Rule 0.1 Preamble and incorporation by reference. Section 25-5-704(1)(a) of the Colorado Revised Statutes allows the Colorado Passenger Tramway Safety Board ("Board") to "use as general guidelines the standards contained in the 'American Standard Safety Code for Aerial Passenger Tramways', as adopted by the American Standards Association, Incorporated, as amended from time to time." Since 1965, when this provision was enacted, the American Standards Association, Inc., has been succeeded by the American National Standards Institute, Inc. and the American Standard Safety Code updated., ~~and t~~The relevant publications ~~as~~ are now known as the "American National Standard for Passenger Ropeways – Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors – Ssafety Rrequirements", ("ANSI B77.1-2006") ~~and. The Board may also use~~ the "American National Standard for Funiculars – Safety Requirements" ~~known as~~ ("ANSI B77.2-2004").

~~The Colorado Passenger Tramway Safety Board has adopted, with certain additions, revisions, and deletions, the American National Standards Institute (ANSI) B77.1-2006 American National Standard for Passenger Ropeways – Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors – Safety Requirements, approved February 16, 2006, hereinafter referred to as the ANSI B77.1-2006 Standard, as its rules and regulations. The Colorado Passenger Tramway Safety Board Rules and Regulations do not include any later amendments or additions of the ANSI B77.1-2006 Standard.~~

~~The Colorado Passenger Tramway Safety Board has also adopted, with certain additions, revisions, and deletions, the American National Standards Institute (ANSI) B77.2-2004 American National Standard for Funiculars – Safety Requirements, approved August 19, 2004, hereinafter referred to as the ANSI B77.2-2004 Standard, as additional rules and regulations. The Colorado Passenger Tramway Safety Board Rules and Regulations do not include any later amendments or additions of the ANSI B77.2-2004 Standard.~~

The Board adopts and incorporates by reference, with certain additions, revisions, and deletions, the ANSI standards as listed below: ~~The document titled "State of Colorado Department of Regulatory Agencies Passenger Tramway Safety Board Rules and Regulations" contains only revisions to the ANSI B77.1-1999, B77.1-2006, and B77.2-2004 Standards or additional rules not covered by the ANSI B77.1-1999, B77.1-2006, or B77.2-2004 Standards. If a particular rule is not found in the document titled "State of Colorado Department of Regulatory Agencies Passenger Tramway Safety Board Rules and Regulations" then the rule can be found in the ANSI B77.1-1999, B77.1-2006, or B77.2-2004 Standards. The term "rules and regulations" as used in this document is a reference to the ANSI B77.1-1999, B77.1-2006, or B77.2-2004 Standards and the "State of Colorado Department of Regulatory Agencies Passenger Tramway Safety Board Rules and Regulations." revisions from previous ANSI standards as listed below:~~

B77.1-1960	June 8, 1960	USA standard Safety Code for Aerial Passenger Tramways
B77.1a-1963	July 1, 1963	Addenda to USA standard Safety Code for Aerial Passenger Tramways
B77.1b-1965	July 26, 1965	Addenda to USA standard Safety Code for Aerial Passenger Tramways
B77.1-1970	March 17, 1970	American National Standard - Safety Requirements for Aerial Passenger Tramways
B77.1-1973	January 25, 1973	American National Standard - Safety Requirements for Aerial Passenger Tramways
B77.1-1976	November 19, 1975	American National Standard - Safety Requirements for Aerial Passenger Tramways
B77.1a-1978	January 17, 1978	Addendum to American National Standard - Safety Requirements for Aerial Passenger Tramways

B77.1-1982	July 16, 1982	American National Standard - for passenger tramways - aerial tramways and lifts, surface lifts and tows – Safety Requirements
B77.1a-1986	December 2, 1985	Supplement to American National Standard - for passenger tramways - aerial tramways and lifts, surface lifts and tows - Safety Requirements
B77.1b-1988	March 14, 1988	Supplement to American National Standard - for passenger tramways - aerial tramways and lifts, surface lifts and tows – Safety Requirements
B77.1-1990	March 26, 1990	American National Standard for Passenger Tramways - Aerial Tramways and Lifts, Surface Lifts and Tows - Safety Requirements
B77.1-1992	December 2, 1992	American National Standard for Passenger Tramways - Aerial Tramways, Aerial Lifts, Surface Lifts, Tows - Safety Requirements
B77.1-1999	March 11, 1999	American National Standard for Passenger Ropeways - Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors - Safety Requirements
B77.2-2004	December 31, 2003	American National Standard for Funiculars- Safety Requirements Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors - Safety Requirements
B77.1-2006	April 17, 2006	American National Standard for Passenger Ropeways - Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors - Safety Requirements

As used in this document, the term "rules and regulations" means the referenced ANSI Standards and the "State of Colorado Department of Regulatory Agencies Passenger Tramway Safety Board Rules and Regulations." The Board Rules and Regulations do not include any later amendments to or editions of the standards listed above.

~~The design, installation, operation, and maintenance of passenger ropeways, funiculars, and their components that are not covered by these standards should conform to applicable standards or codes. To the extent that they are available, applicable codes or standards shall be selected to cover all features, including, but not limited to, allowable unit stresses and properties of materials. Each code or standard should be of the most recent issue as of the effective date of this rule, and the designer shall state which code or standard was followed. Features not covered by these standards shall be handled in accordance with sound engineering judgment.~~

A copy of each of the ~~ANSI B77.1-1999, B77.1-2006, and B77.2-2004 Standards and other referenced~~ standards, codes, ~~or~~ and guidelines ~~as~~ listed ~~herein~~ above are available for public inspection at the Board office at the Division of Registrations, Department of Regulatory Agencies, 1560 Broadway, Suite 1350, Denver, Colorado, 80202, and at any state publications depository library. For further information regarding how this material can be obtained or examined, contact the Board's Program Director at 1560 Broadway, Suite 13~~00~~50, Denver, Colorado, 80202, (303) 894-7785.

1.2.4.1 Existing installations. Existing installations need not comply with the new or revised requirements of this edition except as set forth below. The requirements stated below shall comply with the ANSI B77.1-1999 Standard except where stated. Existing tramways, when reinstalled, shall be classified as new installations (see 1.2.4.2). For tramways that have not been relocated, but have not had routine maintenance performed within the previous two years or longer, these tramways shall be subject to an acceptance test as outlined in 2.1.1.11.2, 3.1.1.11.2, 4.1.1.11.2, 5.1.1.11.2, 6.1.1.11.2, 8.1.1.11.2 (ANSI B77.1-1999) and 2.1.1.11.2 (ANSI B77.2-2004) Acceptance Test. This test shall verify that the tramway is in compliance with the rules and regulations that were in effect at the time the tramway was originally constructed and current rules that affect all tramways. A tramway modification or alteration shall be defined by 21.1 and meet the requirements of 21.3, 21.4, and 21.5.

All installations shall comply with the new or revised requirements of these rules and regulations (ANSI B77.1-1999) in the following areas, on or before the effective date of each paragraph, as set forth below:

(1) Requirements for auxiliary drives, as set forth in 2.1.2.1.1, 3.1.2.1.1, 4.1.2.1.1. These requirements shall be effective November 1, 1994.

(2) General requirements for brakes and rollback devices as set forth in 2.1.2.5, 3.1.2.5, 4.1.2.5, 5.1.2.5, and 6.1.2.5. These requirements shall be effective November 1, 1994.

(3) Requirements for service brakes as set forth in 2.1.2.5.1, 3.1.2.5.1, 4.1.2.5.1, 5.1.2.5.1 and 6.1.2.5.1. These requirements shall be effective November 1, 1994.

(4) Requirements for drive sheave brakes, as set forth in 2.1.2.5.2, 3.1.2.5.2 and 4.1.2.5.2. These requirements shall be effective November 1, 1994.

(5) Requirements for rollback devices as set forth in 3.1.2.5.3, 4.1.2.5.3, 5.1.2.5.3 and 6.1.2.5.3. These requirements shall be effective November 1, 1994.

(6) Requirements for drive train backstop devices as set forth in 3.1.2.5.4 and 4.1.2.5.4. These requirements shall be effective November 1, 1994.

(7) Requirements for guarding of machinery as set forth in 2.1.2.6.1 (paragraph 1), 3.1.2.6.1 (paragraph 1), 4.1.2.6.1 (paragraph 1), 5.1.2.6.1 (paragraph 1), and 6.1.3.2. These requirements shall be effective November 1, 1994.

(8) Requirements for mechanical stops for rigid mounted carriages as set forth in 3.1.2.8.2, 4.1.2.8.2, and 5.1.2.8.2. These requirements shall be effective November 1, 1994.

(9) Requirements for manual and automatic stops as set forth in 2.1.2.11, 3.1.2.11, 4.1.2.11, 5.1.2.11 and 6.1.2.11. These requirements shall be effective November 1, 1994.

(10) Requirements for manual stop devices as set forth in 2.1.2.11.1, 3.1.2.11.1, 4.1.2.11.1, 5.1.2.11.1 and 6.1.2.11.1. These requirements shall be effective November 1, 1994.

(11) Requirements for automatic stop devices as set forth in 2.1.2.11.2, 3.1.2.11.2, 4.1.2.11.2, 5.1.2.11.2 and 6.1.2.11.2. These requirements shall be effective November 1, 1994.

(12) Requirements for cable catchers and derail switches as set forth in 2.1.3.3.2, 3.1.3.3.2 (paragraphs 4 and 5), 4.1.3.3.2 and 5.1.3.3.2. These requirements shall be effective November 1, 1994.

(13) Requirements for grips as set forth in 3.1.4.3.1(paragraph 1, 2, and item I), 3.1.4.3.4.1(paragraph 1), 3.1.4.3.4.2, 3.1.4.3.4.4, 4.1.4.3.2, 4.1.4.3.5, 5.1.4.3.2. These requirements shall be July 1, 2000.

(14) Requirements for operating personnel as set forth in 2.1.5, 3.1.5, 4.1.5, 5.1.5 and 6.1.5. These requirements shall be effective November 1, 1994.

~~(15) Requirements for an operational manual as set forth in 2.1.6.1, 3.1.6.1, 4.1.6.1, 5.1.6.1 and 6.1.6.1. These requirements shall be effective November 1, 1994.~~

~~(16) Requirements for the protection of electrical equipment as set forth in 2.2.1.3, 3.2.1.3, 4.2.1.3, 5.2.1.3 and 6.2.1.3. These requirements shall be effective November 1, 1994.~~

~~(17) Requirements for operating control circuits as set forth in 2.2.1.7, 3.2.1.7, 4.2.1.7, 5.2.1.7 and 6.2.1.7. These requirements shall be effective November 1, 1994.~~

~~(18) Requirements for the location of machinery in attaching/detaching areas as set forth in 3.1.2.6.1 and 3.1.2.6.4. These requirements shall be effective November 1, 1994.~~

~~(19) Requirements for end connections and protective coverings as required in Rule 7.3.2. These requirements shall be effective July 1, 2000.~~

~~(20) Requirements for clearances and skiable track as set forth in Rules 6.1.1.3.1 and 6.1.1.4.1. These requirements shall be effective November 1, 1994.~~

~~(21) Requirements for voltage limitations for non-haul or track rope overhead cables as set forth in 2.2.1.4, 3.2.1.4, 4.2.1.4, 5.2.1.4, and 6.2.1.4. These requirements shall be effective July 1, 2000.~~

~~*Note: Items 22-29 below shall be required to meet the requirements of CPTSB Rules and Regulations dated May 15, 2005.*~~

~~(22) Requirements for alarms as set forth in 11.7.7 shall be effective July 1, 2000.~~

~~(23) Requirements for automatic stop devices for conveyor lifts as set forth in 8.1.2.11.2 shall be effective November 1, 1999.~~

~~(24) Requirements for moving machinery guarding for conveyor lifts as set forth in 8.1.2.6.1 shall be effective November 1, 1999.~~

~~(25) Requirements for operating circuits as set forth in 8.2.1.7.1 shall be effective November 1, 1999.~~

~~(26) Requirements for voltage limitations as set forth in 8.2.1.4 shall be effective November 1, 1999.~~

~~(27) Requirements for Safety of operating and maintenance personnel as set forth in 2.1.1.12 and 3.1.1.12 shall be effective November 1, 1999.~~

~~(28) Requirements for fuel handling as set forth in Section 11 with the **EXCEPTION** of Rule 11.5.1 Structural members used as fuel tanks; Rule 11.5.4 Outside aboveground or underground fuel supply tanks; Rule 11.5.4.1 Location with respect to haul and counterweight ropes; Rule 11.5.6 Provisions for internal corrosion; Rule 11.5.8.3 Supply tanks; and Rule 11.5.11.11 Fill pipes. These requirements shall be effective October 15, 2001.~~

~~(29) Requirements for fuel handling as set forth in Section 11 and Rule 1.2.4.1 (28) with the **EXCEPTION** of Rule 11.4.2 (a) and (c) Engines designed for continuous tramway operation. These requirements shall be effective December 2, 2002.~~

1.2.4.1 Existing installations. Existing tramways, when reinstalled, shall be classified as new installations (see 1.2.4.2). For tramways that have not been relocated, but have not had routine maintenance performed within the previous two years or longer, these tramways shall be subject to an acceptance test as outlined in 2.1.1.11, 3.1.1.11, 4.1.1.11, 5.1.1.11, 6.1.1.11, 7.1.1.11 (ANSI B77.1-2006) and 2.1.1.11 (ANSI B77.2-

2004) Acceptance Test. This test and inspection shall verify that the tramway is in compliance with the rules and regulations that were in effect at the time the tramway was originally constructed and current rules that affect all tramways. A tramway modification or alteration shall be defined by 21.1 and meet the requirements of 21.3, 21.4, and 21.5.

If an ANSI B77.1 or CPTSB rule was in existence at the time of the ropeway installation date or modification date of an existing tramway and is absent from the current CPTSB rules and regulations, it shall continue to be required.

Section 2 Aerial Tramways

2.1.1.3.1 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

2.1.1.3.2 Air space requirements.

2.1.1.3.2.1 Structures. No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

2.1.1.3.2.2 Cables or ropes. Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

2.1.2.7.4 Egress. Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

2.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

Note: Timeframes relate to the ropeway installation date or modification date whichever controls, unless otherwise noted.

2.1.1.3.1 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

2.1.1.3.2 Air space requirements.

2.1.1.3.2.1 Structures.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

2.1.1.3.2.2 Cables or ropes.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

2.1.1.12 Safety of operating and maintenance personnel.

Provision shall be incorporated in the aerial tramway design to render the system inoperable when necessary for the protection of personnel working on the aerial tramway. See 2.3.1.1 for placement of applicable warning signs.

The aerial tramway shall incorporate an audible warning device that signals of an impending start of the ropeway. After the start button is pressed, the device shall sound an audible alarm for a minimum of 2 seconds and shall continue until the ropeway begins to move. The audible device shall be heard inside and outside all

terminals and machine rooms above the ambient noise level.

2.1.2.1.1 Auxiliary power unit.

An auxiliary power unit (APU) with an independent power source shall be provided to move the carrier(s) to a terminal in the event of failure of the primary power unit.

A single auxiliary power unit shall not be used except to unload passengers and for maintenance purposes. This unit shall be electrically wired to meet the requirements of 2.2.1.7.2 so that it can be stopped by the Emergency Shutdown Circuit. The auxiliary power unit shall not depend upon the mechanical integrity of the prime mover to drive the unit. The prime mover shall be disconnectable in event of a mechanical lockup.

The auxiliary power unit shall be designed to become operational and move the carriers to terminal areas within 1 hour from the time of initiating its connection.

2.1.2.5 Brakes.

The aerial tramways shall have the following friction-type brakes:
- service brake (see 2.1.2.5.1);
- drive sheave brake (see 2.1.2.5.2);
- track cable brake (see 2.1.4.3.2).

All drive braking systems shall be designed and monitored to ensure that:

a) once the aerial tramway begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing torque;

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial tramway under any condition of loading;

d) the failure of one braking system to properly decelerate the aerial tramway shall automatically initiate a second braking system, if any.

The service brake and drive sheave brake shall be designed such that failure of one braking system shall not impair the function of the other systems, and all brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake and drive sheave brake shall be designed to assure operation under all anticipated conditions.

Deceleration rates specified in 2.1.2.4 shall be achieved by each brake without the aid of other braking devices or drive regeneration.

All drive braking systems shall be capable of operation to comply with the daily inspections and periodic testing.

A qualified engineer shall furnish a written procedure to be followed and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake. This procedure shall be performed during the acceptance test, and at the frequency specified, to demonstrate the ability of each brake to produce the required torque.

Such testing shall be accomplished as part of normal maintenance during the operating season, but shall be performed when the aerial tramway is not open to the public.

2.1.2.5.1 Service brake.

The service brake can be located at any point in the drive train such that there is no belt, friction clutch, or similar friction-type device between the brake and the drive sheave.

The service brake shall be an automatic brake to stop and hold the aerial tramway under the most unfavorable design loading condition. The rate of application of this brake shall be adjustable. This brake shall have the design capability to decelerate the aerial tramway at a rate of 2 feet (0.6 meter) per second squared when operating under the most unfavorable condition of overhauling load and at full speed.

2.1.2.5.2 Drive sheave brake.

Drive sheave brake controls shall be located and the brake activated in a manner that deceleration will begin within 3 seconds after the operator or attendant reacts to the stimulus to apply the brake.

The drive sheave brake shall operate on the drive sheave assembly.

Application of the drive sheave brake shall automatically disconnect the power source to the power unit in use. This brake shall act automatically when the speed of the haul rope exceeds the design speed by 15% in either direction or if the carriers travel beyond their normal stopping position in either terminal.

The drive sheave brake shall be an automatic brake to stop and hold the aerial tramway under the most unfavorable design loading condition. The rate of application of this brake shall be adjustable. This brake shall have the design capability to decelerate the aerial tramway operating at full speed, with the design loading condition most unfavorable to stopping, at 1.5 feet (0.5 meter) per second squared and within the parameters specified in 2.1.2.4.

2.1.2.6.1 General.

Moving machine parts that normally may be in reach of personnel shall be fitted with guards conforming to *American National Standard Safety standard for mechanical power transmission apparatus*, ANSI/ASME B15.1-1992.

Protection against static electricity shall be provided.

Fire-fighting device(s) shall be available.

2.1.2.7.4 Egress. Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

2.1.2.11 Manual and automatic control devices.

All control devices and switches shall conform to the requirements of 2.2.1.7.

2.1.2.11.1 Manual control devices.

The following manual control devices that will initiate a stop shall be installed and conspicuously and permanently marked:

a) a stop device at each terminal platform;

b) a stop device on the conductor's control console in each carrier when a conductor is required in the carrier;

c) a stop device at the operator's station;

d) emergency shutdown device (see 2.1.5 and 2.2.1.7.2).

2.1.2.11.2 Provisions for automatic stop devices.

The following automatic stop devices or systems shall be installed:

a) a device(s) that will be actuated in the event manual or automatic controls fail to reduce aerial tramway speeds to design values at critical control points along the line;

b) a device(s) that will stop the aerial tramway before the carrier reaches its limit of travel. An adequate bumper system shall also be installed;

c) a device(s) that will stop the aerial tramway before any counterweight, other tension system device, or tension sheave carriage reaches either end of its travel, or when the tension system exceeds its range of normal operating travel. When pneumatic or hydraulic tension systems are used, pressure-sensing devices shall also be incorporated that will stop the aerial tramway system in case the operating pressure goes above/below the design pressure range. Such pressure-sensing devices shall be located close to the actual tensioning device. It shall not be possible to isolate the pressure sensor from the actual tensioning device;

d) a device that will be actuated by the application of a track cable brake. These devices shall effect an emergency shutdown;

e) a device that will stop the aerial tramway in the event a cabin door is not closed;

f) a mechanical overspeed device mounted on the driving sheave shall effect an emergency shutdown in the event of a 15% overspeed;

g) a device that will effect a stop of the aerial tramway in the event of inadvertent actuation of the brake system(s);

h) a device that will stop the aerial tramway in the event that the haul rope comes in contact with the track cable or other grounded equipment (bicable systems only).

2.1.3.3.2 Sheave and sheave unit design.

Sheave flanges shall be as deep as possible, considering other features of the system. At the same time, rope attachments shall be designed in relation to the sheave groove so as not to contact sheave flanges during normal operations, taking into consideration the anticipated amount of wear of the sheave liner groove. Attachments shall be allowed to contact sheave flanges adjacent to the haul rope when the carrier swings, provided that this is considered in the design of the attachments and sheaves. Furthermore, rope attachments, sheave flanges, and hanger guides shall be designed so that hangers cannot be caught behind guides, and so that ropes and attachments cannot be deroped from sheaves if the carrier is swinging within design limits as it approaches or passes the tower.

Suitable guards, of sufficient strength to resist the lateral forces caused by an inside deropement, shall be installed.

Construction of the entire sheave unit shall be such that the rope cannot become entangled in the sheave unit in the event the rope leaves the sheave toward the outside.

On each sheave unit, rope-catching devices shall be installed to reduce the risk of the rope moving excessively in the direction of the load on the sheave unit in the event of deropement. These devices shall be located less than one-half the diameter of the sheaves from the normal operating position of the rope and shall extend a minimum of two rope diameters beyond the sheave flange. They shall be designed to permit the passage of the rope and attachments after deropement.

On each sheave unit, suitable devices shall be installed and maintained that will stop the aerial tramway in case of deropement (see 2.1.2.11.2(h)).

If the gage of the haul rope system is varied at any point along the line, the horizontal departure at any one tower shall be provided for in the design so that deropement cannot occur by virtue of such a departure. Sheave mounts or mounting frames shall be designed to be adjustable, allowing the sheave units to be aligned and held in the plane of the rope.

See also 2.1.1.4 through 2.1.1.4.7 for the effect of tower height and location on sheave units.

2.1.5 Provisions for operating personnel.

Operator and attendant stations shall be located to provide visual surveillance of the station and the line in the vicinity of the station or in a cabin. When enclosed, they shall be heated, ventilated, and lighted as required to perform the function of the station. They shall contain, inside the station when enclosed:

a) the communications and controls required of the station;

b) the operating instructions and emergency procedures;

c) a fire extinguisher.

This does not preclude additional communications and controls located outside the enclosed station. All enclosed stations shall be locked to prevent unauthorized entry when unattended.

The operator shall be located where he/she can observe the aerial tramway in operation and may be located in a cabin. The physical appearance, operation, and location of emergency shutdown devices shall differentiate them from other operating devices or controls. The operator's controls and communicating devices shall be within reach without leaving his/her position.

2.1.6.1 Operational manual.

The designer of each new or reinstalled aerial tramway shall prepare an operational manual for use with each installation. The manual shall describe the function and operation of the components and provide instructions for the correct usage of the installation.

2.2.1.3 Protection.

All transformer stations and other high voltage electrical equipment shall be marked with conspicuous warning signs and shall be protected so as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. All power equipment shall be protected against overloads by circuit breakers or fuses.

2.2.1.4 Voltage limitations for overhead circuits.

Signal, communication, and control circuits may be supported between towers that support the aerial tramway. Voltage on overhead or exposed circuits shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

2.2.1.7 Operating control circuits.

2.2.1.7.1 Operating circuits.

All aerial tramway systems shall contain one or more normally de-energized circuit(s) that, when energized, allow(s) the system to start, accelerate to and run at designated speeds, and when interrupted

or de-energized by manual stop switches, automatic stop devices, inadvertent ground or a power failure, cause(s) the system to stop.

Operating circuits shall not have anything across or parallel with the contacts of switches, relays, or automatic stopping devices (including solid state devices monitoring the circuits or devices), unless it can be shown that any failure mode of the device placed across the contacts does not defeat the purpose of the operating circuit devices.

All start/run/stop and speed control switches shall be conspicuously and permanently marked with the proper function.

All automatic and manual stop and shutdown devices shall be of the manually reset type. An exception to this requirement is allowed for magnetic or optically operated automatic stop devices, if the operating circuit is such that it indicates that such devices initiated the stop and the circuit is of the manually reset type.

Manual stop switches (push button) shall be positively opened mechanically and their opening shall not be dependent upon springs.

2.2.1.7.2 Emergency shutdown circuit.

All aerial tramway systems shall include a normally de-energized circuit that, when energized, allows the system to run and when interrupted, effects a shutdown (see 1.4.22). The shutdown shall have priority over all other control stops or commands. If, for any reason, the operator has lost control of the aerial tramway while using the operating control circuitry, the controls shall include an emergency shutdown circuit allowing the operator/attendant to stop the aerial tramway. Any one of the following conditions is considered a loss of control of an aerial tramway:

a) Aerial tramway will not SLOW DOWN when given the command to do so;

b) Aerial tramway will not STOP when given the command to do so;

c) Aerial tramway OVERSPEEDS beyond control settings and/or maximum design speed;

d) Aerial tramway ACCELERATES faster than normal design acceleration;

e) Aerial tramway SELF-STARTS or SELF-ACCELERATES without the command to do so;

f) Aerial tramway REVERSES direction unintentionally and without the command to do so.

The shutdown circuit shall not have anything across or parallel with the contacts of switches, relays, or other devices in this circuit, but can have such devices as solid state monitoring devices and microprocessors in series with the manual shutdown device and main control contactor (main control disconnect coil).

This circuit shall include a manual shutdown device at each station and in the machine room. The shutdown device shall be conspicuously and permanently marked and shall be red in color (see 2.1.5).

2.2.1.7.3 Bypass circuits.

A temporary bypass circuit may be installed for malfunctions in operating control circuitry (see 2.3.2.5.9).

2.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot

passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

Section 3 Detachable grip aerial lifts

3.1.1.3.1 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

3.1.1.3.2 Air space requirements.

3.1.1.3.2.1 Structures. No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

3.1.1.3.2.2 Cables or ropes. Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

3.1.2.4 Acceleration and speed control.

The drive equipment shall be designed to accelerate the line smoothly and to avoid severe oscillation or undulation under any loading condition.

The aerial lift shall be started at its lowest point of speed range after any type of stop.

For all stops, the minimum average rate of the carrier's horizontal deceleration shall be adequate to prevent carrier collision in the receiving and launching mechanisms.

The rate of the carrier's acceleration to, and deceleration from, the design rope speed shall not exceed eight (8) feet per second squared (2.4 meters per second squared) under the most unfavorable braking condition. The interval between carriers shall be controlled by automatic carrier spacers or other suitable systems. Unbalanced loading shall be controlled to the extent required by the design through the use of automatic carrier counters or other suitable systems.

The drive shall be capable of moving the unloaded system at reduced speed for rope inspection and equipment maintenance. This reduced-speed operation may be obtained by the use of the auxiliary power unit.

On installations in which a forward overhauling condition exists:

a) Provisions shall be made for an overhauling load so that the system shall operate at a controlled speed not exceeding design speed by more than 6%. The energy developed by the overhauling load shall be dissipated in a satisfactory manner without using the brakes specified under 3.1.2.5;

Where the provision made for controlling an overhauling load consists of regenerative capability or a similar characteristic in the prime mover itself, the auxiliary power unit shall have a comparable capability.

b) Provision shall be made for slowing and stopping the aerial lift drive automatically if the line speed exceeds the design speed by more than 10%.

NOTE—Design values of line speed pertain to the design speed for the particular condition of operation (that is, skiers or foot passengers).

Where the aerial lift is not rated for downhill passenger traffic, the following number of loaded carriers, loaded no more closely than 4 times the minimum carrier spacing, shall be permitted for the carrying of authorized persons downhill; the requirements for slowing and stopping the aerial lift drive automatically as set forth in 3.1.2.4(b) shall be waived:

Total number of carriers on lift (both sides)	**Maximum number of loaded carriers on downhill rope**
Less than 60	2
60 to 120	3
Over 120	4

For the purpose of this section only, authorized persons are defined to include all persons, whether employees of the aerial lift owner or not, who are authorized by the owner or the owner's representatives to be carried on the aerial lift.

All installations in which downhill traffic is either limited or not permitted shall be so identified with clearly visible signs at loading or unloading areas, and this information shall be further contained in operating instructions posted in these areas.

3.1.2.6 Brakes and rollback devices.

The aerial lift shall have the following friction-type brakes and other devices as specified in table 3-2:

- service brake (see 3.1.2.6.1);
- drive sheave brake (see 3.1.2.6.2);
- rollback device (see 3.1.2.6.3).

All braking systems shall be designed and monitored to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling;

EXCEPTION — For an aerial lift that overhauls only in the reverse direction, a drive train backstop (3.1.2.6.4) may be used in lieu of the above.

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial lift under any anticipated conditions of loading;

d) the failure of one braking system to properly decelerate the aerial lift shall automatically initiate a second braking system, if any.

The service brake, drive sheave brake, and rollback device shall be designed such that failure of one braking system will not impair the function of the other systems. All brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, and rollback device shall be designed to assure operation under all anticipated conditions.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

The manufacturer or a Qualified Engineer shall furnish a written procedure to be followed and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake, rollback, and backstop device. The procedure shall additionally specify:

e) the minimum and maximum holding force for the service brake and drive sheave brake independently, and;

f) the minimum and maximum stopping distance for the service brake and drive sheave brake independently, with a specified loading condition.

This baseline procedure shall be performed at the completion of the acceptance test and then at the frequency specified in order to demonstrate the ability of each brake to produce the required force.

Testing shall be accomplished as part of normal maintenance during the operating season, but shall not be performed when the aerial lift is open to the public. As a minimum, this testing shall be performed monthly during the operating season.

If a device is permanently installed to cause a brake, or rollback device, to be disabled for testing or reverse rotation, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brake is so disabled.

Table 3-2 – Required stopping devices

Lift category	Service Brake	Drive Sheave Brake	Rollback device	Retarding device (see 3.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required
Non-overhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required	Required	Not Required	Not Required
Overhauling reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required*	Required	Required	Not Required
Overhauling forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Required

* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.

3.1.2.7.4 Other machinery locations. The acceleration/deceleration areas, conveyor areas, and associated access ways shall be well ventilated. These areas shall have a permanently installed lighting system which is adequate for proper machinery maintenance and safety of personnel. Access ways shall be provided for inspection and proper maintenance while the equipment is in operation. Access ways shall have:

(1) Stairs or secured ladder.

(2) Skid resistant floors, platforms, or catwalks which provide access as defined in subparagraph three herein to all manual and automatic safety devices (switches) and tensioning system components. Access to other areas shall be denied while equipment is in operation.

(3) A minimum vertical clearance of 80 inches (2 m), and a minimum horizontal clearance of 24 inches (61 cm). If a component crosses the access way, vertical clearance may be reduced as follows: a) a minimum of 60 inches (152 cm), for a maximum distance of 36 inches (92 cm); or b) a minimum of 48 inches (122 cm), for a maximum distance of 12 inches (30.5 cm). If the obstruction exceeds 15 inches (38 cm), in height, above the floor, stairs shall be provided to allow passage over the obstruction.

(4) Railings protecting floor openings and moving machine parts. Moving parts shall be considered guarded if they are located a minimum of 12 inches (30.5 cm) from the vertical plane of the railing. Railings shall consist of a top rail, located 36 - 42 inches (91-106 cm) from the walking surface; a mid rail, located approximately midway between top rail and walking surface; and a 4 inch high (10 cm) solid toe plate. Railings shall be designed and constructed to resist anticipated loadings.

The requirements of rules 3.1.2.6.1 and 3.1.2.6.4, as revised, shall be in effect for all installations constructed subsequent to January 1, 1988. For all installations completed prior to January 1, 1988 reasonable compliance with Rules 3.1.2.6.1 and 3.1.2.6.4 as revised shall be accomplished prior to November 1, 1990.

3.1.2.7.5 Egress. Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

3.2.3.2 Stop gates.

On aerial lifts using chairs, an automatic stopping device beyond each unloading area are required where passengers wearing skis are required to disembark. The device shall automatically stop the aerial lift in the event a passenger rides beyond the intended point of unloading. The operation of the automatic stop device may be delayed or overridden momentarily by the operator or attendant.

3.2.1.6.3 Haul rope grounding. Grounding sheaves with conductive liners or equivalent means should be provided at each end of the tramway for the he purpose of grounding haul ropes and track cables, as applicable, for static electrical discharge. For the haul rope on bicable systems or monocable systems with an isolated or insulated haul rope incorporated in the operating circuitry, no means of grounding are required when the operating circuit takes into consideration static electrical discharge.

3.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

3.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

3.3.4.3.1 Acceptance criteria for grips and hangers - minimum requirements. The following shall be considered the minimum requirements for an acceptance criteria.

~~(1) Qualifications for testing personnel;~~
~~(2) Sampling size and method of obtaining the sample;~~
~~(3) Allowable rejection rate and retest procedures;~~
~~(4) Types of inspections to be performed and the procedures to be used;~~
~~(5) Criteria for acceptance/rejection of samples;~~
~~(6) Certification from the manufacturer/design engineer that the testing procedures are acceptable to detect faulty materials.~~

Note: Timeframes relate to the ropeway installation date or modification date whichever controls, unless otherwise noted.

3.1.1.3.1 Location of power lines.

Jan. 1, 1977 to Present:
Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

3.1.1.3.2 Air space requirements.

3.1.1.3.2.1 Structures.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

Jan. 1, 1994 to May 15, 2000:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Dec. 30, 1977 to Jan. 1, 1994:
No passenger tramway installation shall be permitted whenever the Passenger Tramway Operator does not have permanent and irrevocable control of the following air space (except when the passenger tramway is located on Forest Service land): the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Prior to Dec. 30, 1977:
None required

3.1.1.3.2.2 Cables or ropes.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

Prior to May. 15, 2000:
Not required

3.1.1.5.2 Clearances.

Jan. 1, 1984 to Nov. 1, 1991:
Terminals and towers shall be designed and installed to provide the clearances as herein specified and to minimize surge of the line under operating conditions. Local wind conditions shall be taken into consideration.

The minimum distance between passing carriers, each swung 10 degrees inward from the vertical, shall be the greater of the following:

a) 2 feet 6 inches
b) 1/2% of the span length (applies to gondolas only).

The distance between haul ropes, (or track cables), for the purpose of these checks, shall be considered as equal to the gauge of the line.

External structures, posts, or obstructions, other than lift structural components, shall have at least 4 feet (1.22 meters) of clearance from either edge of a loaded open carrier passenger seat or open cabin body (measured from the outermost attachments on or parts of the carrier while the carrier is hanging in a vertical position).

Prior to Jan. 1, 1984:
Terminals and towers shall be designed and installed to provide the clearances as herein specified and to minimize surge of the line under operating conditions. Local wind conditions shall be taken into consideration.

The minimum distance between passing carriers, each swung 10 degrees inward from the vertical, shall be the greater of the following:

a) 2 feet 6 inches
b) 1/2% of the span length (applies to gondolas only).

The distance between haul ropes, (or track cables), for the purpose of these checks, shall be considered as equal to the gauge of the line.

3.1.1.5.3 Terminal clearances.

Prior to Nov. 1, 1991:
Not required.

3.1.2.1.3 Power unit interlock.

Prior to May 15, 2006:
Not required.

3.1.2.5 Stops and shutdowns.

For all stops, the minimum average rate of the carrier's horizontal deceleration shall be adequate to prevent carrier collision in the receiving and launching mechanisms.

The maximum rate of the rope deceleration shall be 5 feet per second squared (1.52 meters per second squared). These measurements shall be measured over any one second interval under any operating condition while the carrier is attached to the haul rope and referenced to the rope speed at the drive terminal.

Normal stop: (see 1.4 – *normal stop*). If a service brake is required (see table 3-2), it shall have been applied by the time the aerial lift comes to a stop.

Emergency shutdown: (see 1.4 – *emergency shutdown)* The drive sheave brake shall be applied. The service brake, if installed, shall have been applied by the time the aerial lift comes to a stop. The designer shall designate which control functions of the ropeway system shall initiate an emergency shutdown.

The designer may define other stopping modes other than normal and emergency shutdown. For other stopping modes, the designer shall specify the method of stopping, including the type and timing of brake(s) that may be applied, and the stopping criteria.

Table 3-1 B Required Stopping Devices

Aerial lift category	Service Brake	Drive sheave brake	Rollback device	Retarding device (see 3.1.2.4)
Self braking: A lift that decelerates, stops & remains stopped within the service brake performance requirements without a braking device	Required*	Required	Not Required	Not Required
Non-overhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required	Required	Not Required	Not Required
Overhauling reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required*	Required	Required	Not Required
Overhauling forward: A lift that will accelerate in the forward direction when it is not driven	Required	Required	Not Required	Required
* A service brake is not required if the overhauling, reverse direction aerial lift will meet the service brake stopping requirements under the most unfavorable design loading conditions				

3.1.2.6 Brakes and rollback devices.

May 15, 2006 to Present:
The aerial lift shall have the following friction-type brakes and other devices as specified in table 3-2:

- service brake (see 3.1.2.6.1);
- drive sheave brake (see 3.1.2.6.2);
- rollback device (see 3.1.2.6.3).

All braking systems shall be designed and monitored to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling;

EXCEPTION – For an aerial lift that overhauls only in the reverse direction, a drive train backstop (3.1.2.6.4) may be used in lieu of the above.

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial lift under any anticipated conditions of loading;

d) the failure of one braking system to properly decelerate the aerial lift shall automatically initiate a second braking system, if any.

The service brake, drive sheave brake, and rollback device shall be designed such that failure of one braking system will not impair the function of the other systems. All brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, and rollback device shall be designed to assure operation under all anticipated conditions.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

The manufacturer or a Qualified Engineer shall furnish a written procedure to be followed and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake, rollback, and backstop device. The procedure shall additionally specify:

e) the minimum and maximum holding force for the service brake and drive sheave brake independently, and;

f) the minimum and maximum stopping distance for the service brake and drive sheave brake independently, with a specified loading condition.

This baseline procedure shall be performed at the completion of the acceptance test and then at the frequency specified in order to demonstrate the ability of each brake to produce the required force.

Testing shall be accomplished as part of normal maintenance during the operating season, but shall not be performed when the aerial lift is open to the public. As a minimum, this testing shall be performed monthly during the operating season.

If a device is permanently installed to cause a brake, or rollback device, to be disabled for testing or reverse rotation, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brake is so disabled.

Table 3-2 - Required stopping devices

Lift category	Service Brake	Drive Sheave Brake	Rollback device	Retarding device (see 3.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required
Non-overhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required	Required	Not Required	Not Required
Overhauling reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required*	Required	Required	Not Required
Overhauling forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Required
* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.				

Prior to May 15, 2006:
The aerial lift shall have the following friction-type brakes and other devices as specified in table 3-2:

- service brake (see 3.1.2.6.1);
- drive sheave brake (see 3.1.2.6.2);
- rollback device (see 3.1.2.6.3).

All braking systems shall be designed and monitored to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling;

EXCEPTION – For an aerial lift that overhauls only in the reverse direction, a drive train backstop (3.1.2.6.4) may be used in lieu of the above.

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial lift under any anticipated conditions of loading;

d) the failure of one braking system to properly decelerate the aerial lift shall automatically initiate a second braking system, if any.

The service brake, drive sheave brake, and rollback device shall be designed such that failure of one braking system will not impair the function of the other systems, and all brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, and rollback device shall be designed to assure operation under all anticipated conditions.

Deceleration rates specified in 3.1.2.4 shall be achieved by each brake without the aid of other braking devices or drive regeneration.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

A Qualified Engineer shall furnish a written procedure to be followed and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake, rollback, and backstop device. This procedure shall be performed during the acceptance test, and then at the frequency specified, to demonstrate the ability of each brake to produce the required torque.

Such testing shall be accomplished as part of normal maintenance during the operating season, but shall be performed when the aerial lift is not open to the public.

If a device is permanently installed to cause a brake, or rollback device, to be disabled for testing or reverse rotation, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brake is so disabled.

Table 3-2 - Required stopping devices

Lift category	Service Brake	Drive Sheave Brake	Rollback device	Retarding device (see 3.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required
Non-overhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required	Required	Not Required	Not Required
Overhauling reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required*	Required	Required	Not Required
Overhauling forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Required
* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.				

3.1.2.6.1 Service brake.

The service brake can be located at any point in the drive train such that there is no belt, friction clutch, or similar friction-type device between the brake and the drive sheave. The service brake shall not act on the same braking surface as the drive sheave brake.

The service brake shall be an automatic brake to stop and hold the aerial lift under the most unfavorable design loading condition. Deceleration rates specified in 3.1.2.5 shall be achieved by the service brake without the aid of other braking devices or drive regeneration.

The brake shall be in a normally applied position. It shall be held open for operation of the aerial lift and shall be applied when its power is removed or the aerial lift is stopped.

3.1.2.6.2 Drive sheave brake.

The drive sheave brake shall operate on the drive sheave assembly.

The drive sheave brake shall be an automatic brake to stop and hold the aerial lift under the most unfavorable design loading condition. Deceleration rates specified in 3.1.2.5 shall be achieved by the drive sheave brake without the aid of other braking devices or drive regeneration.

Application of the drive sheave brake shall automatically disconnect the power source to the power unit in use. This brake shall act automatically when the speed of the haul rope exceeds the design value by 15% in either direction.

3.1.2.6.3 Rollback device.

The rollback device shall act directly on the drive sheave assembly or on the haul rope. Under the most unfavorable design loading condition, the rollback device shall automatically control reverse rotation of the aerial lift, as defined herein. The rollback device shall bring the aerial lift to a stop if unintentional reverse rotation occurs. The rollback device shall be activated if the haul rope travels in excess of 36 inches (915 mm) in the reverse direction (see 3.2.3.7 for electrical requirements).

3.1.2.6.4 Drive train backstop.

A drive train backstop device may be installed on an aerial lift. If used, it shall conform to the following requirements:

a) A drive train backstop device is a one-way or overrunning clutch device. The drive train shall be so arranged that there is no belt, friction clutch, or similar friction-type device between the backstop device and the drive sheave;

b) The backstop device shall be rated for the maximum design load;

c) Under the most unfavorable design loading condition, the backstop device shall automatically prevent reverse rotation of the aerial lift before the aerial lift travels in excess of 36 inches (915 mm) in the reverse direction.

3.1.2.7.4 Other machinery locations.

Jan. 1, 1988 to present:
The acceleration/deceleration areas, conveyor areas, and associated access ways shall be well ventilated. These areas shall have a permanently installed lighting system which is adequate for proper machinery maintenance and safety of personnel. Access ways shall be provided for inspection and proper maintenance while the equipment is in operation. Access ways shall have:

(1) Stairs or secured ladder.

(2) Skid resistant floors, platforms, or catwalks which provide access as defined in subparagraph three herein to all manual and automatic safety devices (switches) and tensioning system components. Access to other areas shall be denied while equipment is in operation.

(3) A minimum vertical clearance of 80 inches (2 m), and a minimum horizontal clearance of 24 inches (61 cm). If a component crosses the access way, vertical clearance may be reduced as follows: a) a minimum of 60 inches (152 cm), for a maximum distance of 36 inches (92 cm); or b) a minimum of 48 inches (122 cm), for a maximum distance of 12 inches (30.5 cm). If the obstruction exceeds 15 inches (38 cm), in height, above the floor, stairs shall be provided to allow passage over the obstruction.

(4) Railings protecting floor openings and moving machine parts. Moving parts shall be considered guarded if they are located a minimum of 12 inches (30.5 cm) from the vertical plane of the railing. Railings shall consist of a top rail, located 36 - 42 inches (91-106 cm) from the walking surface; a mid rail, located approximately midway between top rail and walking surface; and a 4 inch high (10 cm) solid toe plate. Railings shall be designed and constructed to resist anticipated loadings.

The requirements of rules 3.1.2.6.1 and 3.1.2.6.4, as revised, shall be in effect for all installations constructed subsequent to January 1, 1988. For all installations completed prior to January 1, 1988 reasonable compliance with Rules 3.1.2.6.1 and 3.1.2.6.4 as revised shall be accomplished prior to November 1, 1990.

Prior to Jan 1, 1988:
Not required.

3.1.2.7.5 Egress.

Jan. 1, 1994 to Present:
Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

Prior to Jan 1, 1994:
Not required.

3.1.2.8.2 Hall rope terminal sheaves (Bullwheel and deflection sheaves):
Haul rope terminal sheave frames shall be designed to retain the rope in the event of the failure of the sheave, shaft, or mounting. In instances where the sheave is cantilevered, the design working stresses shall not be more than 60% of those otherwise allowable.

The minimum diameter of terminal sheaves shall be 72 times the nominal diameter of the haul rope. The sheave assembly shall be designed to retain the haul rope in the event of a deropement from the sheave. A flange extension of 1-½ times the rope diameter (measured from the bottom of the rope groove) shall be deemed adequate for retention.

Haul rope terminal sheaves that act as driving, braking, or holding sheaves shall be so designed tht the haul rope does not slip in the sheave groove. The design coefficient of friction for a particular sheave liner shall not exceed the following values:

Sheave Liner	Coefficient of Friction
Steel or cast iron grooves	0.070
Leather	0.150
Rubber, neoprene, or other	0.205

3.1.2.10 Tension systems.

Prior to May 15, 2006:
Counterweights, hydraulic and pneumatic cylinders, or other suitable devices shall be used to provide the tensioning requirements of the particular installation. All devices used to provide the tension shall have sufficient travel to adjust to all normal operating changes in loading and temperature.

The tension for haul ropes and track cables for all modes of operation shall be determined by the design engineer. Tension systems may be automatic or manual; however, all systems shall have monitoring equipment that will automatically prevent operation outside of design limits (see 3.1.2.11.2(c)).

Tension systems may be adjustable to provide proper tensions for different modes of aerial lift operation.

The tension system design shall consider changes, for each mode of operation, in tensions due to rope elongation, friction, and other forces affecting traction on driving, braking, or holding sheaves, tower and sheave loading, and maximum vertical loads on grips to assure that tensions remain within design limits.

3.1.2.10.1 Hydraulic and pneumatic systems. (Previously 3.1.2.9.1 in ANSI 1999)

Hydraulic and pneumatic cylinders, when used, shall have sufficient ram travel to accommodate all normal operating changes in loading and temperature. Provisions shall be made to keep the cylinder free from climatic-induced conditions and contaminants that may interfere with free movement.

If the system fails to provide the design operating pressure, the aerial lift shall be able to be operated to unload passengers.

Cylinders and their attachments shall each have a minimum factor of safety of 5. The factor of safety is equal to the ultimate tensile strength of the cylinder divided by the maximum steady state design tension.

The systems providing operating pressure for the cylinder shall have a minimum factor of safety of 5 unless a high velocity check valve or flow control device is used where the pressure line is connected to the cylinder. The check valve shall be rated to hold twice the normal operating pressure. The remainder of the system shall not exceed the manufacturer's published working pressure. Provisions shall be made to restrict the movement of pressure lines or hoses should they become severed under pressure. When pneumatic storage cylinders, accumulators, or other similar devices are used, they shall be located so that they cannot be knocked over or damaged.

3.1.2.10.2 Counterweights. (Previously 3.1.2.9.2 in ANSI 1999)

Counterweights, when used, shall be arranged to move freely up and down. Enclosures for counterweights shall be provided where necessary to prevent snow, ice, water, and other materials from accumulating under and around the counterweights and interfering with their free movement. Visual access shall be provided to areas beneath and above all counterweights contained in enclosures or pits. When a counterweight is contained in a structural frame, guides shall be provided to protect the frame and to ensure free movement of the counterweight. Where snow enclosures are not required, guardrails or enclosures shall be provided to prevent unauthorized persons from coming in contact with or passing under counterweights.

3.1.2.10.3 Wire ropes in tension systems. (Previously 3.1.2.9.3 in ANSI 1999)

Wire ropes in tension systems shall have a minimum factor of safety of 6 when new (see 7.1.3.1). On arrangements involving rope reeving, the maximum design static tension with sheave friction taken into account shall be the basis for determining the factor of safety. See 7.3 for additional requirements. No rotation-resistant ropes shall be used in tension systems (see 1.4 B *rotation-resistant rope*).

Wire ropes in tension systems shall be adjusted so that the counterweight will reach the end of its travel before the attached tension sheave carriage comes within 6 inches (150 mm) of the end of its travel. When wire ropes are used with pneumatic or hydraulic cylinders, they shall be adjusted so that connecting devices will not contact the reeving devices before the ram reaches the travel limits of the cylinder.

3.1.2.10.4 Chains in tension systems. (Previously 3.1.2.9.4 in ANSI 1999)

Roller, leaf, or welded link chains may be used in tension systems (see section 7).

For chain used as a tensioning component, where the chain does not pass through or around sprockets, the minimum factor of safety shall be 5 (see 7.1.3.3). For applications of chain where any sprockets are used, the minimum factor of safety shall be 6.

3.1.2.10.5 Cable winches or chain-adjusting devices. (Previously 3.1.2.9.5 in ANSI 1999)

Winches or other mechanical devices that are used for take-up and remain part of the system shall have a minimum factor of safety of 6 against their ultimate capacity. They shall have a positive lock against release. Where this factor cannot be established by the manufacturer's endorsement, a device shall be installed on the tension system rope or chain ahead of the winch/mechanical device that will keep the tension system intact in the event of a failure or release of the device.

The diameter of the winding drum shall not be less than the specified minimum sheave diameters referenced as Condition C in 3.1.2.7.3 for rope.

3.1.3.1 Towers.

Prior to Nov. 1, 1991:
The design of the tower structure and foundation shall be in accordance with the requirements of 3.1.1.6. Where guyed towers are used and guys intersect the ground within or near ski runs, the guys shall be marked for visibility.

Means shall be provided for ready access from the ground to all tower tops. Permanent ladders are required for heights above those accessible by portable ladders.

Portable ladders, if used, shall be in at least sufficient quantity to be available at each point where attendants are positioned. Portable ladders extending more than 20 feet (6.10 meters) shall not be used.

Towers shall be identified with successive numbers clearly visible to passengers.
Where towers are designed to permit variations in rope height, sheave unit supports shall be guided and attached so as to prevent misalignment by rotation

3.1.3.3.2 (g) Sheave and sheave unit design.

Prior to May 15, 1994:
Sheave flanges shall be as deep as possible, considering other features of the system. At the same time, rope grips shall be designed in relation to the sheave groove so as not to contact sheave flanges during normal operations, taking into consideration the anticipated amount of wear of the sheave liner groove. Grips shall be allowed to contact sheave flanges adjacent to the haul rope when the carrier swings, provided that this is considered in the design of the grips and sheaves. Furthermore, rope grips, sheave flanges, and hanger guides shall be designed so that hangers cannot be caught behind guides, and so that haul ropes and grips cannot be deroped from sheaves if the carrier is swinging within design limits as it approaches or passes the tower.

Suitable guards, of sufficient strength to resist the lateral forces caused by an inside deropement, shall be installed.

Construction of the entire sheave unit shall be such that the haul rope cannot become entangled in the sheave unit in the event the rope leaves the sheave toward the outside.

On each sheave unit, rope-catching devices shall be installed to reduce the risk of the haul rope moving excessively in the direction of the load on the sheave unit in the event of deropement. These devices shall be located less than one-half the diameter of the sheaves from the normal operating position of the rope and shall

extend a minimum of two rope diameters beyond the sheave flange. Alternatively, when the catcher is located so that the rope cannot move in the direction of the load when it passes from the edge of the sheave to a position in the catcher, the catcher shall extend a minimum of two rope diameters beyond the center of the rope when the rope has reached the point where the deropement switch device initiates a stop. Rope-catching devices shall be designed to permit the passage of the haul rope and grips after deropement. The catcher shall be independent from the sheave.

On each sheave unit, suitable deropement switch devices shall be installed and maintained that will stop the lift in case of deropement.

On lifts where the carrier speed exceeds 600 feet per minute (3.0 meters per second), at least one device that senses the position of the rope shall be installed on each sheave unit. The device shall initiate a stop before the rope leaves the sheave in the horizontal direction or when the rope is displaced in the vertical direction by one rope diameter plus the distance that the rope is displaced vertically from the sheave by the grip.

If the gage of the haul rope system is varied at any point along the line, the horizontal departure at any one tower shall be provided for in the design so that deropement cannot occur by virtue of such a departure.

Sheave mounts or mounting frames shall be designed to be adjustable, allowing the sheave units to be aligned and held in the plane of the rope.

See also 3.1.1.4 through 3.1.1.4.7 for the effect of tower height and location on sheave units.

3.1.4.4.2 Cabin.

May 15, 2000 to May 15, 2006:
Fully enclosed passenger cabins shall be ventilated. They shall be equipped with doors that fill the entire entrance opening. The minimum clearance width opening shall be 32 inches (815 mm). Each door shall be provided with a lock located in such a manner that it can be unlocked only by authorized persons or by automatic means.

The horizontal gap between the cabin door opening floor edge and platform edge shall not be greater than 1 inch (25.4 mm). The height of the cabin floor to the platform shall be within ± ½ inch (±12.7 mm). Where it is not operationally or structurally practical to meet these requirements, platform devices, vehicle devices, system devices, or bridge plates shall be provided for independent loading.

All windows shall be of shatter-resistant material.

Means of emergency evacuation of passengers shall be provided.

The maximum capacity of each cabin, both in pounds and kilograms and number of passengers, shall be posted in a conspicuous place in each cabin (see table D-1(r)).

The minimum clear floor space in accessible cabins shall be 48 inches by 30 inches (1220 mm x 760 mm). Where special accessible cabins are used, it is recommended the waiting interval should not exceed 10 minutes.

All carriers shall be clearly identified with numbers located on each end of each carrier.

Semi-open carriers shall meet applicable requirements for enclosed cabins and open chairs.

Jan. 1, 1994 to May 15, 2000:

Fully enclosed passenger cabins shall be ventilated. They shall be equipped with doors that fill the entire entrance opening. Each door shall be provided with a lock located in such a manner that it can be unlocked only by authorized persons or by automatic means.

All windows shall be of shatter-resistant material.

Means of emergency evacuation of passengers shall be provided.

The maximum capacity of each cabin, both in pounds and kilograms and number of passengers, shall be posted in a conspicuous place in each cabin.

If passengers are to remain standing, floor space of 2.5 square feet (0.23 square meter) per person shall be available; the width of cabin seats shall be at least 18 inches (46 cm) per person.

All carriers shall be clearly identified with numbers located on each end of each carrier.

Semi-open carriers shall meet applicable requirements for enclosed cabins and open chairs.

3.2.1.1 Applicable codes.

May 15, 2000 to May 15, 2006:
All electrical systems shall comply with 3.2.1.1 Applicable codes of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical systems shall comply with 3.2.1.1 Applicable codes of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical systems shall comply with 3.2.1.1 Applicable codes of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical systems shall comply with 3.2.1.1 Applicable codes of the B77.1-1982 ANSI Standard.

Jan 1, 1977 to Jan. 1, 1984:
All electrical work shall comply with 3.2.1.1 Applicable codes of the B77.1-1976 ANSI Standard.

Jan 1, 1974 to Jan. 1, 1977:
All electrical work shall comply with 3.2.1.1 Applicable codes of the B77.1-1972 ANSI Standard.

Jan 1, 1972 to Jan 1, 1974:
All electrical work shall comply with 3.2.1.1 Applicable codes of the B77.1-1970 ANSI Standard.

Prior to Jan 1, 1972:
All electrical work shall comply with 3.2.1.1 Applicable codes of the B77.1-1960 ANSI Standard.

3.2.1.2 Location.

May 15, 2000 to May 15, 2006:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 3.2.1.2 Location of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 3.2.1.2 Location of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 3.2.1.2 Location of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 3.2.1.2 Location of the B77.1-1982 ANSI Standard.

Prior to Jan. 1, 1984:
All exposed electrical power transmission wiring shall be so located that in case of collapse or breakage of the power line it will not come into contact with carriers, ropes, or passengers.

3.2.1.3 Protection.

Prior to May 15, 2006:
All transformer stations and other high voltage electrical equipment shall be marked with conspicuous warning signs and shall be protected so as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. All power equipment shall be protected against overloads by circuit breakers or fuses.

3.2.1.4 Overhead cables.

Prior to May 15, 2006:
Signal, communication, and control circuits may be supported between towers that support the aerial lift. Voltage on overhead or exposed circuits shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

3.2.1.5.5 Ground fault interrupter protection.

Prior to May 15, 2006:
Not required.

3.2.1.6.3 Haul rope grounding.

Jan 1, 1984 to Present:
Grounding sheaves with conductive liners or equivalent means should be provided at each end of the tramway for the he purpose of grounding haul ropes and track cables, as applicable, for static electrical discharge. For the haul rope on bicable systems or monocable systems with an isolated or insulated haul rope incorporated in the operating circuitry, no means of grounding are required when the operating circuit takes into consideration static electrical discharge.

Prior to Jan 1, 1984:
Not required.

3.2.3.2 Stop gates.

On aerial lifts using chairs, an automatic stopping device beyond each unloading area are required where passengers wearing skis are required to disembark. The device shall automatically stop the aerial lift in the event a passenger rides beyond the intended point of unloading. The operation of the automatic stop device may be delayed or overridden momentarily by the operator or attendant.

3.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

3.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

3.3.4.3.1 Acceptance criteria for grips and hangers - minimum requirements. The following shall be considered the minimum requirements for an acceptance criteria.

(1) Qualifications for testing personnel;
(2) Sampling size and method of obtaining the sample;
(3) Allowable rejection rate and retest procedures;
(4) Types of inspections to be performed and the procedures to be used;
(5) Criteria for acceptance/rejection of samples;
(6) Certification from the manufacturer/design engineer that the testing procedures are acceptable to detect faulty materials.

Section 4 Fixed grip aerial lifts

4.1.1.3.1 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

4.1.1.3.2 Air space requirements.

4.1.1.3.2.1 Structures. No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

4.1.1.3.2.2 Cables or ropes. Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

4.1.2.6 Brakes and rollback device.

The aerial lift shall have the following friction-type brakes and other devices as specified in table 4-3:
- service brake (see 4.1.2.6.1);
- drive sheave brake (see 4.1.2.6.2);
- rollback device (see 4.1.2.6.3);
- drive train backstop (see 4.1.2.6.4).

All braking systems shall be designed to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling.

EXCEPTION — For an aerial lift that overhauls only in the reverse direction, a drive train backstop may be used in lieu of the above.

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial lift under any anticipated conditions of loading;

d) the failure of one braking system to properly decelerate the aerial lift shall automatically initiate a second braking system, on an overhauling forward direction aerial lift.

The service brake, drive sheave brake, rollback device, and drive train backstop device shall be designed such that failure of one system will not impair the function of the other systems. All brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, rollback, and drive train backstop devices shall be designed to assure operation under all anticipated conditions.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

The manufacturer or a Qualified Engineer shall furnish a written procedure to be followed, and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake and backstop device. The procedure shall additionally specify:

e) the minimum and maximum holding force for the service brake and drive sheave brake independently; and

f) the minimum and maximum stopping distance for the service brake and drive sheave brake independently, with a specified loading condition.

This baseline procedure shall be performed at the completion of the acceptance test and then at the frequency specified in order to demonstrate the ability of each brake to produce the required force.

Testing shall be accomplished as part of normal maintenance during the operating season, but shall not be performed when the aerial lift is open to the public. As a minimum, this testing shall be performed monthly during the operating season.

If a device is permanently installed to cause a brake, rollback, or drive train backstop device to be disabled for testing, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brakes are so disabled.

Table 4-3 - Required stopping devices

Lift category	Service Brake	Drive Sheave Brake	Rollback device	Drive train backstop	Retarding device (see 4.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required	Not Required
Nonoverhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required*	Required	Not Required	Not Required	Not Required
Overhauling, reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required	Required	Required	Required	Not Required
Overhauling, forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Not Required	Required
* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.					

4.1.2.7.4 Egress. Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

4.2.1.6.3 Haul rope grounding. Grounding sheaves or equivalent means shall be provided at each end of the tramway for the purpose of grounding haul ropes, as applicable, for static electrical discharge. For systems with an isolated or insulated haul rope incorporated in the operating circuitry, no means of grounding are required when the operating circuit takes into consideration static electrical discharge.

4.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

4.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

4.3.4.3.1 Acceptance criteria for grips and hangers – minimum requirements. The following shall be considered the minimum requirements for an acceptance criteria.

(1) Qualifications for testing personnel;
(2) Sampling size and method of obtaining the sample;
(3) Allowable rejection rate and retest procedures;
(4) Types of inspections to be performed and the procedures to be used;
(5) Criteria for acceptance/rejection of samples;
(6) Certification from the manufacturer/design engineer that the testing procedures are acceptable to detect faulty materials.

Note: Timeframes relate to the ropeway installation date or modification date whichever controls, unless otherwise noted.

4.1.1.3.1 Location of power lines.

Jan. 1, 1977 to Present:
Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

4.1.1.3.2 Air space requirements.

4.1.1.3.2.1 Structures.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

Jan. 1, 1994 to May 15, 2000:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface.

Dec. 30, 1977 to Jan. 1, 1994:
No passenger tramway installation shall be permitted whenever the Passenger Tramway Operator does not have permanent and irrevocable control of the following air space (except when the passenger tramway is located on Forest Service land): the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface.

Prior to Dec. 30, 1977:
None required

4.1.1.3.2.2 Cables or ropes.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

Prior to May 15, 2000:
Not required

4.1.1.5.2 Clearances.

Jan. 1, 1984 to Nov. 1, 1991:
Terminals and towers shall be designed and installed to provide the clearances as herein specified and to minimize surge of the line under operating conditions. Local wind conditions shall be taken into consideration.

The minimum distance between passing carriers, each swung 10 degrees inward from the vertical, shall be the greater of the following:

a) 2 feet 6 inches
b) 1/2% of the span length (applies to gondolas only).

The distance between haul ropes, (or track cables), for the purpose of these checks, shall be considered as equal to the gauge of the line.

External structures, posts, or obstructions, other than lift structural components, shall have at least 4 feet (1.22 meters) of clearance from either edge of a loaded open carrier passenger seat or open cabin body (measured from the outermost attachments on or parts of the carrier while the carrier is hanging in a vertical position).

Dec. 31, 1977 to Jan. 1, 1984:
Terminals and towers shall be designed and installed to provide the clearances as herein specified and to minimize surge of the line under operating conditions. Local wind conditions shall be taken into consideration.

The minimum distance between passing carriers, each swung 10 degrees inward from the vertical, shall be the greater of the following:

a) 2 feet 6 inches
b) 1/2% of the span length (applies to gondolas only).

The distance between haul ropes, (or track cables), for the purpose of these checks, shall be considered as equal to the gauge of the line.

Prior to Dec. 31, 1977:
All towers shall be equipped with guards to prevent contact of carriers or hangers with a tower structure or tower machinery except that such guards shall not be required if such contact does not occur when the carrier is swung freely 15 degrees from the vertical position.

In the absence of guards described herein, the following minimum clearances shall prevail when the carrier is swung inward 10 degrees from the vertical position:

(1) on chair lifts

(a) 18 inches between inside limit of passenger seat and tower clearance line or surface.
(b) 12 inches between innermost point on chair structure and tower clearance line or structure.

(2) On Gondola lifts:

(a) With the windows open on the tower side, 18 inches between innermost point on carrier and tower clearance line or structure.
(b) With screened or closed windows on the tower side, 12 inches.

Guards shall be so shaped and located that a 30- degree lateral swing from vertical shall not place and part of the loaded or empty carrier on the inner side of the guard.

On all towers, with or without guards, when a carrier is swung longitudinally by 15 degrees, there shall be no contact between any obstruction and any part of the carrier.

Special requirements for chair lifts.

The following clearance requirements shall be met to prevent entanglement of skis with tower structure. Clearance is here defined to mean the distance between inner limit of passenger seat and clearance line or surface of tower.

With the chair swinging laterally 10 degrees from the vertical position, or to the limit permitted by the guards, if any, if clearance is less than 24 inches from any open frame tower or 18 inches from any closed tubular tower, guards shall be provided on the up-going side to keep skis from being caught in the structure. Such guards shall be at least 72 inches in height, extending 36 inches above and below average foot level.

A tubular tower with permanent ladder rungs shall be considered as an open frame tower, with the following exceptions:

(1) If the ladder rungs are on the uphill side and are covered by simple fascia boards or equivalent over the previously mentioned 72-inch range, the tower may be considered as a closed tubular tower with respect to uphill skier traffic.

(2) If it can be demonstrated that ski tips can not be caught in the rungs of the ladder, the tower may be considered as a closed tubular tower.

4.1.1.5.3 Terminal Clearances.

Prior to Nov. 1, 1991:
Not required.

4.1.2.1.3 Power unit interlock.

Prior to May 15, 2006:
Not required.

4.1.2.6 Brakes and rollback devices.

May 15, 2006 to Present:
The aerial lift shall have the following friction-type brakes and other devices as specified in table 4-3:
- service brake (see 4.1.2.6.1);
- drive sheave brake (see 4.1.2.6.2);
- rollback device (see 4.1.2.6.3);
- drive train backstop (see 4.1.2.6.4).

All braking systems shall be designed to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling.

EXCEPTION – For an aerial lift that overhauls only in the reverse direction, a drive train backstop may be used in lieu of the above.

c) multiple brakes or brake systems shall not be simultaneously applied such that excessive deceleration is applied to the aerial lift under any anticipated conditions of loading;

d) the failure of one braking system to properly decelerate the aerial lift shall automatically initiate a second braking system, on an overhauling forward direction aerial lift.

The service brake, drive sheave brake, rollback device, and drive train backstop device shall be designed such that failure of one system will not impair the function of the other systems. All brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, rollback, and drive train backstop devices shall be designed to assure operation under all anticipated conditions.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

The manufacturer or a Qualified Engineer shall furnish a written procedure to be followed, and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake and backstop device. The procedure shall additionally specify:

e) the minimum and maximum holding force for the service brake and drive sheave brake independently; and

f) the minimum and maximum stopping distance for the service brake and drive sheave brake independently, with a specified loading condition.

This baseline procedure shall be performed at the completion of the acceptance test and then at the frequency specified in order to demonstrate the ability of each brake to produce the required force.

Testing shall be accomplished as part of normal maintenance during the operating season, but shall not be performed when the aerial lift is open to the public. As a minimum, this testing shall be performed monthly during the operating season.

If a device is permanently installed to cause a brake, rollback, or drive train backstop device to be disabled for testing, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brakes are so disabled.

Table 4-3 - Required stopping devices

Lift category	**Service Brake**	**Drive Sheave Brake**	**Rollback device**	**Drive train backstop**	**Retarding device** (see 4.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required	Not Required

Nonoverhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required*	Required	Not Required	Not Required	Not Required
Overhauling, reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required	Required	Required	Required	Not Required
Overhauling, forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Not Required	Required
* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.					

Prior to May 15, 2006:

The aerial lift shall have the following friction-type brakes and other devices as specified in table 4-3:

- service brake (see 4.1.2.6.1);
- drive sheave brake (see 4.1.2.6.2);
- rollback device (see 4.1.2.6.3);
- drive train backstop (see 4.1.2.6.4).

All braking systems shall be designed to ensure that:

a) once the aerial lift begins movement in the intended direction, the brakes are maintained in the open position;

b) the service brake shall not open prior to the drive system developing sufficient torque to prevent overhauling.

EXCEPTION – For an aerial lift that overhauls only in the reverse direction, a drive train backstop may be used in lieu of the above.

The service brake, drive sheave brake, rollback device, and drive train backstop device shall be designed such that failure of one system will not impair the function of the other systems, and all brakes shall have the braking force applied by springs, weights, or other approved forms of stored energy.

The service brake, drive sheave brake, rollback, and drive train backstop devices shall be designed to assure operation under all anticipated conditions.

Stopping distances specified in 4.1.2.5.1 shall be achieved by each brake without the aid of other braking devices or drive regeneration.

Each braking system shall be capable of operation to comply with daily inspections and periodic testing.

A Qualified Engineer shall furnish a written procedure to be followed, and specify the auxiliary equipment necessary for periodic testing and adjustment of the holding force of each brake and backstop device. This procedure shall be performed during the acceptance test, and at the frequency specified, to demonstrate the ability of each brake to produce the required torque.

Such testing shall be accomplished as part of normal maintenance during the operating season, but shall be performed when the aerial lift is not open to the public.

If a device is permanently installed to cause a brake, rollback, or drive train backstop device to be disabled for testing, it shall be electronically monitored so that the aerial lift cannot be operated in its normal mode when the brakes are so disabled.

Table 4-3 - Required stopping devices

Lift category	Service Brake	Drive Sheave Brake	Rollback device	Drive train backstop	Retarding device (see 4.1.2.4)
Self-braking: A lift that decelerates, stops, & remains stopped within the service brake performance requirements without a braking device	Not Required	Required	Not Required	Not Required	Not Required
Nonoverhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-braking	Required*	Required	Not Required	Not Required	Not Required
Overhauling, reverse direction: A lift that will accelerate in the reverse direction when it is not driven	Required	Required	Required	Required	Not Required
Overhauling, forward direction: A lift that will accelerate in forward direction when it is not driven	Required	Required	Not Required	Not Required	Required

* A service brake is not required if the overhauling, reverse direction lift will meet the service brake stopping requirements under most unfavorable design loading conditions.

4.1.2.6.1 Service brake.

The service brake shall be located at any point in the drive train such that there is no belt, friction clutch, or similar friction-type device between the brake and the drive sheave. The service brake shall not act on the same braking surface as the drive sheave brake.

The service brake shall be an automatic brake to stop and hold the aerial lift under the most unfavorable design loading condition. The deceleration rate or stopping distance specified in 4.1.2.5 shall be achieved by the service brake without the aid of other braking devices or drive regeneration.

The brake shall be in a normally applied position. It shall be held open for operation of the aerial lift and shall be applied when the aerial lift is stopped.

4.1.2.6.2 Drive sheave brake.

The drive sheave brake shall operate on the drive sheave assembly.

The drive sheave brake shall be capable of being activated both manually and automatically to stop and hold the aerial lift under the most unfavorable design loading condition. Deceleration rates or stopping distances specified in 4.1.2.5 shall be achieved by the drive sheave brake without the aid of other braking devices or drive regeneration.

Application of the drive sheave brake shall automatically disconnect the power source to the power unit in use. This brake shall act automatically when the speed of the haul rope exceeds the design value by 15% in either direction of an overhauling lift.

4.1.2.6.3 Rollback device.

The rollback device shall act directly on the drive sheave assembly or on the haul rope. When it has been determined that under the most unfavorable design loading condition, haul rope slippage will not occur, the rollback device may be located at the return sheave assembly. However, the rollback device shall not be located at other than the drive station, unless its location will not decrease the factor of safety of the haul rope below the minimum permissible value whenever the rollback device is statically engaged.

Under the most unfavorable design loading condition, the rollback device shall automatically stop reverse rotation of the aerial lift before the haul rope travels in excess of 36 inches (915 mm) in the reverse direction (see 4.2.3.7 for electrical requirements).

4.1.2.6.4 Drive train backstop.

A drive train backstop device shall conform to the following requirements:

a) A drive train backstop device is a one-way or overrunning clutch device. The drive train shall be so arranged that there is no belt, friction clutch, or similar friction-type device between the backstop device and the drive sheave;

b) The backstop device shall be rated for the maximum design load;

c) Under the most unfavorable design loading condition, the backstop device shall automatically prevent reverse rotation of the aerial lift before the aerial lift travels in excess of 36 inches (915 mm) in the reverse direction.

4.1.2.7.4 Egress.

Jan. 1, 1994 to Present:

Permanent stairs and walkways shall be provided for egress from all machinery areas. The maximum angle of inclination for the stairs shall not exceed 70 degrees. Stairs and walkways shall have a minimum width of 18 inches. Stair treads shall have a minimum depth of 4 inches. Walkway surfaces and stair treads shall be constructed of non-skid bar grating or expanded metal. Handrails shall be provided.

Prior to Jan 1, 1994:
Not required.

4.1.2.8.2 Hall rope terminal sheaves (Bullwheel and deflection sheaves):
Haul rope terminal sheave frames shall be designed to retain the rope in the event of the failure of the sheave, shaft, or mounting. In instances where the sheave is cantilevered, the design working stresses shall not be more than 60% of those otherwise allowable.

The minimum diameter of terminal sheaves shall be 72 times the nominal diameter of the haul rope. The sheave assembly shall be designed to retain the haul rope in the event of a deropement from the sheave. A flange extension of 1-½ times the rope diameter (measured from the bottom of the rope groove) shall be deemed adequate for retention.

Haul rope terminal sheaves that act as driving, braking, or holding sheaves shall be so designed tht the haul rope does not slip in the sheave groove. The design coefficient of friction for a particular sheave liner shall not exceed the following values:

Sheave Liner	Coefficient of Friction
Steel or cast iron grooves	0.070
Leather	0.150
Rubber, neoprene, or other	0.205

4.1.2.10 Tension systems.

Prior to May 15, 2006:
Counterweights, hydraulic and pneumatic cylinders, or other suitable devices shall be used to provide the tensioning requirements of the particular installation. All devices used to provide the tension shall have sufficient travel to adjust to all normal operating changes in loading and temperature.

The tension for haul ropes for all modes of operation shall be determined by the design engineer. Tension systems may be automatic or manual; however, all systems shall have monitoring equipment that will automatically prevent operation outside of design limits (see 4.1.2.11.2(c)).

Tension systems may be adjustable to provide proper tensions for different modes of aerial lift operation.

The tension system design shall consider changes, for each mode of operation, in tensions due to rope elongation, friction and other forces affecting traction on driving, braking, or holding sheaves, tower and sheave loading, and maximum vertical loads on grips to assure that tensions remain within design limits.

4.1.2.10.1 Hydraulic and pneumatic systems. (Previously 4.1.2.9.1 in ANSI 1999)

Hydraulic and pneumatic cylinders, when used, shall have sufficient ram travel to accommodate all normal operating changes in loading and temperature. Provisions shall be made to keep the cylinder free from climatic-induced conditions and contaminants that may interfere with free movement.

If the system fails to provide the design operating pressure, the aerial lift shall be able to be operated to unload passengers.

Cylinders and their attachments shall each have a minimum factor of safety of 5. The factor of safety is equal

to the ultimate tensile strength of the cylinder divided by the maximum steady-state design tension.

The systems providing operating pressure for the cylinder shall have a minimum factor of safety of 5 unless a high-velocity check-valve or flow-control device is used where the pressure line is connected to the cylinder. The check-valve shall be rated to hold twice the normal operating pressure. The remainder of the system shall not exceed the manufacturer's published working pressures. Provisions shall be made to restrict the movement of pressure lines or hoses should they become severed under pressure. When pneumatic storage cylinders, accumulators, or other similar devices are used, they shall be located so that they cannot be knocked over or damaged.

4.1.2.10.2 Counterweights. (Previously 4.1.2.9.2 in ANSI 1999)

Counterweights, when used, shall be arranged to move freely up and down. Enclosures for counterweights shall be provided where necessary to prevent snow, ice, water, and other materials from accumulating under and around the counterweights and interfering with their free movement. Visual access shall be provided to areas beneath and above all counterweights contained in enclosures or pits. When a counterweight is contained in a structural frame, guides shall be provided to protect the frame and to ensure free movement of the counterweight. Where snow enclosures are not required, guardrails or enclosures shall be provided to prevent unauthorized persons from coming in contact with or passing under counterweights.

4.1.2.10.3 Wire ropes in tension systems. (Previously 4.1.2.9.3 in ANSI 1999)

Wire ropes in tension systems shall have a minimum factor of safety of 6 when new (see 7.1.3.1). On arrangements involving rope reeving, the maximum design static tension with sheave friction taken into account shall be the basis for determining the factor of safety. See 7.3 for additional requirements. No rotation-resistant ropes shall be used in tension systems (see 1.4 B *rotation-resistant ropes*).

Wire ropes in tension systems shall be adjusted so that the counterweight will reach the end of its travel before the attached tension sheave carriage comes within 6 inches (150 mm) of the end of its travel. When wire ropes are used with pneumatic or hydraulic cylinders, they shall be adjusted so that connecting devices will not contact the reeving devices before the ram reaches the travel limits of the cylinder.

4.1.2.10.4 Chains in tension systems. (Previously 4.1.2.9.4 in ANSI 1999)

Roller, leaf, or welded link chains may be used in tension systems (see section 7).

For chain used as a tensioning component, where the chain does not pass through or around sprockets, the minimum factor of safety shall be 5 (see 7.1.3.3). For applications of chain where any sprockets are used, the minimum factor of safety shall be 6.

4.1.2.10.5 Cable winches or chain adjusting devices. (Previously 4.1.2.9.5 in ANSI 1999)

Winches or other mechanical devices that are used for take-up and remain part of the system shall have a minimum factor of safety of 6 against their ultimate capacity. They shall have a positive lock against release. Where this factor cannot be established by the manufacturer's endorsement, a device shall be installed on the tension system rope or chain ahead of the winch/mechanical device that will keep the tension system intact in the event of failure or release of the device.

The diameter of the winding drum shall not be less than the specified minimum sheave diameters referenced as Condition C in 4.1.2.7.3 for rope.

4.1.3.1 Towers.

Prior to Nov. 1, 1991:
The design of the tower structure and foundation shall be in accordance with the requirements of 4.1.1.6. Where guyed towers are used and guys intersect the ground within or near ski runs, the guys shall be marked for

visibility.

Means shall be provided for ready access from the ground to all tower tops. Permanent ladders are required for heights above those accessible by portable ladders.

Portable ladders, if used, shall be in at least sufficient quantity to be available at each point where attendants are positioned. Portable ladders extending more than 20 feet (6.10 meters) shall not be used.

Towers shall be identified with successive numbers clearly visible to passengers.
Where towers are designed to permit variations in rope height, sheave unit supports shall be guided and attached so as to prevent misalignment by rotation

4.1.3.3.2 (g) Sheave and sheave unit design.

Prior to May 15, 1994:
Sheave flanges shall be as deep as possible, considering other features of the system. At the same time, rope grips shall be designed in relation to the sheave groove so as not to contact sheave flanges during normal operations, taking into consideration the anticipated amount of wear of the sheave liner groove. Grips shall be allowed to contact sheave flanges adjacent to the haul rope when the carrier swings, provided that this is considered in the design of the grips and sheaves. Furthermore, rope grips, sheave flanges, and hanger guides shall be designed so that hangers cannot be caught behind guides, and so that haul ropes and grips cannot be deroped from sheaves if the carrier is swinging within design limits as it approaches or passes the tower.

Suitable guards, of sufficient strength to resist the lateral forces caused by an inside deropement, shall be installed.

Construction of the entire sheave unit shall be such that the haul rope cannot become entangled in the sheave unit in the event the rope leaves the sheave toward the outside.

On each sheave unit, rope-catching devices shall be installed to reduce the risk of the rope moving excessively in the direction of the load on the sheave unit in the event of deropement. These devices shall be located less than one-half the diameter of the sheaves from the normal operating position of the rope and shall extend a minimum of two rope diameters beyond the sheave flange. Alternatively, when the catcher is located so that the rope cannot move in the direction of the load when it passes from the edge of the sheave to a position in the catcher, the catcher shall extend a minimum of two rope diameters beyond the center of the rope when the rope has reached the point where the deropement switch device initiates a stop. Rope-catching devices shall be designed to permit the passage of the haul rope and grips after deropement. The catcher shall be independent from the sheave.

On each sheave unit, suitable deropement switch devices shall be installed and maintained that will stop the lift in case of deropement.

On lifts where the carrier speed exceeds 600 feet per minute (3.0 meters per second), at least one device that senses the position of the rope shall be installed on each sheave unit. The device shall initiate a stop before the rope leaves the sheave in the horizontal direction or when the rope is displaced in the vertical direction by one rope diameter plus the distance that the rope is displaced vertically from the sheave by the grip.

If the gage of the haul rope system is varied at any point along the line, the horizontal departure at any one tower shall be provided for in the design so that deropement cannot occur by virtue of such a departure.

Sheave mounts or mounting frames shall be designed to be adjustable, allowing the sheave units to be aligned and held in the plane of the rope.

See also 4.1.1.4 through 4.1.1.4.3 for the effect of tower height and location on sheave units.

4.1.4.4.2 Cabin.

May 15, 2000 to May 15, 2006:
Fully enclosed passenger cabins shall be ventilated. They shall be equipped with doors that fill the entire entrance opening. The minimum clearance width opening shall be 32 inches (815 mm). Each door shall be provided with a lock located in such a manner that it can be unlocked only by authorized persons or by automatic means.

The horizontal gap between the cabin door opening floor edge and platform edge shall not be greater than 1 inch (25.4mm). The height of the cabin floor and the platform shall be within ± ½ inch (±12.7mm). Where it is not operationally or structurally practical to meet these requirements, platform devices, vehicle devices, system devices, or bridge plates shall be provided for independent loading.

All windows shall be of shatter-resistant material.

Means of emergency evacuation of passengers shall be provided.

The maximum capacity of each cabin, both in pounds and kilograms and number of passengers, shall be posted in a conspicuous place in each cabin (see Annex D).

The minimum clear floor space in accessible cabins shall be 48 inches by 30 inches (1220 mm X 760 mm). Where special accessible cabins are used, it is recommended the waiting interval should not exceed 10 minutes.

All carriers shall be clearly identified with numbers located on each end of each carrier.

Semi-open carriers shall meet applicable requirements for enclosed cabins and open chairs.

Jan. 1, 1994 to May 15, 2000:
Fully enclosed passenger cabins shall be ventilated. They shall be equipped with doors that fill the entire entrance opening. The minimum opening door width shall be 32 inches (815 mm). Each door shall be provided with a lock located in such a manner that it can be unlocked only by authorized persons or by automatic means.

The horizontal gap between the cabin door opening floor edge and platform edge shall not be greater than 1 inch (25.4mm). The height of the cabin floor and the platform shall be within 2 inch (12.7mm). Where it is not operationally or structurally practical to meet these requirements, platform devices, vehicle devices, system devices, or bridge plates shall be provided for independent loading.

All windows shall be of shatter-resistant material.

Means of emergency evacuation of passengers shall be provided.

The maximum capacity of each cabin, both in pounds and kilograms and number of passengers, shall be posted in a conspicuous place in each cabin.

The width of cabin seats shall be at least 18 inches (460 mm) per person. If passengers are to remain standing, floor space of 2.5 square feet (0.232 square meter) per person shall be available. The minimum clear floor space in accessible cabins shall be 48 inches by 30 inches (1220 mm X 760 mm). Where special accessible cabins are used, it is recommended the waiting interval should not exceed 10 minutes.

All carriers shall be clearly identified with numbers located on each end of each carrier.

Semi-open carriers shall meet applicable requirements for enclosed cabins and open chairs.

4.1.4.5.4 Chair safety details.

Prior to May 15, 1999:
Each chair shall be equipped with a railing at each side, to a height of not less than 4 inches (10 cm) above the seat for a distance of not less than 12 inches (30 cm) from the back of the seat.

For aerial lifts operating primarily for foot passengers, each chair shall be equipped with a restraining device that will not open under forward pressure.

4.2.1.1 Applicable codes.

May 15, 2000 to May 15, 2006:
All electrical systems shall comply with 4.2.1.1 Applicable codes of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical systems shall comply with 4.2.1.1 Applicable codes of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical systems shall comply with 4.2.1.1 Applicable codes of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical systems shall comply with 4.2.1.1 Applicable codes of the B77.1-1982 ANSI Standard.

Jan 1, 1977 to Jan. 1, 1984:
All electrical work shall comply with 4.2.1.1 Applicable codes of the B77.1-1976 ANSI Standard.

Jan 1, 1974 to Jan. 1, 1977:
All electrical work shall comply with 4.2.1.1 Applicable codes of the B77.1-1972 ANSI Standard.

Jan 1, 1972 to Jan 1, 1974:
All electrical work shall comply with 4.2.1.1 Applicable codes of the B77.1-1970 ANSI Standard.

Prior to Jan 1, 1972:
All electrical work shall comply with 4.2.1.1 Applicable codes of the B77.1-1960 ANSI Standard.

4.2.1.2 Location.

May 15, 2000 to May 15, 2006:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 4.2.1.2 Location of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 4.2.1.2 Location of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 4.2.1.2 Location of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 4.2.1.2 Location of the B77.1-1982 ANSI Standard.

Prior to Jan. 1, 1984:
All exposed electrical power transmission wiring shall be so located that in case of collapse or breakage of the power line it will not come into contact with carriers, ropes, or passengers.

4.2.1.3 Protection.

Prior to May 15, 2006:
All transformer stations and other high voltage electrical equipment shall be marked with conspicuous warning signs and shall be protected so as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. All power equipment shall be protected against overloads by circuit breakers or fuses.

4.2.1.4 Overhead cables.

Prior to May 15, 2006:
Signal, communication, and control circuits may be supported between towers that support the aerial lift. Voltage on overhead or exposed circuits shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

4.2.1.5.5 Ground fault interrupter protection.

Prior to May 15, 2006:
Not required.

4.2.1.6.3 Haul rope grounding.

Jan 1, 1984 to Present:
Grounding sheaves or equivalent means shall be provided at each end of the tramway for the purpose of grounding haul ropes, as applicable, for static electrical discharge. For systems with an isolated or insulated haul rope incorporated in the operating circuitry, no means of grounding are required when the operating circuit takes into consideration static electrical discharge.

Prior to Jan 1, 1984:
Not required.

4.2.2 Electrical system circuit design and classification.

Prior to May 15, 2006:
Not required.

4.2.3.8 Acceleration/deceleration monitoring.

Prior to May 15, 2006:
Not required.

4.2.10 Safety of operating and maintenance personnel.

Prior to May 15, 1999:
The sign "Personnel Working on Lift - Do Not Start" or a similar warning sign shall be hung on the main disconnect switch or at control points for starting the power unit(s) when persons are working on the aerial lift.

Provision shall be incorporated in the ropeway design to render the system inoperable when necessary for the Lock-out Tag-out protection of personnel working on the aerial lift.

4.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

4.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

4.3.4.3.1 Acceptance criteria for grips and hangers - minimum requirements. The following shall be considered the minimum requirements for an acceptance criteria.

(1) Qualifications for testing personnel;
(2) Sampling size and method of obtaining the sample;
(3) Allowable rejection rate and retest procedures;
(4) Types of inspections to be performed and the procedures to be used;
(5) Criteria for acceptance/rejection of samples;
(6) Certification from the manufacturer/design engineer that the testing procedures are acceptable to detect faulty materials.

Section 5 Surface lifts

5.1.1.3.4 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

5.1.1.3.5 Air space requirements.

5.1.1.3.5.1 Structures. No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

5.1.1.3.5.2 Cables or ropes. Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

5.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

5.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

Note: Timeframes relate to the ropeway installation date or modification date whichever controls, unless otherwise noted.

5.1.1.3.4 Location of power lines.

Jan. 1, 1977 to Present:
Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

5.1.1.3.5 Air space requirements.

5.1.1.3.5.1 Structures.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

Jan. 1, 1994 to May 15, 2000:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Dec. 30, 1977 to Jan. 1, 1994:
No passenger tramway installation shall be permitted whenever the Passenger Tramway Operator does not have permanent and irrevocable control of the following air space (except when the passenger tramway is located on Forest Service land): the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Prior to Dec. 30, 1977:
Not required

5.1.1.3.5.2 Cables or ropes.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

Prior to May 15, 2000:
Not required

5.1.1.5.2 Clearances.

Prior to Dec. 31, 1977:
A minimum clearance of 36 inches shall be maintained between the base of the tower and the vertical plane of the upward traveling cable. With respect to the downward traveling cable, a minimum clearance of 24 inches shall be provided between towing outfit in its normal position and the tower. This paragraph is not to be construed as preventing the authority having jurisdiction from requiring larger minimum clearances, at its discretion. A definite need for additional clearances arises when it is proposed to transport more than two skiers per towing outfit.

5.1.2.8.2 Hall rope terminal sheaves (Bullwheel and deflection sheaves):
Haul rope terminal sheave frames shall be designed to retain the rope in the event of the failure of the sheave, shaft, or mounting. In instances where the sheave is cantilevered, the design working stresses shall not be more than 60% of those otherwise allowable.

The minimum diameter of terminal sheaves shall be 72 times the nominal diameter of the haul rope. The sheave assembly shall be designed to retain the haul rope in the event of a deropement from the sheave. A flange extension of 1-½ times the rope diameter (measured from the bottom of the rope groove) shall be deemed adequate for retention.

Haul rope terminal sheaves that act as driving, braking, or holding sheaves shall be so designed tht the haul rope does not slip in the sheave groove. The design coefficient of friction for a particular sheave liner shall not exceed the following values:

Sheave Liner	Coefficient of Friction
Steel or cast iron grooves	0.070
Leather	0.150
Rubber, neoprene, or other	0.205

5.1.3.1 Towers.

Prior to Nov. 1, 1991:
The design of the tower structure and foundation shall be in accordance with the requirements of 5.1.1.6. Where guyed towers are used and guys intersect the ground within or near ski runs, the guys shall be marked for visibility.

Means shall be provided for ready access from the ground to all tower tops. Permanent ladders are required for heights above those accessible by portable ladders.

Portable ladders, if used, shall be in at least sufficient quantity to be available at each point where attendants are positioned. Portable ladders extending more than 20 feet (6.10 meters) shall not be used.

Towers shall be identified with successive numbers clearly visible to passengers.
Where towers are designed to permit variations in rope height, sheave unit supports shall be guided and attached so as to prevent misalignment by rotation

5.2.1.1 Applicable codes.

May 15, 2000 to May 15, 2006:
All electrical systems shall comply with 5.2.1.1 Applicable codes of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical systems shall comply with 5.2.1.1 Applicable codes of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical systems shall comply with 5.2.1.1 Applicable codes of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical systems shall comply with 5.2.1.1 Applicable codes of the B77.1-1982 ANSI Standard.

Jan 1, 1977 to Jan. 1, 1984:
All electrical work shall comply with 5.2.1.1 Applicable codes of the B77.1-1976 ANSI Standard.

Jan 1, 1974 to Jan. 1, 1977:
All electrical work shall comply with 5.2.1.1 Applicable codes of the B77.1-1972 ANSI Standard.

Jan 1, 1972 to Jan 1, 1974:
All electrical work shall comply with 5.2.1.1 Applicable codes of the B77.1-1970 ANSI Standard.

Prior to Jan 1, 1972:
All electrical work shall comply with 5.2.1.1 Applicable codes of the B77.1-1960 ANSI Standard.

5.2.1.2 Location.

May 15, 2000 to May 15, 2006:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 5.2.1.2 Location of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 5.2.1.2 Location of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 5.2.1.2 Location of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 5.2.1.2 Location of the B77.1-1982 ANSI Standard.

Prior to Jan. 1, 1984:
All exposed electrical power transmission wiring shall be so located that in case of collapse or breakage of the power line it will not come into contact with carriers, ropes, or passengers.

5.2.1.3 Protection.

Prior to May 15, 2006:

All transformer stations and other high voltage electrical equipment shall be marked with conspicuous warning signs and shall be protected so as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. All power equipment shall be protected against overloads by circuit breakers or fuses.

5.2.1.4 Overhead cables.

Prior to May 15, 2006:
Signal, communication, and control circuits may be supported between towers that support the aerial lift. Voltage on overhead or exposed circuits shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

5.2.1.5.5 Ground fault interrupter protection.

Prior to May 15, 2006:
Not required.

5.2.2 Electrical system circuit design and classification.

Prior to May 15, 2006:
Not required.

5.2.10 Safety of operating and maintenance personnel.

Prior to May 15, 2006:
The sign "Personnel Working on Lift - Do Not Start" or a similar warning sign shall be hung on the main disconnect switch or at control points for starting the power unit(s) when persons are working on the aerial lift.

Provision shall be incorporated in the ropeway design to render the system inoperable when necessary for the Lock-out Tag-out protection of personnel working on the aerial lift.

5.3.1.2.1 Requirements for signs.

(a) The design of any sign as well as its support and the installation procedure of such sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

5.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

Section 6 Tows

6.1.1.3.3 Location of power lines. Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

6.1.1.3.4 Air space requirements.

6.1.1.3.4.1 Structures. No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

6.1.1.3.4.2 Cables or ropes. Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

6.2.3.2 Stop gates.

Automatic stop device(s) shall be installed at each terminal and beyond each unloading area to stop the tow if actuated by a person's passage.

For actuating device(s) of the suspended type, the suspended portion shall be strong enough to cause release of the actuating devices in use under the most adverse conditions, and each side shall be detachable and shall interrupt the operating circuit when detached.

The device shall be in accordance with the following as applicable:

a) *Intermediate unloading areas:* Required only when passengers are not permitted beyond the intermediate unloading area;

b) *Terminal areas:* Installed on the incoming side so that the distance from the stop gate to the first obstruction is more than 150% of the distance required to stop the empty tow operating at maximum speed. The stop device shall extend across the tow beneath the incoming rope and insofar as is practical the outgoing rope;

EXCEPTION: Loading areas where the deflection sheaves or bullwheels are enclosed by guarding, such that personnel or a passenger cannot be pulled into or have unauthorized access to the deflection sheaves or bullwheels, are not required to maintain a stop gate at the terminal loading area.

e) *Fiber rope tows;* Additionally, at unloading areas a device shall encircle the incoming fiber rope.

6.3.1.2.1 Requirement for signs.

(a) The design of any sign as well as its support and the installation procedure of each sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

6.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

Note: Timeframes relate to the ropeway installation date or modification date whichever controls, unless otherwise noted.

6.1.1.3.3 Location of power lines.

Jan, 1, 1977 to Present:
Power lines shall be located a minimum distance equal to the height of poles or support structures from any passenger tramway so that poles and electrical lines cannot touch any portion of the tramway, loading or unloading points or platforms and tow path, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

6.1.1.3.4 Air space requirements.

6.1.1.3.4.1 Structures.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by vertical planes commencing at a point thirty-five (35) feet from the intersection of the vertical planes of the ropes or cables and ground surface.

For purposes of this rule, buildings controlled by the licensee used primarily for maintenance and operation of the lift and other tramways shall not be considered structures; however, buildings must comply with the following.

(1) No flammable liquids may be stored in the building outside of a UL listed container or storage cabinet, unless such flammable liquids are in the original containers and intended for daily usage. Quantities must be consistent with normal daily use. Class I or II flammable storage materials shall be limited to 2 gallons in a UL listed container and must be stored either in an outside storage area or in a UL listed cabinet.

(2) The building must be within the view of the attendant but not impair the sight line of the lift.

(3) Entrances to all machinery, operators', and attendants' rooms shall be locked when not in use. Unattended entrances accessible to public, which may be left open, shall be equipped with barriers to prevent entry.

Jan. 1, 1994 to May 15, 2000:
No passenger tramway installation shall be permitted to operate when a structure encroaches into the air space of the passenger tramway, defined as the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Dec. 30, 1977 to Jan. 1, 1994:
No passenger tramway installation shall be permitted whenever the Passenger Tramway Operator does not have permanent and irrevocable control of the following air space (except when the passenger tramway is located on Forest Service land): the area bounded by planes having an outward slope of one horizontal and two vertical and commencing at a point twenty (20) feet horizontally outside of the intersection of the vertical planes of ropes or cables and ground surface

Prior to Dec. 30, 1977:
Not required

6.1.1.3.4.2 Cables or ropes.

Note: Timeframes stated for this rule define the air space requirements for each ropeway at the time when the encroachment was known to the area and DO NOT pertain to the installation date of the ropeway.

May 15, 2000 to Present:
Any cable or rope installed on or near a ropeway that may represent a hazard to the ropeway shall be monitored to automatically stop the ropeway if the cable or rope fails. Failure would be defined as per Section 23.1 (g).

EXCEPTION: Track or haul ropes are excluded from this rule.

Prior to May 15, 2000:
Not required

6.2.1.1 Applicable codes.

May 15, 2000 to May 15, 2006:
All electrical systems shall comply with 6.2.1.1 Applicable codes of the B77.1-1999 ANSI Standard.

Jan. 1, 1994 to May 15, 2000:
All electrical systems shall comply with 6.2.1.1 Applicable codes of the B77.1-1992 ANSI Standard.

Nov. 1 1991 to Jan 1, 1994:
All electrical systems shall comply with 6.2.1.1 Applicable codes of the B77.1-1990 ANSI Standard.

Jan. 1 1984 to Nov 1, 1991:
All electrical systems shall comply with 6.2.1.1 Applicable codes of the B77.1-1982 ANSI Standard.

Jan 1, 1977 to Jan. 1, 1984:
All electrical work shall comply with 6.2.1.1 Applicable codes of the B77.1-1976 ANSI Standard.

Jan 1, 1974 to Jan. 1, 1977:
All electrical work shall comply with 6.2.1.1 Applicable codes of the B77.1-1972 ANSI Standard.

Jan 1, 1972 to Jan 1, 1974:
All electrical work shall comply with 6.2.1.1 Applicable codes of the B77.1-1970 ANSI Standard.

Prior to Jan 1, 1972:
All electrical work shall comply with 6.2.1.1 Applicable codes of the B77.1-1960 ANSI Standard.

6.2.1.2 Location.

May 15, 2000 to May 15, 2006:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 6.2.1.2 Location of the applicable requirements of ANSI C2-1997.

Jan. 1, 1994 to May 15, 2000:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 6.2.1.2 Location the applicable requirements of ANSI C2-1993.

Nov. 1 1991 to Jan 1, 1994:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 6.2.1.2 Location the applicable requirements of ANSI C2-1989.

Jan. 1 1984 to Nov 1, 1991:
All electrical power transmission wiring located near or proposed to cross over aerial lifts shall comply with 6.2.1.2 Location the applicable requirements of ANSI C2-1981.

Prior to Jan. 1, 1984:
All exposed electrical power transmission wiring shall be so located that in case of collapse or breakage of the power line it will not come into contact with carriers, ropes, or passengers.

6.2.1.3 Protection.

Prior to May 15, 2006:
All transformer stations and other high voltage electrical equipment shall be marked with conspicuous warning signs and shall be protected so as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. All power equipment shall be protected against overloads by circuit breakers or fuses.

6.2.1.4 Overhead cables.

Prior to May 15, 2006:
Signal, communication, and control circuits may be supported between towers that support the aerial lift. Voltage on overhead or exposed circuits shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

6.2.1.5.5 Ground fault interrupter protection.

Prior to May 15, 2006:
Not required.

6.2.2 Electrical system circuit design and classification.

Prior to May 15, 2006:
Not required.

6.3.1.2.1 Requirement for signs.

(a) The design of any sign as well as its support and the installation procedure of each sign shall be considered a minor modification if the sign or aggregate of signs on a given tower is greater than three feet square (nine square feet).

(b) Signs, fasteners, or supporting members shall not interfere with the operation of the tramway.

(c) The design of structural components shall be reviewed to consider the increase in loading caused by any sign.

(d) Signs shall not interfere with passenger or attendant vision.

6.3.1.3 Operational plan for transportation of recreational equipment. Each licensee shall have an operational plan that has procedures for transportation of sports equipment and recreational devices by foot passengers. This plan shall be consistent with the tramway manufacturer's specifications and instructions, if any.

STATEMENT OF BASIS AND PURPOSE

The basis for the revision and adoption of the following rules is C.R.S. 25-5-704 (1) (a).

The purpose for the revision of Rule 0.1 Preamble and incorporation by reference, Rule 1.2.4.1 Existing installations, Section 2 Aerial tramways, Section 3 Detachable grip aerial lifts, Section 4 Fixed grip aerial lifts, Section 5 Surface lifts, and Section 6 Tows AND the adoption of Section 7 Conveyors, Annex E Operator control devices, Annex F Combustion engine(s) and fuel handling, and Annex G Welded link chain is to grandfather in the ANSI rules for pre-existing tramways and consolidate all versions of the ANSI standards into one set of rules so that one ANSI code book and one CPTSB rulebook can be utilized for all tramways.

The revision and adoption of these rules shall become effective May 15, 2010.