but attaches conditions to the height of the scaffold and the surfaces over which the scaffold travels. A “level” surface is considered “level” if it varies no more than 3 degrees from horizontal. Hazards that may cause a scaffold to tip include pits, holes, depressions or obstructions.

Subsection 334(3)

This subsection makes the worker responsible for locking or blocking the wheels of a rolling scaffold under specified conditions.

Section 335 Half-horse scaffolds

A half-horse or lean-to scaffold is a supported scaffold that is kept upright by tilting it toward and resting it against a building or structure. Lumber sizes for half-horse scaffolds are specified in Tables 5 and 6 of Schedule 7 of the *OHS Code*.

Section 336 Ladderjack scaffolds

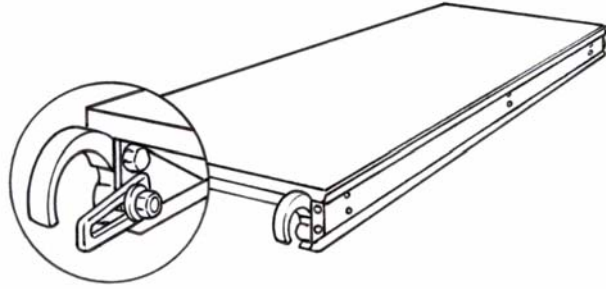
Figure 23.10 shows a typical ladderjack scaffold. The ladderjack scaffold brackets must be supported by the side rails of the ladder to which they are attached or have at least 90 millimetres (3 ½ inches) of width resting on the ladder rung. Doing so ensures that the weight of the scaffold is safely transferred onto the ladders.

Figure 23.10 Typical ladderjack scaffold. Since the working platform is more than 3 metres above the ground the workers are using personal fall arrest systems



Figure 23.11 shows a commercially manufactured aluminum plank that could be used on a ladderjack scaffold.

Figure 23.11 Commercially manufactured aluminum plank

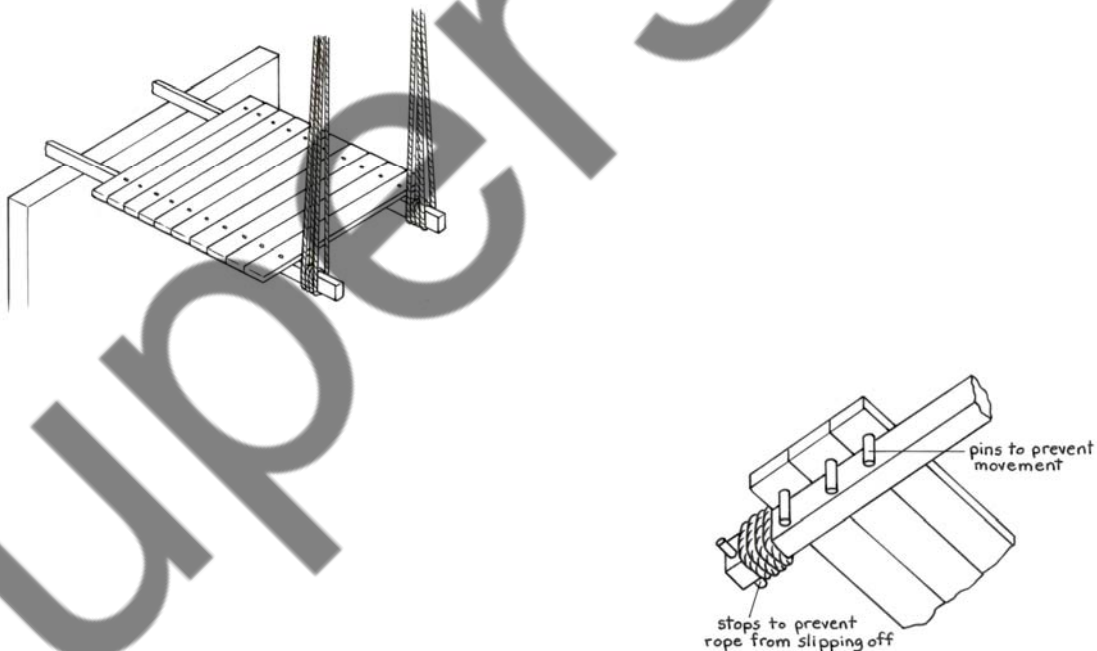


Readers are referred to section 349 of this Explanation Guide for a discussion of the term “commercially manufactured”.

Section 337 Needle-beam scaffolds

Figure 23.12 shows a typical needle-beam scaffold, highlighting several of the design details that make the scaffold safe for use.

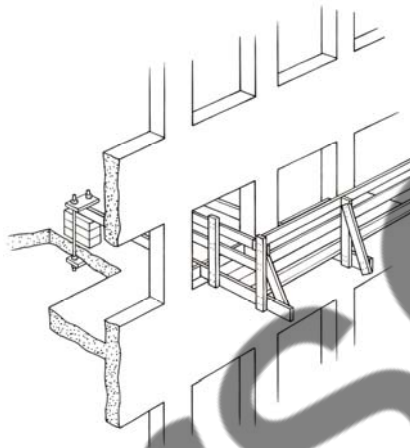
Figure 23.12 Needle beam scaffold and design details



Section 338 Outrigger scaffolds

Figure 23.13 shows a typical outrigger scaffold. An outrigger scaffold is a scaffold that consists of a platform resting on outrigger beams or thrustouts. The beams project beyond the wall or face of the building or structure, with inboard ends secured inside the building or structure.

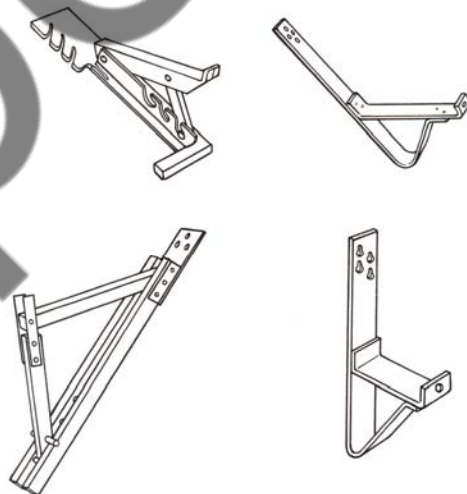
Figure 23.13 Typical outrigger scaffold



Section 339 Roofing brackets

Figure 23.14 shows examples of typical roofing brackets.

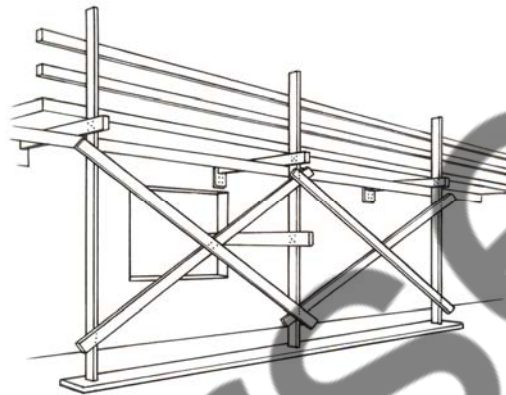
Figure 23.14 Examples of typical roofing brackets



Section 340 Single-pole scaffolds

This section only applies to wooden single-pole scaffolds (see Figure 23.15). This type of scaffold has platforms resting on putlogs or cross beams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights, the inner ends of which are supported on or in a wall. Readers should compare this to the double-pole scaffold shown in Figure 23.8.

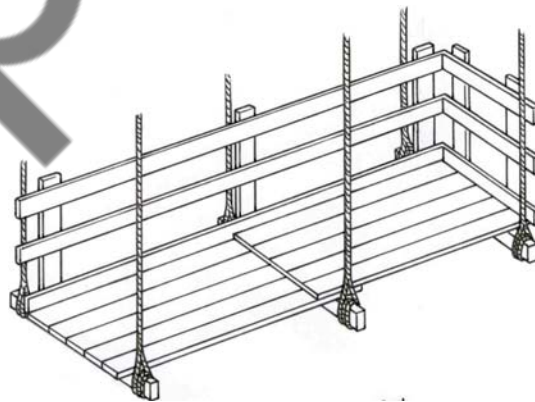
Figure 23.15 Example of a typical wooden single-pole scaffold intended for light duty service



Section 341 Suspended scaffolds

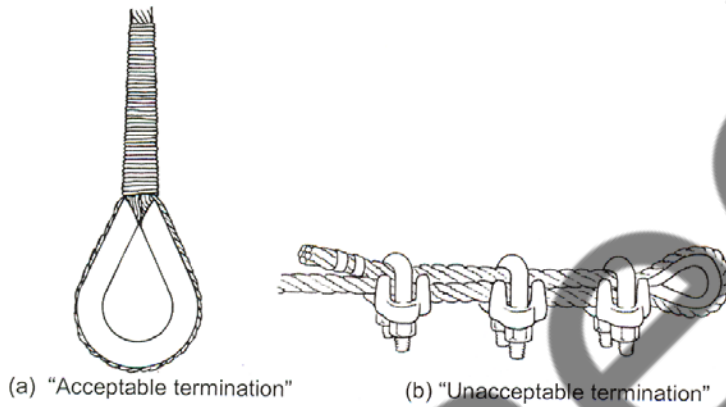
A suspended scaffold is a scaffold supported from above by wires or ropes. This type of scaffold is used for work on, or providing access to, vertical sides of structures on a temporary basis. Figure 23.16 shows an example of an interior hung suspended scaffold.

Figure 23.16 Example of an interior hung suspended scaffold



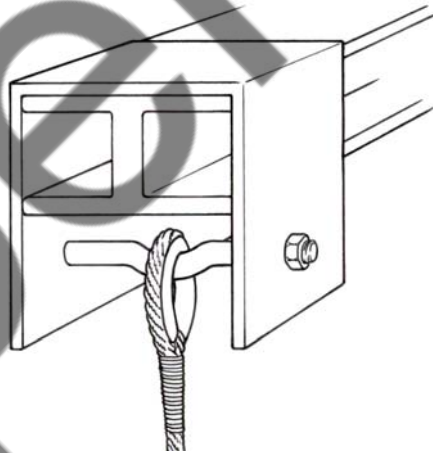
The upper end of the suspended scaffold's suspension rope must be terminated in a spliced loop as shown in Figure 23.17(a). The clamped wire rope arrangement shown in Figure 23.17(b) is unacceptable because the connection may loosen and slip if not properly maintained.

Figure 23.17 Suspension rope terminations



Suspension ropes must be prevented from separating from the shackles to which they are attached. A securing nut must be used as shown in Figure 23.18.

Figure 23.18 Suspension rope securement to thrustout shackle



Because the safety and stability of the working platform relies on the thrustouts from which it is suspended, the thrustouts must be securely anchored to the building or structure from which the platform is suspended. Counterweights cannot be used as the method of anchoring or stabilizing a thrustout. Figure 23.19 shows two types of properly secured thrustouts.

Figure 23.19(a) Examples of thrustout correctly tied back to wall

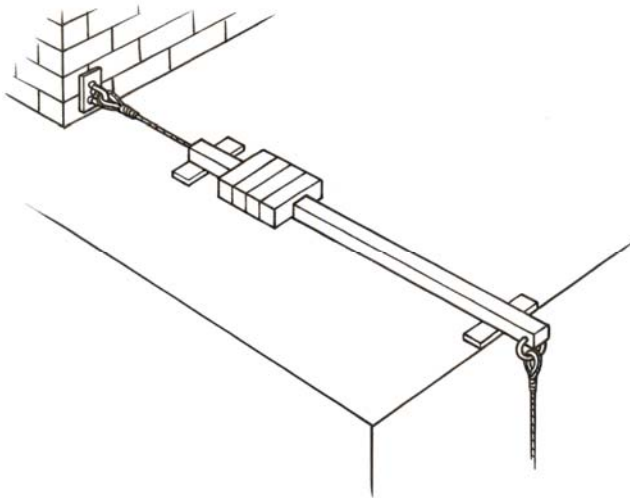
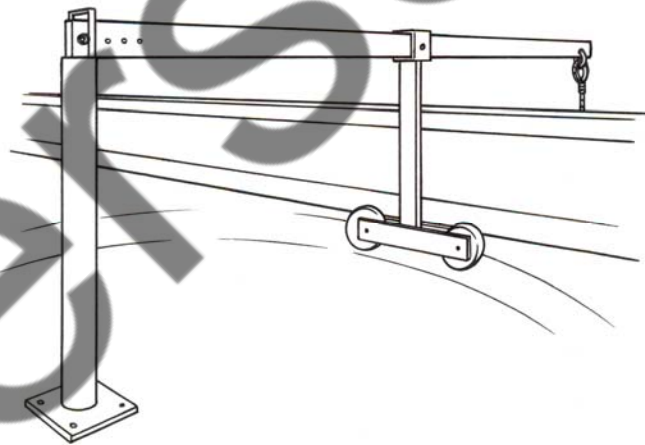
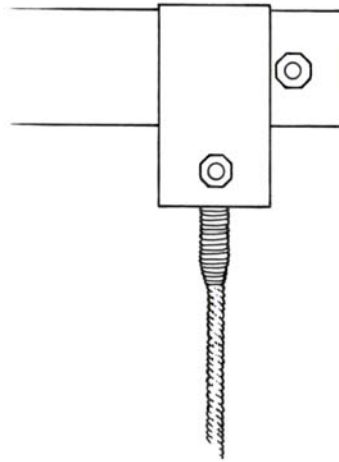


Figure 23.19(b) Example of thrustout on rotating centre



As shown in Figure 23.20, stop bolts must be installed at the outer ends of thrustouts to prevent shackles from slipping off the thrustouts.

Figure 23.20 Stop bolts at end of thrustout



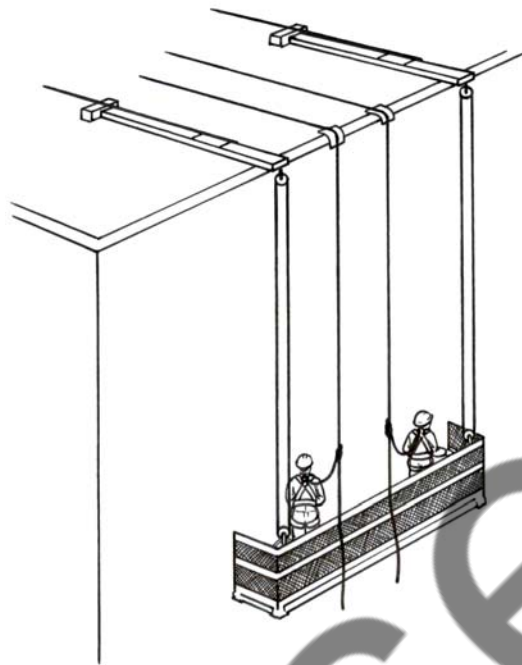
Readers are referred to section 349 of this Explanation Guide for a discussion of the term “commercially manufactured”.

Section 342 Swingstage scaffolds

Figure 23.21 shows a swingstage scaffold in use. If a swingstage scaffold has been designed by a professional engineer rather than manufactured commercially, operating procedures certified by a professional engineer must be developed.

Readers are referred to section 349 of this Explanation Guide for a discussion of the term “commercially manufactured”.

Figure 23.21 Example of a swingstage scaffold

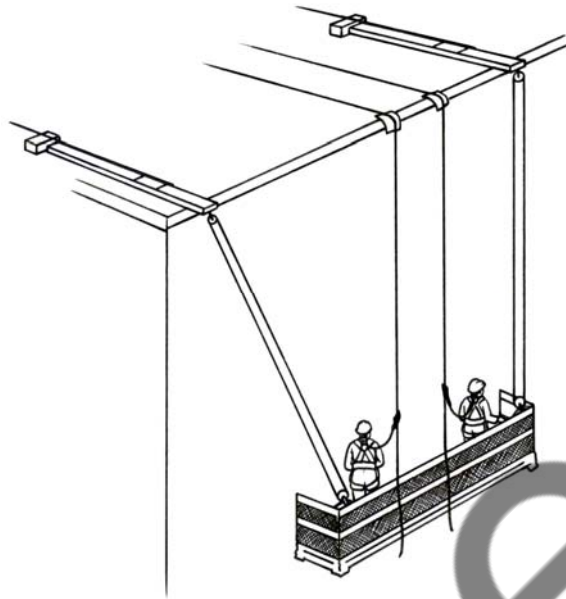


Section 343 Requirements for swingstage scaffold

A light duty scaffold is intended for workers only. Materials other than tools should not be stored on this type of scaffold. Such a scaffold is designed to support the equivalent of an evenly distributed load of no more than 122 kilograms/square metre (25 pounds/square foot).

Figure 23.21 shows the proper parallel positioning of suspension ropes. This positioning eliminates the creation of lateral forces on those structures supporting the ropes. Lateral forces could cause thrustouts and thrustout blocking to suddenly shift, damage parapets, and cause the swingstage to become unstable. Figure 23.22 shows suspension ropes that have been positioned improperly.

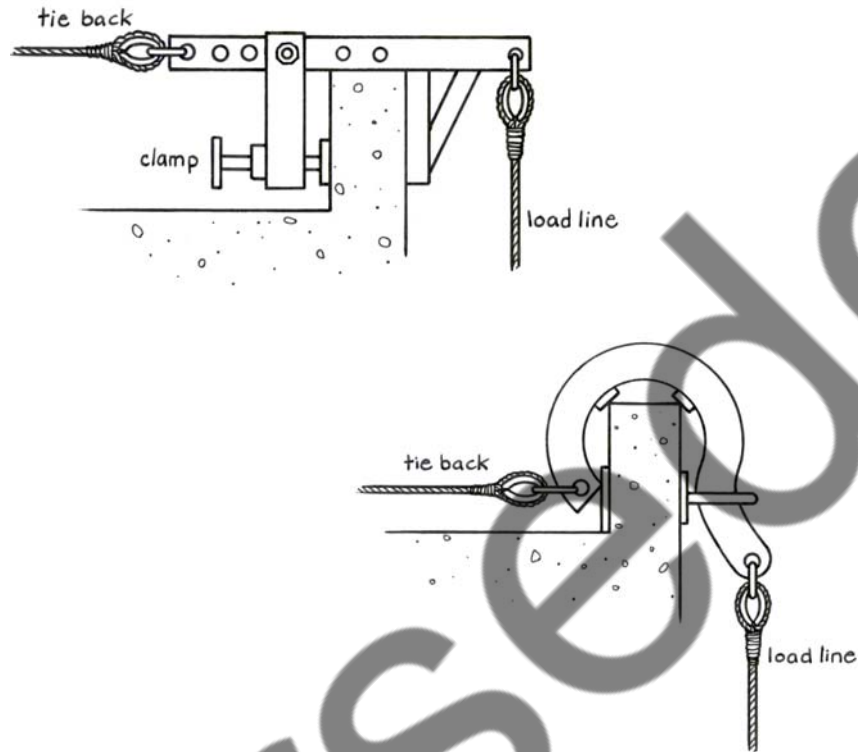
Figure 23.22 Improper suspension rope positioning



A parapet or cornice hook is a device that functions as a portable or temporary anchor for a suspension line. A parapet clamp functions as a portable or temporary anchor for a suspension line, lifeline or tieback line (Figure 23.23 shows both devices in use). As such, each hook or clamp should be designed with a minimum breaking strength of 22.2 kilonewtons (5000 pounds-force). If a parapet clamp is used to anchor a lifeline i.e. life safety rope (vertical lifeline), it must have a minimum breaking strength of 16 kilonewtons (3600 pounds-force) or two times the maximum arresting force per worker attached as required by subsection 152.1(2).

The tieback of a thrustout, parapet hook or parapet clamp can only function as an effective anchor if it is positioned on a part of the building or structure that is structurally sound and able to support the loads that the tieback will apply. These tiebacks should, as much as possible, be rigged at right angles to the building face from which the scaffold is suspended. Selection of proper tieback points is extremely important.

Figure 23.23 Parapet clamp and parapet or cornice hook



A “constant pressure control” is one that requires a deliberate, sustained application of force by a human body part for the machine to operate. Removal of this force immediately stops the machine from operating. A control equipped with a locking mechanism that keeps the control active without contact by a human body part is unacceptable.

“Positive drive”, in relation to a swingstage scaffold power unit, means that the power unit actively drives the stage in both the up and down directions. A “non-positive” or “free-wheeling” power unit drives the stage up but permits it to descend freely.

Section 344 Safety on swingstage scaffolds

Failure of the hoisting mechanism of a manually operated swingstage scaffold could cause the scaffold to drop uncontrollably. To prevent this, all manually operated swingstage scaffolds must be equipped with a secondary anti-fall device that connects the scaffold to the suspension rope at a point above the hoisting mechanism.

In case of a mechanical or power failure, workers must be able to safely leave a powered swingstage scaffold. In the case of a building with windows designed to open, or on buildings under construction with access to completed floors, workers may be able to safely leave the stage without the need for any additional or specialized equipment.

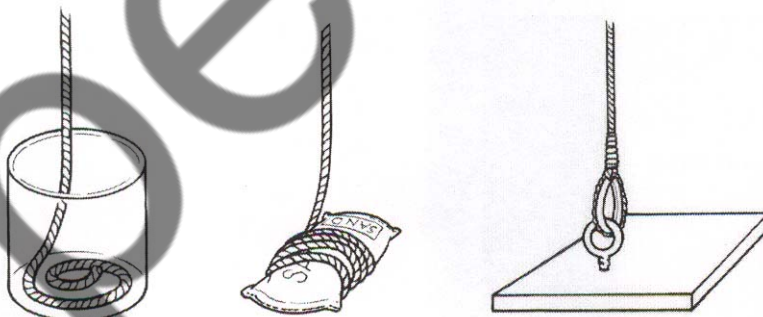
However, where workers cannot safely leave the stage as described above, the scaffold must be equipped with a manually operated secondary mechanism — perhaps the power units are capable of being converted to manual operation — or an escape device. The purpose of the secondary mechanism is to permit the stage to be positioned so that workers can safely leave it. The purpose of the escape device is to permit workers to reach a point of safe exit. The escape device cannot be a vertical lifeline used by a worker for fall protection.

Section 345 Workers on swingstage scaffolds

Subsections 345(1) to 345(3)

Ropes i.e. life safety ropes (vertical lifelines) that extend to the ground or a landing must be secured to prevent them from getting entangled in equipment or vehicular and pedestrian traffic. Figure 23.24 shows examples of how this might be done.

Figure 23.24 Examples of how to secure ropes

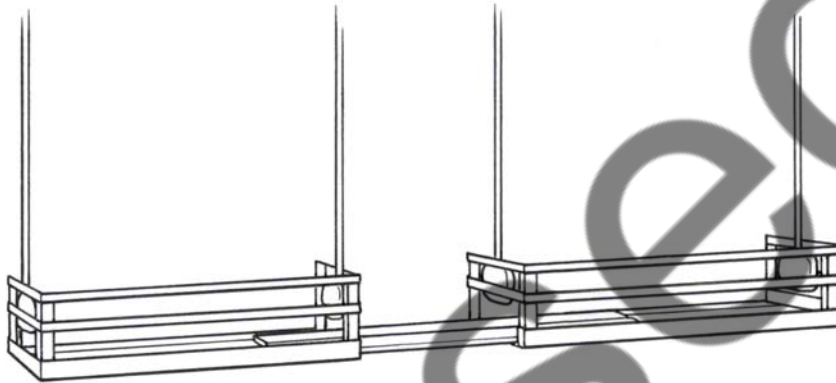


Maintaining the stage level within the specified 10 percent limit helps to prevent workers from falling, materials from upsetting, and rigging from being subjected to excessive wear.

Workers must remain between the swingstage's stirrups for their personal safety and to prevent the possibility of the stage becoming unstable. Stirrups are the main support brackets located at each end of the stage and onto which the hoisting devices are normally attached. They are also commonly known as suspension brackets.

Workers must not bridge the distance between two or more scaffolds with planks or similar connecting materials. This prohibition is consistent with subsection 344(7). Figure 23.25 shows what bridging scaffolds means.

Figure 23.25 Bridging between two or more scaffolds is not permitted



Subsections 345(4) and 345(5)

Workers working from a suspended scaffold must be protected from falling. Two cables suspend most swingstage scaffolds, one at either end of the scaffold. However, other swingstage scaffolds are available with two suspension cables at each end, a primary and a secondary suspension cable.

The Canadian Standards Association (CSA), in clause 5.3.4 of CSA standard Z91-02, *Health and Safety Code for Suspended Equipment Operations* and clause 7.2.3.2 of CSA standard Z271-98, *Safety Code for Suspended Elevating Platforms*, recognizes the use of swingstages in which the failure of one suspension rope will not substantially alter the position of the suspended swingstage. This type of swingstage has primary and secondary suspension lines at each end of the swingstage.

With this type of swingstage, CSA states that a worker's personal fall arrest system can be attached to a horizontal lifeline or anchorage on the swingstage itself, rather than the traditional approach in which workers are attached to a vertical lifeline i.e. life safety rope, secured to an anchorage integral to the structure from which the swingstage is suspended.

Subsection 345(5) now recognizes this situation.

Section 346 Worker safety

This section prohibits a worker from remaining in or on a moving basket, bucket or other elevating platform in situations where doing so creates a danger to the worker. Examples of such situations include road traffic conditions in which there is reduced or restricted visibility, or road surfaces are too slippery for safe travel. Overhead wires and cables may be an electrical contact hazard if they are energized, or present an entanglement hazard.

Where the worker is not in any danger, the worker may remain in or on a moving basket, bucket or other elevating platform. This often involves moving a short distance, as might occur between street lamps during bulb replacement or lamp cleaning. In spite of this subsection, the employer must comply with the manufacturer's specifications for movement with a worker onboard.

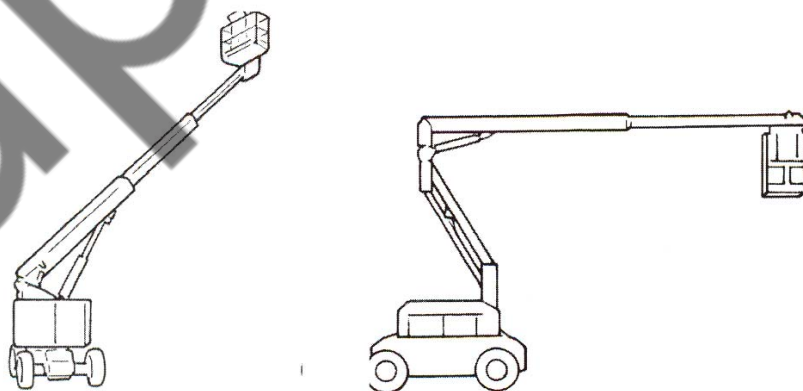
Section 347 Standards

Subsection 347(1)

CSA Standard

CSA Standard B354.4-02 applies to all integral frame, boom-supported elevating work platforms used to position personnel, along with their tools and necessary materials, at overhead work locations. The boom may telescope, articulate, or rotate, and extend the platform beyond the base dimensions. The platform is power operated with primary functions controlled from the platform. The equipment may be manually or self-propelled. Figure 23.26 shows examples of typical boom-type elevating work platforms.

Figure 23.26 Articulated boom and aerial device



An articulated boom is a boom made of two or more hinged sections that support the work platform. A telescoping boom is one in which motion created between two or more boom sections is in a longitudinal direction that lengthens or shortens the boom.

Clause 8.1 of the CSA Standard requires the platform to be equipped with a guardrail or other equivalent structure. Chain, or its equivalent, may be substituted as the toprail or midrail across an access opening. Clause 8.3 of the Standard requires fall protection anchorage point(s) to be installed on the work platform.

The Standard does not require the platform to be marked as complying with the Standard. However, a permanent plate must be located on the platform that lists:

- (a) the make, model, serial number and the manufacturer's name and address;
- (b) the rated working load;
- (c) the maximum platform height;
- (d) the maximum horizontal reach;
- (e) special warnings, cautions, or restrictions necessary for safe operation, including the use of outriders or stabilizers; and
- (f) the operating instructions and a notice indicating the need to read the operating manual before use.

The product manufacturer can provide confirmation of compliance with the Standard.

ANSI Standard

ANSI Standard A92.5-2006, *Boom-Supported Elevating Work Platforms*, applies to self-propelled integral chassis aerial platforms having a platform that can be positioned completely beyond the base and used to position workers, along with their necessary tools and materials, at work locations. Aerial platforms are power operated with primary functions, including drive, controlled from the platform. Such aerial platforms are intended to be occupied when driven. Figure 23.26 shows examples of typical boom-supported elevating work platforms.

The Standard sets criteria for the design, manufacture, performance, inspection, training, maintenance, testing and operation of the platforms. Clause 4.12.5 of the Standard requires boom-supported elevating work platforms to be equipped with anchorage(s) for personal fall protection for fall protection devices for workers occupying the platform. Clause 4.12.2 requires such platforms to have a guardrail system. Flexible materials such as cables, chains or ropes cannot be used in the guardrail system.

A boom-supported elevating work platform complying with the ANSI Standard will have a manufacturer-installed nameplate indicating that the equipment complies with the Standard.

Subsection 347(3)

CSA Standard

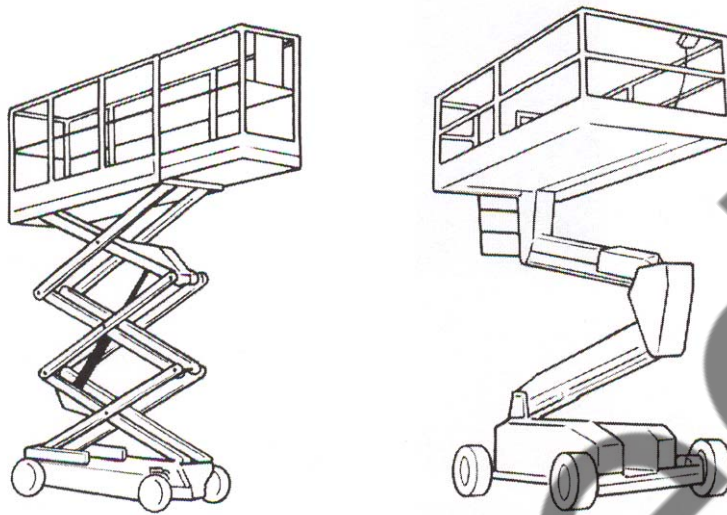
CSA Standard CAN/CSA-B354.2.-01, *Self-Propelled Elevating Work Platforms*, applies to self-propelled integral chassis elevated work platforms that have a platform that cannot be positioned completely beyond the base and that are used to position personnel, along with their necessary tools and materials, at work locations. Self-propelled elevating work platforms (aerial platforms) are power operated with primary functions, including drive, controlled from the platform. The Standard applies to aerial platforms designed for use in both on-slab and off-slab applications.

An on-slab surface means any asphalt, concrete, or equivalent surface. An off-slab surface is an uneven surface made of materials other than asphalt, concrete, or their equivalent. Compacted soil is an example of an off-slab surface. Work platforms intended for off-slab work are more stable than those intended for use on paved/slab surfaces.

The Standard specifies the minimum requirements for the establishment of criteria for the design, manufacture, remanufacture, rebuild/recondition, testing, performance, inspection, training, maintenance, and safe operation of self-propelled elevating work platforms.

Self-propelled elevating work platforms are generally intended for use over level surfaces. Normally they are not insulated for use near electrically energized circuits nor are they intended to be used in hazardous locations. The term self-propelled means that the machine can be power driven using a primary set of operator controls located on the elevated work platform. Figure 23.27 shows examples of typical self-propelled elevating work platforms.

Figure 23.27 Examples of powered (self-propelled) elevating platforms



Clause 4.13.2 of the Standard requires the platform to be equipped with a guardrail. Clause 4.13.5 requires fall protection anchorage point(s) to be installed on the work platform. The platform must be equipped with one anchorage point for each occupant.

The Standard does not require the platform to be marked as complying with the Standard. However, the platform must be durably marked with various warnings and instructions. The following is a partial list of what is required by clause 4.19.1 of the Standard:

- (a) the make, model, serial number and the manufacturer's name and address;
- (b) the rated working load;
- (c) the maximum platform height;
- (d) special warnings, cautions, or restrictions necessary for safe operation, including the use of outriders or stabilizers; and
- (e) the operating instructions and a notice indicating the need to read the operating manual before use.

The product manufacturer can provide confirmation of compliance with the Standard.

ANSI Standard

ANSI Standard ANSI/SIA A92.6-2006, *Self-Propelled Elevating Work Platforms*, applies to self-propelled integral chassis aerial platforms having a platform that cannot be positioned completely beyond the base and that are used to position personnel, along with their tools and materials, at work locations. Aerial platforms are power

operated with primary functions, including drive, controlled from the platform. Figure 23.27 shows examples of the equipment covered by the Standard.

The Standard sets criteria for the design, manufacture, remanufacture, rebuild/recondition, testing, performance, inspection, training, maintenance and operation of the platforms.

The ANSI Standard allows manufacturers to voluntarily include fall protection anchorages on their equipment. When provided, Clause 4.13.5 of the Standard requires the anchorage(s) for personal fall protection to be capable of withstanding a load of 16 kilonewtons (3,600 pounds-force). Special requirements apply if more than one worker uses a single anchorage at one time.

Clause 4.13.2 requires all work platforms to be equipped with a guardrail system. Flexible materials such as cables, chains and ropes cannot be used in the guardrail system except as a midrail at access openings 760 millimetres (30 inches) wide, or less.

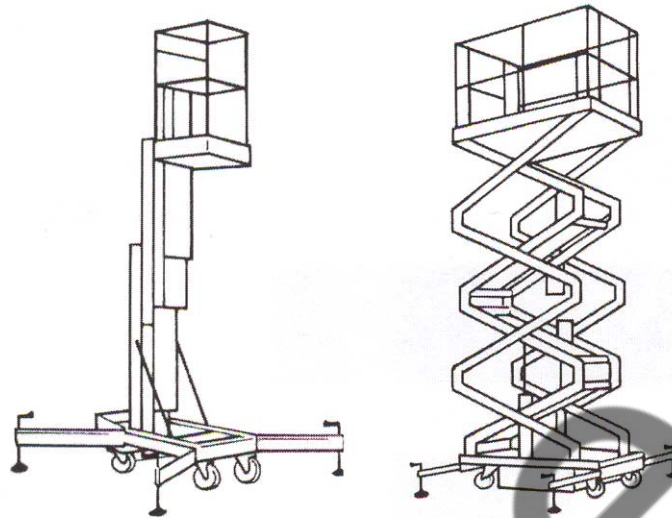
A self-propelled elevating work platform complying with the ANSI Standard will have a manufactured-installed nameplate indicating that the equipment complies with the Standard.

Subsection 347(4)

CSA Standard

CSA Standard CAN3-B354.1-2004, *Elevating Rolling Work Platforms*, applies to elevating rolling work platforms used on a level surface and that are incapable of being self-propelled from an operating station on the work platform. The work platforms are used to position workers, along with their tools and necessary materials, at overhead work locations. The Standard describes requirements and recommended practices for product design and manufacture, lists performance criteria, and sets standards for testing and inspection. Figure 23.28 shows the type of equipment to which this Standard applies.

Figure 23.28 Examples of manual elevating platforms



The Standard does not require the platform to be marked as complying with the Standard. However, a permanent plate must be located on the platform that lists:

- (a) the make, model, serial number and the manufacturer's name and address;
- (b) the rated working load;
- (c) the maximum platform height;
- (d) the maximum horizontal reach;
- (e) special warnings, cautions, or restrictions necessary for safe operation, including the use of outriders or stabilizers; and
- (f) the operating instructions and a notice indicating the need to read the operating manual before use.

The product manufacturer can provide confirmation of compliance with the Standard.

ANSI Standard

ANSI Standard ANSI/SIA A92.3-2006, *Manually Propelled Elevating Aerial Platforms*, applies to manually propelled, integral chassis aerial platforms having a platform that cannot be positioned completely beyond the base and that are used to position workers, together with their tools and materials, at work locations. Platforms are adjusted by manual or powered means and cannot be occupied when moved horizontally. This Standard sets criteria for the design, manufacture, testing, performance, inspection, training, maintenance and operation of the platforms. Figure 23.28 shows typical examples of the equipment to which the Standard applies.

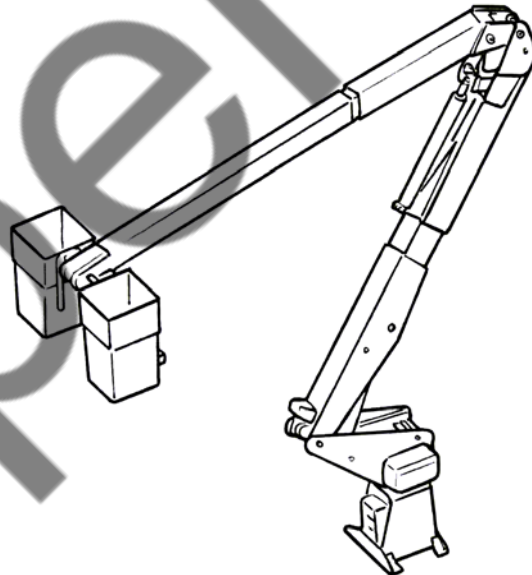
Clause 4.12.5 of the Standard requires the aerial platform to be equipped with a fall protection anchor point(s) if the platform's guardrail system, or parts of the guardrail system, can be removed. Clause 4.12.2 requires all work platforms to be equipped with a guardrail system. Flexible materials such as cables, chains and ropes cannot be used in the guardrail system.

A manually propelled elevating aerial platform complying with the ANSI Standard will have a manufacturer-installed nameplate indicating that the equipment complies with the Standard.

Subsection 347(5)

CSA Standard CAN/CSA-C225-00 (R2005), *Vehicle-Mounted Aerial Devices*, sets criteria for the design, manufacture, testing, inspection, installation, maintenance, use and operation of vehicle-mounted aerial devices. These devices are installed on a chassis, are primarily used to position workers for work purposes, and are used for operator training. The vehicle may be a truck, trailer or all-terrain vehicle. The design and manufacturing requirements of the Standard apply to those devices manufactured after the date of publication of the Standard. Figure 23.29 shows a typical aerial device.

Figure 23.29 Example of a typical aerial device



The Standard recognizes both insulated and non-insulated aerial devices. Insulated aerial devices are classified into three categories based on the degree of electrical protection they provide and the type of work being performed.

Clause 4.9.4 of the Standard requires the work platform to be equipped with a fall arrest anchor(s) capable of withstanding a load of 22.2 kilonewtons (5000 pounds-force). Clause 4.5.4 of the previous 1988 edition of the Standard required anchors to have a strength of 18 kilonewtons (4000 pounds-force). Special requirements apply if more than one worker uses a single anchor at one time. Clause 8 of the Standard, "Responsibilities of Owners", describes what is required of equipment owners in terms of equipment inspections and tests.

Although an attached nameplate may show compliance information, an aerial device is not required by the Standard to bear a marking indicating compliance with the requirements of the Standard. Where compliance is in question, the manufacturer's specifications should be consulted.

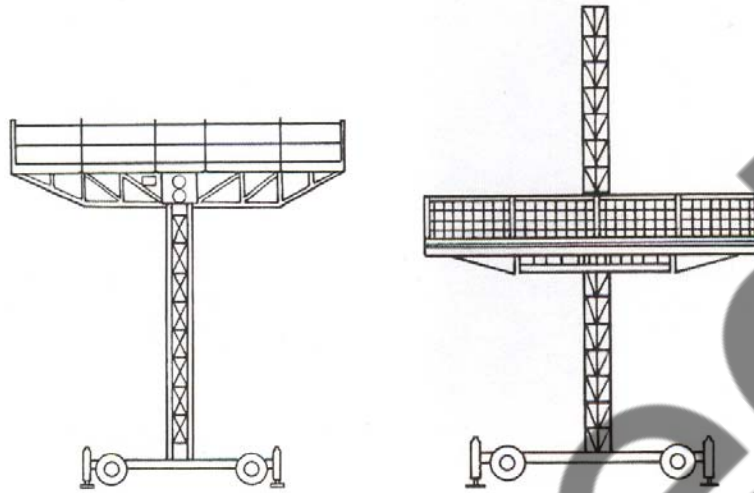
Subsection 347(6)

ANSI

ANSI Standard ANS/SIA A92.9-1993, *Mast-Climbing Work Platforms*, applies to mast-climbing platforms primarily used to position workers, including their tools and materials, so that work can be performed. Platforms can be adjusted by manual or powered means. The Standard sets criteria for the design, manufacture, performance, inspection, training, maintenance, testing and operation of these work platforms. Figure 23.30 shows examples of typical platforms covered by the Standard.

A mast-climbing work platform complying with this Standard will have a manufacturer-installed nameplate indicating that the equipment complies with the Standard.

Figure 23.30 Examples of typical mast-climbing work platforms

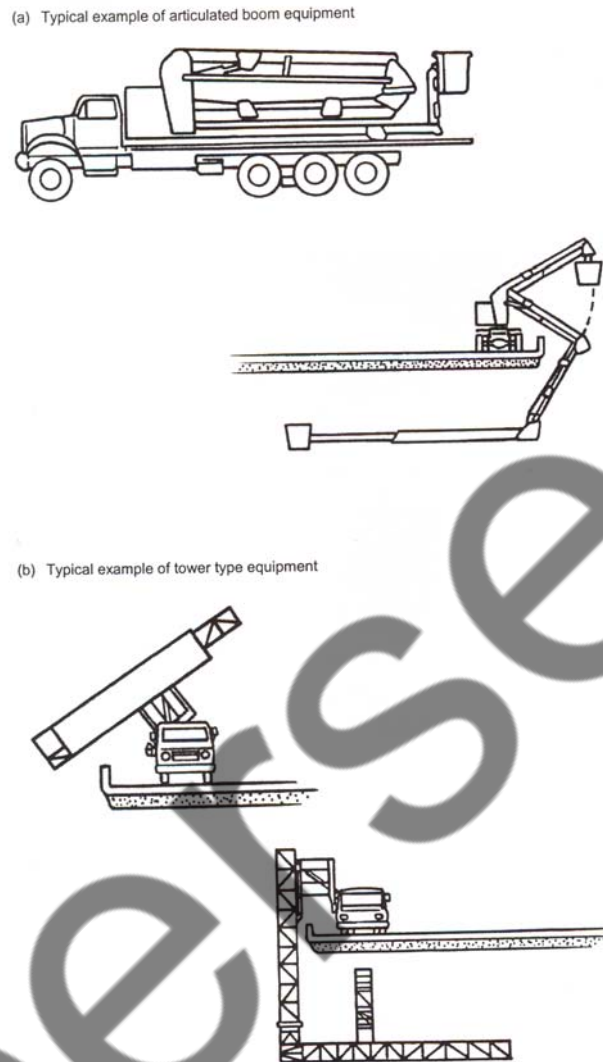


Subsection 347(7)

ANSI Standard ANSI/SIA A92.8-1993 (R1998), *Vehicle-Mounted Bridge Inspection and Maintenance Devices*, applies to mobile units generally designed to be supported on bridge surfaces of varying degrees of grade and super-elevation and have the capability of providing personnel quick and easy access to the underside of such structures. The Standard describes requirements for the design, manufacture, testing, inspection, installation, maintenance, use, training and operation of such devices.

Figure 23.31 shows typical examples of vehicle-mounted bridge inspection and maintenance devices. The device manufacturer can provide confirmation of compliance with the Standard.

Figure 23.31 Typical examples of vehicle-mounted bridge inspection and maintenance devices



Subsection 347(8)

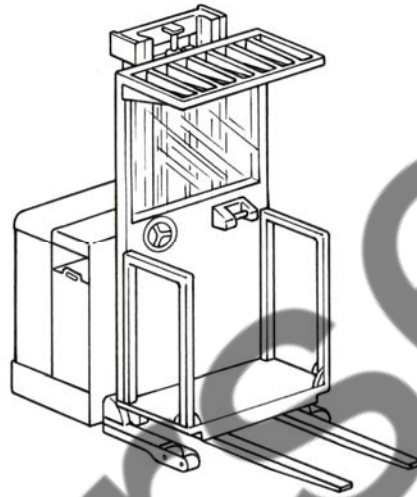
ASME Standard B56.1-2000, *Safety Standard for Low Lift and High Lift Trucks*, defines safety requirements relating to the elements of design, operation and maintenance of low lift and high lift powered industrial trucks controlled by a riding or walking operator, and intended for use on compacted, improved surfaces.

An order picker lift truck complying with the Standard will have a manufacturer-installed nameplate indicating that the lift truck complies with those mandatory requirements of the Standard applicable to the manufacturer. The lift truck may also bear other markings, authorized by an appropriate nationally recognized testing laboratory, indicating compliance with the Standard.

This subsection applies to both high lift and low lift order pickers. The ASME Standard defines this equipment as follows:

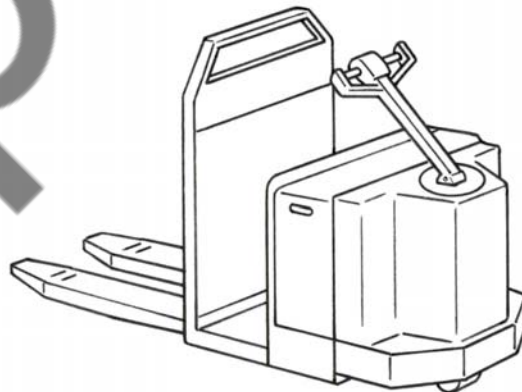
“high lift order picker truck” means a high lift truck controllable by the operator stationed on a platform movable with the load-engaging means and intended for (manual) stock selection. The truck may be capable of self-loading and/or tiering. Figure 23.32 shows an example of such a truck.

Figure 23.32 High lift order picker rider truck



“low lift order picker truck” means a low lift truck controllable by an operator when stationed on, or walking adjacent to, the truck, and intended for (manual) stock selection. The truck may be capable of self-loading. Figure 23.33 shows an example of such a truck.

Figure 23.33 Low lift order picker truck



Section 348 Permanent suspension powered work platforms

This section applies to equipment that is permanently installed on a structure and includes a suspended working platform, a roof car, or other suspension means, track or guidance systems, and the required operating and control devices. This is in contrast to portable powered platforms such as swingstages which are removed from their points of suspension after each use and are normally handled on the ground.

CSA Standard CAN/CSA-Z271-98 (R2004), *Safety Code for Suspended Elevating Platforms*, applies to the design, construction, installation, operation, inspection, test, maintenance, alteration, and repair of suspended elevating platforms designed to carry personnel for the purpose of gaining access to exterior and interior building surfaces and other structures. The Standard also applies to manually operated platforms and boatswain's chairs.

Section 349 Fork-mounted work platforms

Subsection 349(1)

This section applies to a cage or work platform mounted on the forks of powered mobile equipment and intended to only support material. The cage or work platform must be securely attached to the lifting carriage or forks of the powered mobile equipment. Doing so prevents the cage or platform from accidentally moving laterally or vertically and prevents the powered mobile equipment from tipping.


Subsection 349(2)

Because the work platform is intended to support a worker, it must meet a higher standard of design and construction than is required by subsection 349(1) for a platform intended to only support material. This means that the work platform must be commercially manufactured or designed and certified by a professional engineer if not commercially manufactured. This is the same standard of safety that applies to suspended man baskets (see subsection 350(1)), a type of work platform that similarly supports workers at a height above ground level.

The work platform must be equipped with guardrails and toe boards. Guardrails act as a type of fall protection and the toe boards prevent small objects from falling off the platform.

The platform must be equipped with a screen or similar barrier that guards any drive mechanism accessible to a worker while on the work platform. This screen or barrier is intended to protect a worker on the platform from contact with moving parts associated with the lifting or lowering mechanism.

For more information

 ASME Standard B56.1-2000, *Safety Standard for Low Lift and High Lift Trucks*. Clause 7.36 presents design specifications for elevating work platforms

The fall protection approach to be followed when using a fork-mounted work platform depends on the type of forklift being used. The two situations normally encountered are summarized as follows

Forklift truck with vertical mast

When a work platform is attached to a forklift truck having a vertical mast and the platform only moves up and down, then the platform's guardrail system provides worker protection against falls. However, if a portion of the guardrail system is absent or has to be removed while in an elevated position and its absence exposes the worker to an edge from which the worker could fall, then additional safety measures must be taken. Specifically, the worker must use either a travel restraint or personal fall arrest system. Because of the (usually) limited clearance distance below the work platform, a travel restraint system consisting of a self retracting lanyard and full body harness is preferred.

Forklift truck with telescopic mast

In a study of deaths involving aerial work platforms used in the U.S. construction industry between 1992 and 1999, it was determined that boom-supported work platforms accounted for almost 70 percent of deaths involving aerial work platforms.

The study reported that

- (a) half of all falls from boom-supported work platforms involved being ejected from the bucket or platform after being struck by vehicles, cranes, or crane loads, or by falling objects, or when the work platform suddenly jerked, and
- (b) two-thirds of the deaths from collapses/tipovers of boom supported work platforms occurred when the bucket cable or boom broke or the bucket fell.

Almost one-third of the deaths were due to tipovers.

Experience in Alberta about ejections has resulted in subsection 141(1) explicitly requiring that workers use a personal fall arrest system when working from a telescopic forklift truck work platform. The worker's lanyard must be connected to

an engineered anchor point. The worker's lanyard must, if reasonably practicable, be short enough to prevent the worker from being ejected from the work platform yet be long enough to allow the worker to perform his or her work. Readers are referred to the explanation to section 141 of the OHS Code for additional information.

Subsection 349(3)

A worker working from an elevated fork-mounted work platform relies on the equipment operator to position the worker up and down. The operator must not leave the controls while a worker is on the elevated work platform.

Subsection 349(4)

No one is permitted to remain on a fork-mounted work platform while the powered mobile equipment to which it is attached is being driven. The platform is not designed to protect a worker from injury if the powered mobile equipment stops or starts suddenly, or in the event of a collision or upset.

Commentary about "commercially manufactured"

In general, a commercially manufactured product has the following qualities

- (a) it is designed and built to some standard or generally accepted engineering principles that make it safe for use;
- (b) it is designed and built by person(s) with the skill or competence to be able to make the product safe;
- (c) it is produced with the intention of being generally available to anyone who wants to buy it – normally there is an exchange of money;
- (d) it is normally supported by the manufacturer with a warranty, guarantee, and product support; and
- (e) liability and safety issues related to its use have been addressed by the manufacturer.

It is implied by the OHS Code, that a product that is "commercially manufactured" is "safe" because it has been produced by a "manufacturer" that has the skills and competencies to do so.

Criterion (a) refers to the product being designed and built to some "generally accepted engineering principles". It is expected that a "manufacturer" is able to provide drawings or sketches of the product that include an assessment of the product's strength, load-bearing capacity, etc. Further, criterion (d) mentions "product support". This may include, among other elements, the availability of written manufacturer specifications.

Section 350 Suspended man baskets

Moved to section 75.1

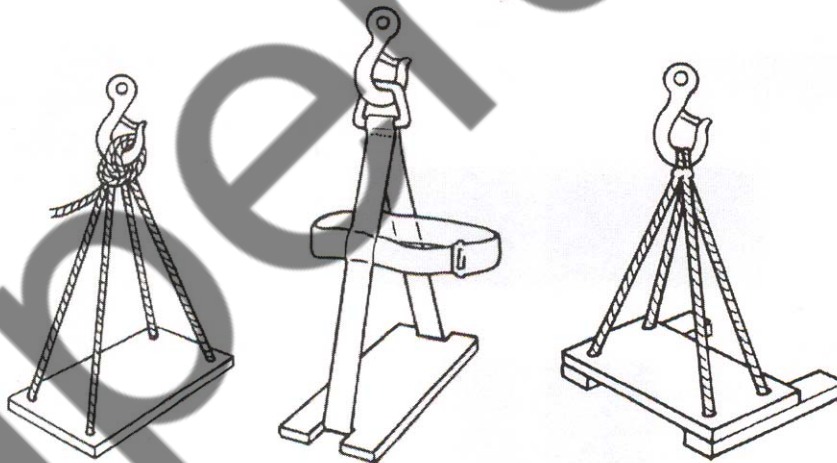
Section 351 Boatswain's chairs

Subsections 351(1) and 351(2)

A boatswain's chair raised and lowered by manually powered hoisting equipment, or used with a "descent only" rigging arrangement, should be designed to support a minimum load of 113.7 kilograms (250 pounds). Generally, the chair will have a minimum 19 millimetre (3/4 inch) thick plywood seat, attached at four corners by minimum 13 millimetre (1/2 inch) diameter nylon rope to a master link, or be constructed to provide an equivalent strength, and have a lap belt to secure the chair to the worker. Various designs of boatswain's chairs are shown in Figure 23.34.

Readers are referred to section 349 of this Explanation Guide for a discussion of the term "commercially manufactured".

Figure 23.34 Various designs of boatswain's chairs



A powered (motorized) boatswain's chair is a powered platform and must meet the requirements of CSA Standard CAN3-Z271-M98 (R2004), *Safety Code for Suspended Powered Platforms* (see section 348).

Subsection 351(3)

While the anchor to which the rope is attached must have a strength of 22 kilonewtons (5000 pounds-force), the rope must have a strength of 27 kilonewtons (6000 pounds-force). The “breaking strength” of rope means the manufacturer’s specified minimum (or nominal) strength of new rope under a straight pull test condition. The 5 kilonewton difference between rope strength and anchor strength is to allow for losses in rope strength due to factors such as the rope termination (such as knots or splices), the rope running over pulleys or other small radius surfaces, wear within generally accepted limits, and deterioration in the rope from regular use up to the time when rejection criteria require the rope to be removed from service.

Subsection 351(4)

No explanation required.

Section 352 Temporary supporting structures

CSA Standard S269.1-1975 (R2003), *Falsework for Construction Purposes*, provides rules and requirements for the design, fabrication, erection, inspection, testing, maintenance and use of falsework materials and components where they are erected to provide temporary vertical support for buildings and other structures during their construction, alteration or repair.

Falsework is the term used to describe structural supports and the bracing required to support temporary loads during construction. A fly form deck panel is a complete, unitized falsework structure intended to be moved as a unit. A form or formwork is the mould into which concrete is placed.

If any of the conditions listed in subsection (3) are present, or may be present, the employer must have the resulting temporary supporting structure certified by a professional engineer. The engineer’s certified specifications must contain the information listed in subsection (4).

Section 353 Fly form deck panels

No one is allowed to be on a fly form deck panel while it is being flown. In addition to the hazard of falling, the presence of a person on the panel may make the panel unstable.