Rule 0.1 Preamble and incorporation by reference.

Section 25-5-704(1)(a) of the Colorado Revised Statutes directs the Colorado Passenger Tramway Safety 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 relevant publication as now known as the “American National Standard for Passenger Ropeways - Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors—safety requirements—", ANSI B77.1-1999. The following rules and regulations are adopted in compliance with the intent of the statute although not strictly according to its language.


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 Standard or additional rules not covered by the ANSI B77.1-1999 Standard. 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 Standard. The term "rules and regulations" as used in this document is a reference to both the ANSI B77.1-1999 Standard and the “State of Colorado Department of Regulatory Agencies Passenger Tramway Safety Board Rules and Regulations.”

The design, installation, operation, and maintenance of passenger ropeways and their components that are not covered by this standard 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 this standard shall be handled in accordance with sound engineering judgment.

A partial list of normative references may be found in Section 9 of the ANSI B77.1-1999 as well as the following list:

- American National Standard for Safety Standard for Mechanical Power Transmission Apparatus, ANSI B15.1 - 1972, (Section 9, Funiculars, only), as published by The American Society of Mechanical Engineers
- American National Standard National Electrical Safety Code, ANSI C2-1981, (Section 9, Funiculars, only), as published by The Institute of Electrical and Electronics Engineers, Inc.
- American National Standard National Electrical Code, ANSI/NFPA 70-1981, (Section 9, Funiculars, only), as published by the National Fire Protection Association, Inc.
- American National Standard Lightning Protection Code, ANSI/NFPA 78-1980, (Section 9, Funiculars, only), as published by the National Fire Protection Association, Inc.
Section 1 General Requirements

1.1 Scope.

This document establishes a standard for the design, manufacture, construction, operation and maintenance of the passenger tramways in the State of Colorado. For this standard, passenger tramways include:

(1) Aerial tramways (single and double reversible).
(2) Aerial lifts (detachable lifts, chair lifts, and similar equipment).
(3) Surface lifts (T-bar lifts, J-bar lifts, platter lifts, and similar equipment).
(4) Tows (wire and fiber rope tows).
(5) Funiculars.
(6) Conveyor lifts.

These rules and regulations are promulgated by the Colorado Passenger Tramway Safety Board pursuant to the authority conferred by C.R.S. 25-5-701 et. seq., as amended.

1.2 Purpose.

The purpose of this standard is to develop a system of principles, specifications, and performance criteria that will meet the following objectives:

(1) Reflect the current state of the art of tramway design, operation, maintenance, and construction

It is recognized that certain dangers and risks are inherent in machines of this type and their operation. It is also recognized that inherent and other risks or dangers exist for those who are in the process of approaching, loading, unloading and departing from passenger tramways. This system is intended to result in tramways that are designed, constructed, operated, and maintained in a manner that helps reduce danger and exposure to risk to passengers and maintenance and operational personnel and to encourage improvements in productivity, efficiency, development, and progress consistent with the objectives.

Such a system with these stated objectives constitutes a safety standard.

1.2.3 Exceptions.

Strict application of the provisions of this standard may not be appropriate in every instance. Wherever it may be proposed to depart from the provisions of this standard, the authority having jurisdiction may grant
exceptions from the literal requirements or permit the use of other devices or methods that provide features comparable to those included in this standard, providing that after receiving such evidence as the Board may require, the Board determines that:

(a) The granting of such an exception would be consistent with, and would aid in, implementing the legislative policy set forth in C.R.S. 25-5-701, and, either;

(b) Compliance with applicable rules and regulations from which an exception is sought would create an unreasonable operational or design condition; or

(c) Compliance with applicable rules and regulations from which an exception is sought would create an unreasonable economic burden.

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. 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 and 9.3.7.3 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. Operation and maintenance shall be in compliance with this standard. (See 2.3, 3.3, 4.3, 5.3, 6.3, 7.4, 8.3, 9.3)

All installations shall comply with the new or revised requirements of these rules and regulations 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 6.1.2.6.1. 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.

(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.

1.2.4.2 New Installations.

New installations which have not received their initial registration by the effective date of these rules and regulations shall meet the requirements in effect at the time of initial registration.

1.2.4.3 Major Tramway Modification.

A major tramway modification shall be defined as an alteration of the current design of the tramway which results in:

(a) A change in the design speed of the system;

(b) A change in the rated capacity by changing the number of carriers, spacing of carriers, or load capacity of carriers;

(c) A change in the path of the rope;

(d) Any change in the type of brakes and/or backstop devices or components thereof;

(e) A change in the structural arrangements;

(f) A change in power or type of prime mover or auxiliary engine;

(g) A change to control system logic.

1.2.5 Interpretation of Rules and Regulations.

Additional explanation or interpretation of these rules and regulations shall be the responsibility and at the reasonable discretion of the Board. An appeal to the ruling of the Board may be made in conformance with C.R.S. 24-4-106.

1.2.6 Existing Laws or Ordinances.

This standard shall be considered as supplementary to any existing law or ordinance covering the installation or operation of these facilities. All construction shall be in accordance with applicable codes of the state or its political subdivisions and the codes and standards of the industry.

1.4 Definitions

authority having jurisdiction: The Colorado Passenger Tramway Safety Board is the authority having jurisdiction over passenger tramway facilities in the State of Colorado. Other public or private bodies may exercise a concurrent jurisdiction over a particular installation by virtue of location or other interests. No such joint jurisdiction shall be limited by these rules and regulations; neither shall these requirements be mitigated by others without the concurrence of the Board.

critical components: Critical components are those parts of a tramway or lift system, the failure of which is likely to cause serious injury to the passengers. The list of critical components for a tramway or lift system shall include, but not be limited to the following:
(1) Carrier, including grip, hanger, chair, or gondola;
(2) Haul rope sheaves, sheave units and their attachments;
(3) Terminal sheaves and their attachments;
(4) Tension systems and their attachments;
(5) Wire rope, including haul ropes, track ropes and counterweight ropes.

design integrity: Verification of design integrity means verification that the tramway conforms to the original design accepted by the Board and such modifications as have been authorized by the Board.

Qualified Engineer: An engineer who is registered as a Professional Engineer in the State of Colorado.

safety gate: See Stop Gate.

stop gate: A stop gate is a type of automatic stopping device that, when actuated by a passenger’s weight, contact, or passage, will automatically stop the tramway. For the purposes of complying with these rules and regulations, stop gate and safety gate shall be considered to have the same meaning.

1.5 Quality Assurance Programs.

Critical components shall be designed, manufactured, installed, and operated in accordance with a quality assurance program. A quality assurance program shall be one that assures that the critical components comply with applicable standards, specifications, and requirements of the authority having jurisdiction.

The program for the design of these components shall verify and document the use of properly selected load factors or allowable stresses based on the conditions of loading and design life. The program shall also verify and document the use of analysis, calculations, and checking procedures.

The program for the manufacture of these components shall verify and document that fabricated and supplied parts conform to the design plans and specifications.

The program for the installation of these components shall verify and document that the installed parts conform to the design plans and specifications.

For the area operator, as defined in C.R.S. 25-5-702(1), the program shall verify and document that the in-use periodic testing requirements of the designer and manufacturer are completed by qualified personnel.

This rule shall apply to all critical components manufactured and installed after January 1, 1992.

Section 2 Aerial Tramway

2.1.1.2.1 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.

2.1.1.2.2 Air space requirements.

2.1.1.2.2.1 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, unless such flammable liquids are stored in UL listed storage cabinets.

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.

2.1.1.2.2 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.

2.1.1.3 Width of clearing

The clearing shall be wide enough to prevent adjacent vegetation from interfering with the aerial lift. Carriers shall not contact trees or vegetation during operational surges, or during maximum design wind conditions, or both. Trees and other vegetation shall be cleared a minimum of 5 feet (1.53 meters) from haul ropes or track cables and carriers under normal (nonsurge) operating conditions. Clearings shall be maintained to avoid washouts that might endanger the installation (see 2.3.3.1). Potentially hazardous trees shall be cleared far enough back to avoid their falling on the tramway.

2.1.1.8.1 Fuel Tanks for Combustion Engines. This rule is superceded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

2.1.1.12 Safety of operating and maintenance personnel. Provisions 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 automatically warns of an impending start of the tramway. After the start button is pressed, the warning device shall sound for a minimum of 2 seconds before the tramway starts, and shall continue until the ropeway begins to move. The audible warning device shall be heard inside and outside all terminals and machine rooms above the ambient noise level.

2.1.2.6.4 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.

2.2.1.4 Voltage limitations for non-haul or track rope overhead cables. Voltage on overhead cables shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems and power lines (see 2.1.1.2.1, 3.1.1.2.1, 4.1.1.2.1, 5.1.1.2.4, 6.1.1.2.4, 8.1.1.2.3 Location of power lines).
2.3.1.2 **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.

2.3.2.2 **Minimum Operating Personnel.** The following personnel are the minimum that shall be required:

(a) An operator shall be in charge of the aerial tramway;

(b) One attendant shall be on duty at each loading/unloading platform or station;

(c) A conductor shall be in each carrier having capacity of 20 or more passengers.

Additional attendants or conductors may be required by the specifics of the design and installation. A conductor may also act as a platform or station attendant.

2.3.3 **Maintenance**

2.3.3.1 **General**

Foundations, structural, mechanical, and electrical components shall be inspected regularly and kept in a state of good repair. The maintenance and testing requirements of the designer or a Qualified Engineer (see 2.1.6.2) shall be followed. Maintenance records shall be kept (see 2.3.5.3).

2.3.3.1.2 **Dynamic testing**

Dynamic testing shall be performed at intervals not exceeding seven (7) years. A written schedule for systematic dynamic testing shall be developed and followed. The owner shall provide experienced personnel to develop and conduct the dynamic test. The schedule shall establish specific frequencies and conditions for dynamic testing. The testing shall simulate or duplicate inertial loadings. The test load shall be equivalent to the design live load. The results of the testing shall be documented in the maintenance log.

The testing shall include, but not be limited to the following:

a) braking systems; b) auxiliary power units; c) tension system; d) electrical systems.

**Section 3 Detachable Grip Aerial Lifts**

3.1.1.2.1 **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.

3.1.1.2.2 **Air space requirements.**

3.1.1.2.2.1 **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, unless such flammable liquids are stored in UL listed storage cabinets.

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.

3.1.1.2.2 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.

3.1.1.3 Width of clearing

The clearing shall be wide enough to prevent adjacent vegetation from interfering with the aerial lift. Carriers shall not contact trees or vegetation during operational surges, or during maximum design wind conditions, or both. Trees and other vegetation shall be cleared a minimum of 5 feet (1.53 meters) from haul ropes or track cables and carriers under normal (nonsurge) operating conditions. Clearings shall be maintained to avoid washouts that might endanger the installation (see 3.3.3.1). Potentially hazardous trees shall be cleared far enough back to avoid their falling on the tramway.

3.1.1.8.1 Fuel Tanks for Combustion Engines. This rule is superceded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

3.1.1.12 Safety of operating and maintenance personnel. Provisions shall be incorporated in the aerial lift design to render the system inoperable when necessary for the protection of personnel working on the aerial tramway. See 3.3.1.1 for placement of applicable warning signs.

The aerial lift shall incorporate an audible warning device that automatically warns of an impending start of the lift. After the start button is pressed, the warning device shall sound for a minimum of 2 seconds before the lift starts, and shall continue until the ropeway begins to move. The audible warning device shall be heard inside and outside all terminals and machine rooms above the ambient noise level.

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 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:

<table>
<thead>
<tr>
<th>Total number of carriers on lift (both sides)</th>
<th>Maximum number of loaded carriers on downhill rope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 60</td>
<td>2</td>
</tr>
<tr>
<td>60 to 120</td>
<td>3</td>
</tr>
<tr>
<td>Over 120</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

3.1.2.5 Brakes and rollback devices

The aerial lift shall have the following friction-type brakes and other devices as specified in table 3-1:

- service brake (see 3.1.2.5.1);
- drive sheave brake (see 3.1.2.5.2);
- rollback device (see 3.1.2.5.3).

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 (3.1.2.5.4) may be used in lien 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 condition 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>
<thead>
<tr>
<th>Table 3-1 - Required stopping devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerial lift category</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>* A service brake is not required if the overhauling, reverse direction aerial lift will meet the service brake stop performance requirements without a braking device</td>
</tr>
<tr>
<td>Self-braking: A lift that decelerates, stops, &amp; remains stopped within the service brake performance requirements without a braking device</td>
</tr>
<tr>
<td>Nonoverhauling: A lift that will not accelerate in either direction when it is not driven, but is not self-</td>
</tr>
</tbody>
</table>
### 3.1.2.6.4 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. All moving equipment located across, above, or within 12 inches (30.5 cm) of the access way periphery shall be guarded according to ANSI B15.101972.
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.
5. Full-length stop cords shall be provided, near railings, adjacent to moving machinery.

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.

### 3.1.2.6.5 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.

<table>
<thead>
<tr>
<th>braking</th>
<th>Overhauling, reverse direction: A lift that will accelerate in the reverse direction when it is not driven</th>
<th>Overhauling, forward: A lift that will accelerate in forward direction when it is not driven</th>
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<tbody>
<tr>
<td>Required*</td>
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<td>Not required</td>
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3.1.2.11.2 Provisions for Automatic Stop Devices.

The following automatic stop devices or systems shall be installed:

(a) A device(s) that will stop the aerial lift in the event a carrier grip does not engage properly to the haul rope at every grip attachment point;

(b) A device(s) that will stop the aerial lift in the event a carrier does not disengage the haul rope properly at every grip disengaging point;

(c) A device(s) that will stop the aerial lift 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 lift 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 system that will prevent carrier collision in the receiving and launching mechanisms. The system shall include devices that will automatically stop the system before any carriers can come together while they are in the decelerating or accelerating process;

(e) In the case of open chair carriers or mechanical requirements for minimum spacing in the stations, a system to prevent abnormal carrier spacing throughout the conveying system. The system shall include devices that will automatically stop the system in the event of abnormal carrier spacing. Open chair carriers shall not be allowed to come together,

(f) If the line speed exceeds the design speed by 10%, the service brake shall slow and stop the aerial lift automatically;

(g) A system or device that will automatically apply the drive sheave brake when the speed of the haul rope exceeds the design value by 15% in either direction on an overhauling aerial lift;

(h) Automatic stopping devices 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 tramway's intended point of unloading. The automatic stop may be delayed or bypassed if stop condition is acknowledged by the operator.

3.2.1.4 Voltage limitations for non-haul or track rope overhead cables.

Voltage on overhead cables shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems and power lines (see 2.1.1.2.1, 3.1.1.2.1, 4.1.1.2.1, 5.1.1.2.4, 6.1.1.2.4, 8.1.1.2.3 Location of power lines).

3.2.1.6.3 Haul Rope Grounding.

Grounding sheaves or equivalent means shall be provided at each end of the tramway for the purpose of grounding track cables and haul ropes, as applicable, for static electrical discharge. For the haul rope on reversible tramways, bicable aerial systems or monocable systems with an isolated or insulated haul rope incorporated in the operating circuitry, no means of grounding are required.

3.3.1.1.3 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
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.

3.3.1.2 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.

3.3.3 Maintenance

3.3.3.1 General

Foundations, structural, mechanical, and electrical components shall be inspected regularly and kept in a state of good repair. The maintenance and testing requirements of the designer or a Qualified Engineer (see 3.1.6.2) shall be followed. Maintenance records shall be kept (see 3.3.5.3).

3.3.3.2 Dynamic testing

Dynamic testing shall be performed at intervals not exceeding seven (7) years.

A written schedule for systematic dynamic testing shall be developed and followed. The owner shall provide experienced personnel to develop and conduct the dynamic test. The schedule shall establish specific frequencies and conditions for dynamic testing. The testing shall simulate or duplicate inertial loadings. The test load shall be equivalent to the design live load. The results of the testing shall be documented in the maintenance log.

The testing shall include, but not be limited to the following:

a) braking systems;
b) auxiliary power units;
c) tension system;
d) electrical systems.

3.3.4.4 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

4.1.1.2.1 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.

4.1.1.2.2 Air space requirements.

4.1.1.2.2.1 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, unless such flammable liquids are stored in UL listed storage cabinets.

(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.

4.1.1.2.2.2 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.

4.1.1.2.3 Requirements for Crossovers.

Where aerial lifts cross one another, the following conditions shall be met:

(1) The crossover shall be made in such a manner that no complete deropement, failing to be retained by the rope catching device (see 4.1.3.3.2), of a single tower of either lift will cause contact of the moving rope or carriers of one lift with the rope or carriers of the other lift under any design condition of loading.

In lieu of the above, the crossover may occur at a tower that is common to each lift.

(2) Any deropement of the upper lift shall cause both lifts to stop and a deropement of the lower lift that reduces the clearance between the two lifts shall cause both lifts to stop.

(3) The minimum vertical clearance between the haul rope of the lower lift and the top of the chair seat of
the upper lift shall be 10 feet (3 meters) under the most adverse loading conditions.

4.1.1.3 **Width of clearing**

The clearing shall be wide enough to prevent adjacent vegetation from interfering with the aerial lift. Carriers shall not contact trees or vegetation during operational surges, or during maximum design wind conditions, or both. Trees and other vegetation shall be cleared a minimum of 5 feet (1.53 meters) from haul ropes or track cables and carriers under normal (nonsurge) operating conditions. Clearings shall be maintained to avoid washouts that might endanger the installation (see 4.3.3.1). Potentially hazardous trees shall be cleared far enough back to avoid their falling on the tramway.

4.1.1.8.1 **Fuel tanks for Combustion Engines.** This rule is superceded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

4.1.1.12 **Safety of operating and maintenance personnel.** Provisions shall be incorporated in the aerial lift design to render the system inoperable when necessary for the protection of personnel working on the aerial lift. See 4.3.1.1 for placement of applicable warning signs.

The aerial tramway shall incorporate an audible warning device that automatically warns of an impending start of the tramway. After the start button is pressed, the warning device shall sound for a minimum of 2 seconds before the tramway starts, and shall continue until the ropeway begins to move. The audible warning device shall be heard inside and outside all terminals and machine rooms above the ambient noise level.

4.1.2.5 **Brakes and rollback device**

The aerial lift shall have the following friction-type brakes and other devices as specified in table 4-2:

- service brake (see 4.1.2.5.1);
- drive sheave brake (see 4.1.2.5.2);
- rollback device (see 4.1.2.5.3);
- drive train backstop (see 4.1.2.5.4).

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 required by 4.3.2.4.2(d).
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 power 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 brake is so disabled.

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 track cables and haul ropes, as applicable, for static electrical discharge.

4.3.1.1.3 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.

4.3.1.2 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.

4.3.3 Maintenance

4.3.3.1 General

Foundations, structural, mechanical, and electrical components shall be inspected regularly and kept in a state of good repair. The maintenance and testing requirements of the designer or a Qualified Engineer (see 4.1.6.2) shall be followed. Maintenance records shall be kept (see 4.3.5.3).

4.3.3.1.2 Dynamic testing

Dynamic testing shall be performed at intervals not exceeding seven (7) years.

A written schedule for systematic dynamic testing shall be developed and followed. The owner shall provide experienced personnel to develop and conduct the dynamic test. The schedule shall establish specific frequencies and conditions for dynamic testing. The testing shall simulate or duplicate inertial loadings. The test load shall be equivalent to the design live load. The results of the testing shall be documented in the maintenance log.

The testing shall include, but not be limited to the following:
a) braking systems;
b) auxiliary power units;
c) tension system;
d) electrical systems.

4.3.4.4 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

5.1.1.2.4 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.

5.1.1.2.5 Air space requirements.

5.1.1.2.5.1 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, unless such flammable liquids are stored in UL listed storage cabinets.

(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.

5.1.1.2.5.2 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.

### 5.1.1.3 Width of clearing

The clearing shall be wide enough to prevent adjacent vegetation from interfering with the surface lift. Carriers shall not contact trees or vegetation during operational surges, or during maximum design wind conditions, or both. Trees and other vegetation shall be cleared a minimum of 5 feet (1.53 meters) from haul ropes or track cables and carriers under normal (nonsurge) operating conditions. Clearings shall be maintained to avoid washouts that might endanger the installation (see 5.3.3.1). Potentially hazardous trees shall be cleared far enough back to avoid their falling on the tramway.

### 5.1.1.8.1 Fuel Tanks for Combustion Engines

This rule is superceded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

### 5.1.2.12 Reserved.

### 5.2.1.4 Voltage limitations for non-haul or track rope overhead cables

Voltage on overhead cables shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems and power lines (see 2.1.1.2.1, 3.1.1.2.1, 4.1.1.2.1, 5.1.1.2.4, 6.1.1.2.4, 8.1.1.2.3 Location of power lines).

### 5.2.1.6.3 Haul Rope Grounding

Grounding sheaves or equivalent means shall be provided at each end of the tramway for the purpose of grounding track cables and haul ropes, as applicable, for static electrical discharge.

### 5.3.1.1.1 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.

### 5.3.1.2 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

### 6.1.1.2.2 Tow path cross slope

Tows used for skiing: The cross slope of a tow path for skiers shall not exceed 5% except at unloading areas. On wire rope tows, any cross slope shall be away from the centerline of the tow.

Tows used for recreational devices: The tow path shall have a minimum and constant cross slope to ensure that, should a recreational device inadvertently detach, the detached carrier will slide clear of the
uphill path of any following carriers. One or more methods shall be in place adjacent to the tow path to keep any detached runaway recreational device away from the tow path.

Tows used for both skiing and recreational devices: The cross slope of a tow path shall utilize the required slope for the intended usage of the tow.

6.1.1.2.4 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.

6.1.1.2.5 Air space requirements.

6.1.1.2.5.1 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, unless such flammable liquids are stored in UL listed storage cabinets.

(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.

6.1.1.2.5.2 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.

6.1.3 Width of clearing

The clearing shall be wide enough to prevent adjacent vegetation from interfering with the tow. Such clearings shall be maintained to avoid washouts that might endanger the installation (see 6.3.3.1(k)). Potentially hazardous trees shall be cleared far enough back to avoid their falling on the tramway.

6.1.8.1 Fuel Tanks for Combustion Engines.

This rule is superceded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

6.1.11.2 Provisions for automatic stop devices.

The following automatic stop devices shall be installed:

(1) Automatic stopping device(s) beyond each unloading area. For actuating devices 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 location of the device shall be in accordance with the following:

(a) *Intermediate unloading stations:* Required only when passengers are not permitted beyond the intermediate unloading station. The device shall automatically stop the tow in the event a passenger passes beyond the intended area of unloading;

(b) *Terminal loading and unloading areas - Always required:* The device shall automatically stop the tow in the event a passenger passes beyond the stop gate. The stop gate shall be so located that the distance from the stopping device to the first obstruction or point of reversal of direction of the towing device is 150% of the distance required to stop the empty tow operating at maximum speed;

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

(2) For fiber rope tows, a device (stop gate) that actuates the automatic stop and encircles the up-going haul rope.

**6.1.2.12 (Reserved)**

**6.2.1.4 Voltage limitations for non-haul or track rope overhead cables.**

Voltage on overhead cables shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems and power lines (see 2.1.1.2.1, 3.1.1.2.1, 4.1.1.2.1, 5.1.1.2.4, 6.1.1.2.4, 8.1.1.2.3 Location of power lines).

**6.2.1.6.3 Haul Rope Grounding.**

Grounding sheaves or equivalent means shall be provided at each end of the tramway for the purpose of grounding track cables and haul ropes, as applicable, for static electrical discharge.

**6.3.1.1 Signs.**

All signs for instruction of the public shall be bold in design with wording short, simple, and to the point. All such signs shall be prominently placed, and those pertaining to the tow operations shall be adequately lighted for night operation.

Instructions and warnings for use of tows shall be posted at loading areas and may include the duties and obligations of the passenger, as well as the Skier's Responsibility Code (see 6.3.6).

Entrances to all machinery, operators', and attendants' rooms shall be posted with a sign to exclude the entry of unauthorized persons.

The sign "Personnel Working on Tow - Do Not Start" or a similar warning sign shall be hung on the main disconnect switch and at control points for starting the auxiliary or prime mover when persons are working on the tow (see 6.1.1.12).

The following signs shall be posted:

(a) "No Loose Scarves" (at loading area)
“No Loose Clothing”
“No Long Hair Exposed”

(b) “Stay in Track”
(c) “Unload Here”
(d) “Stop Gate”
(e) “Wait Here”

6.3.1.1 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.

6.3.1.2 Operational Plan for Transportation of Recreational Equipment.
Each license shall have 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 7 Wire Rope and Strand Requirements

7.3.2 End connections.
The ropeway designer, wire rope manufacturer, fitting manufacturer, or a Qualified Engineer shall specify the parameters for installation, inspections, and intervals for replacement of end connections.

End connections shall be performed by or under the supervision of a competent facility or person and according to instructions approved by the ropeway designer, fitting manufacturer or Qualified Engineer.

Documentation shall be provided by the facility or person performing any splice or end connection stating that it has been accomplished in accordance with the provisions of this standard. This document shall become part of the wire rope or track cable log.

Adequate provisions shall be made to prevent water from contacting the wire rope and track strand at all sockets. Protective covering shall be removed and replaced annually at the time of the wire rope and track strand inspection.

Section 8 Conveyors
This section covers that class of transportation wherein skiers, or passengers on recreational devices, are transported uphill on a flexible moving element. The circulating, flexible moving element (conveyor belt) travels uphill on one path and generally returns underneath the uphill portion.
8.1 Design and installation

8.1.1 General.

8.1.1.1 Design passenger weight.

For purposes of design, a passenger shall be considered having a weight of 170 pounds (77.1 kg.).

8.1.1.2 Location.

In selecting the location and alignment of an installation, considerations shall be given to the following items, and to any others that may be particularly pertinent to the conveyor type and location:

a) electric power lines and their supports;

b) highways;

c) structures;

d) rock and earth slides, cave-ins, washouts, and the like;

e) snow creep and avalanches;

f) wind action;

g) icing;

h) ski slopes and trails;

i) rivers and gullies;

j) buried installations, including pipelines;

k) crossing or close proximity to other passenger ropeways.

l) ADA accessibility.

8.1.1.2.1 Conveyor gradient.

The maximum grade of a conveyor shall be regulated for the use intended. In no case shall the conveyor belt grade exceed 40 percent.

8.1.1.2.2 Cross slope.

The cross slope of the conveyor shall not exceed 5 percent.

8.1.1.2.3 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 conveyor belt path or support, if applicable, upon collapse of poles or lines, unless suitable and approved precautions are taken to safeguard human lives.

8.1.1.3 Configuration.
8.1.1.3.1 Conveyor belt length/width.

The conveyor system length shall be the exposed conveyor belt surface to the next whole inch or centimeter measured from the outgoing transition point to the incoming transition point.

The conveyor system travel length shall be the exposed conveyor belt surface as follows:

a) For end unloading - from the load point to the unload transition point.

b) For side unloading - From the load point to a point 5 feet (1.53 meters) plus 150% of the distance required to stop the empty conveyor operating at maximum speed beyond the stopping device.

The width of the conveyor shall be the width of the exposed conveyor belt to the next whole inch or centimeter. The minimum conveyor belt width shall be 22 inches (560 mm).

8.1.1.3.2 Path width.

A clear surface, with a low coefficient of friction, shall be located along at least one side of the conveyor. It shall be a minimum of 12 inches wide for conveyor belts less than 34 inches wide. The surface shall approximate the horizontal plane of the uphill conveyor belt surface.

Conveyor belts wider than 34 inches do not require the integral clear surface. The surface from the edge of the conveyor to 72 inches (1830 mm) horizontally shall not exceed a 1:2 slope. A fence or other structure can be used in lieu of the grading.

8.1.1.3.3 Clearing width.

The conveyor clearing shall be maintained so trees or vegetation do not extent within 5 feet (1.53 meters) horizontally and 10 feet (3.05 meters) vertically of the conveyor belting. Vegetation may extend over the conveyor belting provided it does not obscure the operator's and/or attendant's view of the conveyor. Such clearings shall be maintained to avoid washouts that might endanger the installation (see 8.3.3.1).

8.1.1.4 Clearances.

8.1.1.4.1 Vertical clearances.

The minimum headroom shall be 7 ft. (2.14 meters) measured vertically from the conveyor belt surface.

8.1.1.4.2 Horizontal clearances.

There shall be a minimum distance of 24 inches (610 mm) between the exposed edge of the belt and any obstruction located between the loading and discharge zones.

8.1.1.5 Capacity and speed.

Maximum conveyor speed shall be 160 ft/min. (.81m/s).

8.1.1.6 Structures and foundations.

All structures and foundations shall be designed and constructed in conformance with applicable criteria listed in 1.3 and shall be appropriate for the site. Applied design loads shall include dead, live, snow, wind and dynamic loads due to normal conditions and foreseeable abnormal conditions. A minimum live load of 100 lbs/ft$^2$ (488 kg/m$^2$) shall be used.

Structures and foundations located in snow creep areas shall be designed for such conditions and loads,
or protective structures shall be provided as required by the conditions.

8.1.1.6.1 Reserved.

8.1.1.6.2 Foundations.

In determining the resistance of the soil to motion of the foundation, the subsoil conditions at the site shall be considered, including any buoyancy due to ground water that may be present. If the resistance of the soil is not practically determinable, the foundation or anchorage should be designed as a gravity anchor, using the coefficient of friction appropriate to the general character of the soil. Foundations on rock shall be firmly anchored to solid rock unless designed as gravity foundations.

The top of concrete foundations shall not be less than 6 inches (150 mm) above finished grade unless specified direction for protection of the foundation and structural steel below grade is specified by the designer.

The design shall have a minimum factor of safety of 2 in resistance to overturning and, concurrently, 2 against sliding, under dead-load and live-load conditions; the minimum factors shall be 1.5 under these loadings plus wind acting simultaneously.

8.1.1.6.3 Anchorages.

All structures that are supported on sills or other supports, however temporary, shall be capable of carrying the loads imposed by structural and machine elements under static or operating conditions without shifting or settlement that will impair the operation of the conveyor.

Anchors may be natural objects or devices installed in a manner capable of withstanding tensions and sliding loads imposed by the conveyor installation.

The design shall have a safety factor of 2 in resisting overturning, sliding, or withdrawal under dead and live load.

8.1.1.7 Communications.

A permanently installed two-way voice communications system shall be provided between the prime mover control point, drive machinery building, if any, loading and unloading areas. The communications system shall be functional and audible during operation.

Audio indicators shall be audible over all ambient noise levels, and visual indicators (e.g. Light Emitting Diode) shall be visible in bright sunlight.

NOTE - Voice communications systems are not required on those conveyors qualifying for operation by a single operator, as defined in 8.3.2.2.

8.1.1.8 Internal combustion engine installation.

Internal combustion engines shall not be used as a direct coupled drive.

8.1.1.8.1 Fuel tanks for combustion engines.

Please refer to CPTSB Rules and Regulations Section 11, Fuel handling

8.1.1.9 Loading and unloading areas.

Platforms, ramps, corrals, and mazes, comprising the loading and unloading areas of a conveyor are
integrated with its operation. They shall be designed and installed in conformance with subclause 1.3.

8.1.1.9.1 Loading.

Loading areas shall be approximately level. The area shall be free of obstructions and maybe fenced in a manner to guide passengers to the loading point. Load gates, artificial surfaces, and other loading aids when used shall be designed and installed with regards to all passengers including adaptive. At least one point of access to the lift shall have a minimum clearance width of 36 inches (915 mm) to accommodate passengers using adaptive equipment.

8.1.1.9.2 Unloading.

The unloading areas' length, profile, and exit pathway shall be installed in accordance with the conveyor's speed, usage and manufacturer's recommendations. The exit pathway should be inclined downward in the direction of travel and outward from the line of the uphill conveyor path to provide passenger movement away from the conveyor.

8.1.1.10 Reserved.

8.1.1.11 Acceptance inspection and tests.

8.1.1.11.1 Acceptance inspection.

Before a conveyor that is new, relocated or that has not been operated for routine maintenance within the previous two years is opened to the public, it shall be given a thorough inspection by qualified personnel to verify compliance with the plans and specifications of the designer.

It shall be the responsibility of the owner to see that the following conditions have been met:

a) tightness of all structural connections;
b) lubrication of moving parts;
c) installation and alignment of all drive components;
d) proper function of belt tensioning components;
e) conveyor belt alignment;
f) conveyor belt splice;
g) operations of all electrical components, including circuit protection, ground fault circuit breakers, and grounding;
h) path width and clearances (see 8.1.1.3.2, 8.1.1.4);
i) conveyor in correct location and installation in accordance with plans and specifications.

8.1.1.11.2 Acceptance tests.

Before a conveyor that is new or relocated or that has not been operated for routine maintenance within the previous two years is opened to the public, it shall be given thorough tests by qualified personnel. The designer or manufacturer shall propose and submit an acceptance test procedure prior to public operation.
The function of all push-button stops, stop gates, etc., shall be checked. Braking shall be proved adequate (see 8.1.2.5.1 and 8.1.2.5.3). The test shall include full-speed operation for as long as required to check for overheating of moving parts, and excessive vibration or deflection of mechanical or structural components.

8.1.1.12 Safety of operating and maintenance personnel.

Provisions shall be incorporated in the conveyor design to render the system inoperable when necessary for the protection of personnel working on the conveyor. See 8.3.1.1 on placement of applicable warning signs.

8.1.2 Drive machinery

8.1.2.1 Power units.

All power units shall have the capacity for starting a fully loaded conveyor under the most unfavorable conditions.

Where manual multi-speed transmissions are used on a power unit, they shall not be shifted when the conveyor is moving.

Where reverse capability is provided on a power unit for a conveyor, provisions shall be made to prevent accidental reversal whenever the conveyor is moving.

The conveyor is to be started at its lowest point of speed range after a stop.

8.1.2.1.1 Auxiliary power unit.

An auxiliary power unit shall not be required on a conveyor.

8.1.2.2 Speed reducers and gearing.

All speed reducers and gearing shall have the capacity for starting a conveyor under the most unfavorable design loading conditions. They shall have a service factor appropriate for the application. They shall be located such that no belt, friction clutch, or similar friction-type device is between speed reducer and drive drum.

8.1.2.3 Bearings, clutches, couplings and shafting.

Bearings, clutches, couplings, shafting and universal joint shafts (universal shafts) shall be selected on the basis of the manufacturer's published data for the particular use. All shafting shall be designed in accordance with accepted standard practices. Guarding and containment shall be in accordance with the provisions of 8.1.2.6.1

Provisions shall be made for adjustment and lubrication of all bearings, clutches, and couplings, when required.

8.1.2.4 Acceleration and speed control.

Acceleration of a drive shall be determined with regard to conveyor type, profile, speed, and use.

8.1.2.5 Brakes and rollback devices.

8.1.2.5.1 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 drum.

8.1.2.5.2 Reserved.

8.1.2.5.3 Rollback device.

If it can be demonstrated that the conveyor will not roll back (if declutched) under the most adverse loading, a rollback device shall not be necessary. This device shall be located on the drive drum.

8.1.2.6 Location of machinery

8.1.2.6.1 General.

Moving machine parts that normally may be in reach of personnel shall be fitted with guards. Where breakage of a power transmission component can result in injury, provisions shall be made for appropriate containment of said components. Guards and containment shall be done in conformance to American National Standard Safety standard for mechanical power transmission apparatus, ANSI/ASME B15.1-1996.

Protection against static electricity shall be provided.

Fire-fighting device(s) shall be available.

8.1.2.6.2 Machinery not housed in a machine room.

Provisions shall be made to keep the public away from the machinery. All machinery and controls shall be rated for use in their intended environment.

8.1.2.6.3 Machinery housed in a machine room.

The machine room shall be adequately ventilated. It shall have a permanently installed lighting system, adequate for proper machinery maintenance and to reduce the risk of injury to operating personnel. The arrangement of machinery shall permit proper maintenance. A door with a suitable lock shall be provided, and the design shall keep the public away from the machinery. When a passageway is provided between machines or machinery and walls, a minimum passageway width of 18 inches (460 mm) shall be maintained. Means shall be provided to heat the machine room unless the designer or manufacturer certifies in writing that the drive machinery is rated for operation in an unheated room.

8.1.2.7 Drums and rollers.

All drums, sprocket drums, and conveyor belt support rollers, including their mountings and frames, shall be designed to withstand static and dynamic loads. Drums, roller bearings and their mountings shall be selected, designed, and installed in accordance with the recommendations of the manufacturers.

8.1.2.8 Tension drums or rollers.

The available travel of tensioning drums or rollers shall be adequate to properly tension the conveyor belt during normal operations.

8.1.2.9 Tension systems.

The system providing tension to the conveyor belt shall provide adequate belt tensioning for normal operations taking into consideration changing load and weather conditions.
8.1.2.10 Reserved.

8.1.2.11 Manual and automatic control devices.

All control devices shall conform to the requirements of 8.2.1.7.

8.1.2.11.1 Manual control devices.

Manual control devices that will initiate a stop shall be installed at all attendants' and operators' work stations, in machine rooms, machine compartments, access points to crawl spaces, and out-of-doors in proximity to all loading and unloading areas.

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

8.1.2.11.2 Provisions for automatic stop devices.

A belt transition entry device that will stop the conveyor shall be provided at the unloading area unless it can be demonstrated that entanglement cannot occur at the belt transition area.

The stop device shall initiate an emergency shutdown of the conveyor and be of the manually reset type. It shall operate in either of two ways:

a) If an object becomes entangled between the conveyor belt and the belt guard, the guard shall move to relieve the pinch point and initiate the stop. The guard shall be capable of moving the lesser of 5 inches (125mm) or 150% of the distance required to stop the empty conveyor belt operating at full speed.

b) An object on the belt initiates the stop as it approaches the pinch point. The stop gate shall be located 5 feet (1.53 meters) plus 150% of the distance required to stop the empty conveyor operating at maximum speed from the first obstruction or pinch point.

8.1.3 Line structure(s).

The design of structures supporting conveyor belting, the drive roller, idler roller and intermediate conveyor belt guide rollers shall be in accordance with the requirements of 8.1.1.6.

8.1.4 Line equipment.

8.1.4.1 Conveyor belt.

Conveyor belting and its splice(s) shall be based on the material rating of the manufacture considering the most adverse design loading conditions.

Splices and alternate treads on adjacent surfaces shall intermesh so that there is no continuous transverse gap between the surfaces. Splicing of the conveyor belt shall be made in such a manner as to result in a continuous conveyor belt surface.

8.1.4.1.2 Supports.

Where the conveyor belt load side is supported on a series of load carrying rollers, the combination of roller spacing, belt tension, and belt stiffness shall be such that the deflection of the conveyor belt surface, midway between load carrying rollers, shall not exceed the quantity .094 inches (2.4 mm) plus .004 times the center to center distance of the rollers in inches (millimeters) when measured as follows:
The conveyor belt surface shall be loaded midway between rollers with a 25 lb. (11.3 kg) weight concentrated on a cylindrical foot piece 2 inches (51mm) long by 1 inch (25mm) in diameter placed with its long axis across the belt. Deflection of the belt by this foot piece from its unloaded position shall not exceed the figure obtained above.

8.1.5 Provisions for operating personnel.

Operator and attendant stations, if provided, shall be located to provide visual surveillance of the station and conveyor in the vicinity of the station. 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.

When the conveyor is operated by an operator without the use of other attendants, the operator shall be located where he/she can observe the full travel length of the conveyor including loading and unloading areas. All primary controls and communications shall be available to him/her.

Loading and unloading areas shall have conveyor stopping devices located convenient to the operator or attendants assigned to those areas.

8.1.6 Operational and maintenance manuals.

8.1.6.1 Operational manual.

The designer of each new or reinstalled conveyor shall prepare an operational manual in English for each installation. The manual shall describe the function and operation of the components and provide instructions for the correct usage of the installation.

8.1.6.2 Maintenance manual.

The designer of each new or relocated conveyor shall prepare a maintenance manual in English for each installation. The manual shall describe recommended maintenance procedures, including:

a) types of lubricants required and frequency of application;

b) definitions and measurements to determine excessive wear;

c) recommended frequency of service to specific components.

8.2 Electrical design and installation.

8.2.1 General design and installation testing.

Prior to operation of newly installed conveyors, or after any modification thereafter of the electrical system, the electrical system shall be tested and shown to meet this standard and the test results shall be recorded. Design of all electrical controls and drives shall consider minimum sensitivity to electrical noise and electrical emissions, such as noise spikes from power lines and lightning, radio transmitters, thyristors (SCR), or solenoid of relay noise at levels and frequencies that could initiate loss of control.
8.2.1.1 Applicable codes.


8.2.1.2 Location.

All electrical power transmission wiring located near or proposed to cross over conveyors shall comply with the applicable requirements of ANSI C2-1997.

8.2.1.3 Protection.

All transformer installations 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.

8.2.1.4 Voltage limitations.

Signal, communications and control circuits may be supported by the structure supporting the conveyor belt. Voltage on control or communications wiring shall be limited to 50 volts with the exception of the intermittent ring-down circuits for telephone systems.

8.2.1.5 Wiring.

All wiring shall be in accordance with the designer's specifications and applicable codes.

8.2.1.5.1 Control wiring classification.

All control wiring shall be Class 1 in accordance with Article 725 Part A and B of ANSI/NFPA 70-1999.

8.2.1.5.2 Communications wiring.

All communications wiring and systems are excluded from the requirements in Article 725-5 of ANSI/NFPA 70-1999.

8.2.1.5.3 Insulation.

All control wiring is excepted from the requirements of Article 725-16 of ANSI/NFPA 70-1999. The designer shall specify conductor size, type, and insulation suitable for the electrical and mechanical requirements of the application.

8.2.1.5.4 Exterior lighting and snowmaking.

All ungrounded exterior lighting and snowmaking circuits, mounted on or within 60 feet (18.3 meters) of the conveyor centerline, shall be ground fault protected.

8.2.1.5.5 Power supply cords.

Placement of wires shall take into consideration, snow grooming, skiers, and other equipment that may pass over temporary power supply cords. The power supply cords shall be protected by ground fault circuit breaker.

8.2.1.6 Grounding.
8.2.1.6.1 Reserved.

8.2.1.6.2 Conveyor structure.

The conveyor structure shall have one point at the drive end referred to as a ground point, as defined in ANSI/NFPA 70-1999. All dc and ac electrical systems shall be referenced to this point. If an electrical prime mover is used, the electrical service shall terminate at this point. Under the worst case conditions, the resistance for the ground point to any part of the conveyor system shall not exceed 50 ohms for the purpose of grounding the conveyor control circuit. The grounding system for the conveyor shall not be used as a grounding system for any other system not related to the conveyor system.

8.2.1.6.3 Reserved.

8.2.1.6.4 Lightning protection.

If lightning protection is provided, it shall follow American National Standard Lightning protection code, ANSI/NFPA 780-1997.

8.2.1.7 Operating control circuits.

8.2.1.7.1 Operating circuits.

All conveyor systems shall contain one or more normally de-energized circuits(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 switches, inadvertent ground or a power failure, cause(s) the system to stop.

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

All start/run/stop and speed control switches shall be conspicuously and permanently marked with the proper function. All manual stop switches shall be permanently marked with “Push to Stop” in lettering a minimum 20 mm in height.

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

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

8.2.1.7.2 Emergency shutdown circuit.

All conveyor systems shall include a normally de-energized circuit that, when energized, allows the system to run and when interrupted, effects an emergency shutdown (see 1.4 - emergency shutdown). The shutdown shall have priority over all other control stops or commands. If, for any reason, the operator has lost control of the conveyor while using the normal operating control circuitry, the controls shall include an emergency shutdown circuit allowing the operator/attendant to stop the conveyor. Any one of the following conditions is considered a loss of control of a conveyor:

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

b) conveyor will not STOP when given the command to do so;
c) conveyor OVERSPEEDS beyond control settings and/or maximum design speed;
d) conveyor ACCELERATES faster than the normal design acceleration;
e) conveyor SELF-STARTS or SELF-ACCELERATES without the command to do so;
f) conveyor REVERSES direction unintentionally without the command to do so.

The shutdown circuit shall not have anything across or parallel to 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 the conveyor. The shutdown device shall be conspicuously and permanently marked and shall be red in color (see 8.1.5). If there is only one circuit, it shall be the Emergency Shutdown Circuit.

(See 8.1.2.11.1 Manual Control Devices)

8.2.1.7.3 Bypass circuits.

A temporary bypass circuit may be installed for malfunctions of operating control circuitry (see 8.3.2.5.9).

8.2.1.8 Electrical prime mover and power circuits.

8.2.1.8.1 Reserved

8.2.1.8.2 Electronic speed-regulated drives.

All electronic speed-regulated drives and electric motors shall shut down in the event of:

a) field loss (de motors);
b) speed feedback loss;
c) overspeed;
d) overcurrent.
e) phase loss

8.2.2 Night operation.

For nighttime operations, operating conveyors shall be provided with lighting systems. The entire conveyor belt surface including the loading and unloading areas shall be lighted.

8.2.2.1 Illumination.

Lights shall be located in a manner to provide generally uniform illumination.

8.2.2.2 Types.

Lamps shall be of a type suitable and rated for minimum temperatures of the location. Fixtures shall be designed to maintain proper lamp operating characteristics.

8.2.2.3 Location.
Lights shall be mounted on substantial poles or standards.

**8.2.2.4 Emergency lighting.**

Emergency lighting shall be provided in the event of electric power failure to permit unloading of the conveyor.

**8.3 Operation and maintenance**

**8.3.1 General and personnel safety.**

This subclause covers the requirements of operation and maintenance of conveyors. Many requirements listed here are listed elsewhere in section 8, since they also regulate installation and design. It is imperative that operating and maintenance personnel be familiar with applicable provisions of this section and the conveyor operational and maintenance manual (see 8.1.6).

Operation and maintenance of conveyor equipment can be dangerous to personnel performing these tasks. Procedures for performing these functions shall require precautionary measures necessary to reduce the risk of the personnel involved. Implementation of the procedures intended for the protection of the public and operating and maintenance personnel shall be the responsibility of the owner, supervisor, and the individual worker.

Passengers and operating personnel shall be cautioned or prevented, as required, from transporting objects or materials that may encroach upon limitations of clearance or design live loads.

**8.3.1.1 Signs.**

All signs for instruction for the public shall be bold in design with wording short, simple, and to the point. All such signs shall be prominently placed, and those pertaining to the conveyor operations shall be adequately lighted for night operation. Additional signs, deemed necessary by the owner, may be posted but should not detract attention from any required sign.

Instructions and warnings for the use of the conveyor shall be posted at loading areas and may include the duties and obligations of the passenger.

Entrances to all machinery, operators' and attendants' rooms or compartments shall be posted with a sign to exclude the entry of unauthorized persons.

The sign “Personnel Working on Conveyor - Do Not Start” or similar warning sign shall be placed on the main disconnect switch and at control points for starting the drive unit when persons are working on the conveyor (see 8.1.1.12).

The following signs shall be posted:

a) “Load Here”

b) “Please Remain Standing” (at the loading area)

c) “Unload Here”

d) “Stop Gate” (if applicable)

e) “No Loose Scarves” (at loading area)

“No Loose Clothing”
f) “Alarm will sound” (or similar as required, see 8.3.2.2.1 and 8.3.2.2.3)

g) “Push to stop” (see 8.2.1.7.1)

8.3.1.2 Operational plan for the 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 manufacturer’s specifications and instructions, if any.

8.3.2.1 Personnel.

Conveyors shall be operated by trained and competent personnel, and the owner shall be responsible for their supervision and training. Procedures for loading and unloading passengers including passengers with common adaptive equipment shall be included in the training. One or more persons familiar with emergency procedures shall be on site at all times when the conveyor is in regular operation. All personnel shall practice good housekeeping, with particular emphasis on avoiding the development of any condition that might contribute to personal injury. Personnel shall comply with the operational rules and regulations of the specific conveyor.

8.3.2.1.1 Supervisors.

One individual shall be in responsible charge of all operating personnel and attendants. This individual shall be responsible for the operation, and shall have the authority to deny access to the conveyor to any person who in the supervisor's opinion is not fit or competent to use the conveyor without danger to that person, to others, or to the equipment. The supervisor shall also have the authority to prohibit operation of the conveyor under adverse weather or operational conditions. Although he/she may delegate authority to others, the supervisor has the final responsibility.

8.3.2.1.2 Operators.

An operator shall be in charge of each conveyor. This operator shall be trained and experienced in normal and emergency procedures and such training shall be documented.

8.3.2.1.3 Attendants.

An attendant shall be assigned to particular duties under the direction of the operator. The attendant shall be familiar with operational and emergency procedures pertaining to his/her assignment. This training shall include instruction for observation of any potentially dangerous developments within his/her view and such training shall be documented.

8.3.2.1.4 Reserved.

8.3.2.1.5 First aid.

One or more persons trained to provide first aid/emergency care at the Basic Life Support (BLS) level, including CPR, shall be available at all times when a conveyor is operating and transporting passengers. There shall be ready access to first aid/emergency care supplies and equipment, including provisions for transporting an injured person to an enclosed and, if required, heated shelter.

8.3.2.2 Minimum operating personnel.

A single operator may operate a conveyor provided the following conditions are met:
a) the travel length of the conveyor shall not exceed 400 feet (122 meters);

b) the travel length of the conveyor is clearly visible during operation to the operator including the exit transition belt pinch point if applicable;

c) the operator can start the conveyor while maintaining the surveillance required in condition (b);

d) the restarting of the conveyor following the actuation of an automatic or manual stopping device(s) shall be impossible until clearance is assured and the automatic or manual stopping device(s) have been reset by an authorized person;

e) if television surveillance of the conveyor belt and unattended unloading area is provided, conditions (a) and (b) need not apply;

8.3.2.2.1 Single operator, two conveyors.

If conditions of 8.3.2.2 are met, one operator can operate two (2) conveyors providing the conveyors are no more than 100 feet (33 meters) apart. A keyed switch or other device shall be installed in both conveyors that will only allow authorized personnel to restart the conveyors.

An additional attendant is required if the above conditions are not met. Each attendant shall be furnished with a stopping device and shall be able to communicate with the operator.

8.3.2.2.2 Ski school instructor / operator.

A conveyor may be operated by a Ski School instructor up to 150 feet away from the conveyor provided the following conditions are met:

a) the conveyor is utilized only for Ski School activities.

b) when a manual or automatic stop occurs, an audible alarm will sound for a minimum of 10 seconds. The alarm shall be heard by the operator over ambient noise levels.

c) a keyed switch or other device shall be installed in both conveyors that will only allow authorized personnel to restart the conveyors.

d) a Ski School instructor or operator shall always be within 150 feet of the conveyor and a stop device whenever it is operating.

e) the Ski School instructor / operator operating the conveyor shall be trained as per 8.3.2.3.2.

8.3.2.2.3 Operator at adjacent tramway.

A conveyor may be operated by an operator of an existing adjacent tramway provided:

a) the conveyor can be operated when a qualified operator at the adjacent existing tramway can observe the entire length of the conveyor.

b) the operator of the existing tramway located in the vicinity of the conveyor will automatically be notified by a continuous audible alarm whenever the conveyor is stopped.

c) when a manual or automatic stop occurs, an audible alarm will sound for a minimum of 10 seconds along the conveyor. The alarm shall be heard by the operator over ambient noise levels.

d) a sign will be located at the stop device that indicates an alarm will sound when the stop device is
e) a keyed switch or other device shall be installed that will allow only authorized personnel to restart the conveyor.

8.3.2.3 Duties of operating personnel.

8.3.2.3.1 Supervisor.

The duties of the supervisor shall be as follows:

a) to determine that the conveyor is operational and that all operating personnel are trained, equipped, and fit to perform their duties;

b) to discontinue operations on the conveyor due to physical, weather, personnel, or other reasons;

c) to enforce operational, maintenance, and safety rules.

8.3.2.3.2 Operator.

The duties of the operator shall be as follows:

a) to assume responsible charge of the conveyor,

b) to assign and supervise all attendants on his/her conveyor;

c) to maintain an operational log as required in 8.3.5.1;

d) to advise the supervisor of any condition or occurrence that may adversely affect the safety of the operations.

8.3.2.3.3 Attendant.

The duties of the attendant shall be as follows:

a) to maintain orderly passenger traffic conditions within his/her area of jurisdiction;

b) to advise and assist passengers, as required;

c) to maintain surveillance of his/her area of jurisdiction.

     The operator shall be advised of any unusual or improper occurrences. Should a condition develop in which continued operation might endanger a passenger, the attendant shall stop the conveyor and advise the operator. The operator shall also be advised of changes in weather, ground, or snow surface conditions.

8.3.2.4 Operational procedures.

The required operational procedures as set forth in 8.3.2.4 through 8.3.2.5 shall be supplemented by specific requirements as specified in the designer's operational manual (see 8.1.6.1).

8.3.2.4.1 Control of passengers.

Each conveyor shall have a definite method for marshaling passengers for loading and unloading. Fences and gates and alternate access and/or loading methods may be required to implement the system.
8.3.2.4.2 Daily preoperational inspection.

Prior to transporting passengers, a daily inspection shall be conducted. As a minimum, the inspection shall consist of the following:

a) a visual inspection of each end, and the entire length of the conveyor belt;

b) assurance that the conveyor belt is properly tensioned and operates smoothly;

c) operation of all manual and automatic switches;

d) operation of all braking systems (the designer of the conveyor system shall specify whether the inspection is to take place while the conveyor is moving);

e) operation of the communications system;

f) operation of the conveyor;

g) inspection of the loading and unloading areas and preparing them for ingress and egress of passengers;

h) condition and preparation of the clear surface beyond each exposed edge (see 8.1.1.3.2).

8.3.2.4.3 Access to facilities.

Entrances to all machinery, operators’ and attendants’ rooms and/or compartments shall be locked when not in use. Unattended entrances accessible to the public, which may be left open, shall be equipped with barriers to entry.

8.3.2.5 Operational requirements.

8.3.2.5.1 General.

The owner and supervisor of each conveyor shall review the requirements of 8.1 of this standard to ascertain that original design and installation conditions have not been altered in such a manner as to violate the requirements of the standard.

8.3.2.5.2 Starting.

No conveyor shall be started except at the direction of or following clearance by the operator.

8.3.2.5.3 Reserved

8.3.2.5.4 Stops.

After any stop of a conveyor, the operator shall determine the cause of the stop, and not restart until clearance has been obtained from all attended stations.

8.3.2.5.5 Reserved.

8.3.2.5.6 Hazardous conditions.

No conveyor shall be operated when wind or icing conditions may endanger passengers or equipment or when there is an electrical storm in the immediate vicinity. Should such conditions develop while the conveyor is in operation, loading of passengers shall be terminated, and operation shall be continued only
as long as necessary to discharge all passengers.

8.3.2.5.7 Reserved.

8.3.2.5.8 Termination of daily operation.

Procedures shall be established for terminating daily operations.

8.3.2.5.9 Bypass requirements.

Prior to and during the operation of a bypass circuit that has been installed for the purpose of bypassing normal operating control circuits, the conditions listed in this subclause shall be met in the following order.

a) the condition that the circuit indicated is in default shall be thoroughly inspected to ensure an electrical operating circuit malfunction, rather than the indicated condition actually exists;

b) the bypass shall be authorized only by the conveyor supervisor or his/her representative;

c) when bypass is in operation, the function bypassed shall be under constant, close visual observation;

d) the use of a bypass circuit shall be logged and shall indicate when, who authorized and for what duration a bypass was used;

e) the operator control panel shall indicate that a bypass in use.

8.3.3 Maintenance.

8.3.3.1 General.

Foundation and all structural, mechanical, and electrical components shall be inspected regularly and kept in a state of good repair. The maintenance requirements of the designer (see 8.1.6.2) shall be followed. Maintenance records shall be kept (see 8.3.5.3).

A written schedule for systematic maintenance shall be developed and followed. The schedule shall establish specific frequencies for periodic lubrication, inspection, and adjustment. The schedule shall include, but not be limited to, the following:

a) conveyor belting;

b) drums and rollers;

c) conveyor belt tensioning system;

d) braking systems;

e) electrical control systems;

f) communications systems;

 g) structures.

8.3.4 Inspection.

Each conveyor shall be inspected annually, or after each 2,000 hours of operation, whichever comes first, by a conveyor specialist independent of the owner. The inspection shall verify preservation of the original
design integrity and cover the requirements of this standard for maintenance, operation, required self inspections, and record keeping. Items found either deficient or in noncompliance shall be noted. A report signed by the specialist shall be filed with the owner.

8.3.5 Records.

8.3.5.1 Operational log.

A log shall be maintained for each conveyor. Daily entries shall be made giving the following minimum information:

a) date;

b) names and duty station of operating personnel;

c) operating hours and purpose of operations;

d) temperature, wind, and weather conditions;

e) record of compliance with daily operational inspection including signs, loading and unloading zones;

f) accidents, malfunctions, or abnormal occurrences during operation;

g) signature of the operator.

8.3.5.2 Reserved.

8.3.5.3 Maintenance log.

A signed complete log shall be maintained wherein the actual execution of maintenance work shall be recorded. The log shall state components' serviced, and the condition of the components. A record shall be kept of replacement components.

8.3.6 Passenger conduct.

8.3.6.1 Dexterity and ability.

All passengers who use a conveyor shall be presumed to have sufficient ability and physical dexterity or provide personal assistance to negotiate the conveyor. Each passenger shall maintain control of their speed and course while loading, and unloading and shall remain standing while riding the conveyor.

8.3.6.2 Embarkation and disembarkation.

A passenger shall get on and get off a conveyor at designated areas.

8.3.6.3 Riding.

Passengers, while riding a conveyor, shall not throw or expel therefrom, any object, nor shall any passenger do any act or thing that shall interfere with the operation of the conveyor. Passengers shall not willfully engage in any type of conduct that may contribute to, or cause injury to any other person.

Section 9 Funiculars

This section covers the class of passenger tramways commonly called funiculars. Funicular tramways are defined in C.R.S. 25-5-702(c). The term funicular shall include, but not be limited to, the definition of
Inclined Elevator as defined in Part XVII of the American National Standard/American Society of Mechanical Engineers A17.1 - 1981, Safety Code for Elevators and Escalators, and these devices shall, as a minimum, comply with the rules and regulations set forth herein.

These rules and regulations shall not apply to devices which meet the requirements for Private Residence Incline Lifts as defined in Part XVII of the American National Standard/American Society of Mechanical Engineers A17.1 - 1981, Safety Code for Elevators and Escalators.

NOTE: For the distinction between elevators and funiculars it shall be considered that a funicular is a carrier(s) that is fitted with wheels which are supported (i.e. having a vertical component) and guided by a fixed rail type track and is propelled by means of a haul rope system. An elevator is a carrier(s) which is supported and propelled by a haul rope or other system and is guided by a fixed rail type track.

Funiculars shall be classified in the following manner

<table>
<thead>
<tr>
<th>CLASS</th>
<th>MAX. OPERATING SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>200 FPM</td>
</tr>
<tr>
<td>B</td>
<td>500 FPM</td>
</tr>
<tr>
<td>D</td>
<td>2000 FPM</td>
</tr>
</tbody>
</table>

Funiculars may be operator controlled or fully-automated.

Fully-automated must be approved by the authority having jurisdiction.

9.1 Mechanical and Structural Design and Installation

9.1.1 General

9.1.1.1 Speed.

The maximum carrier speed shall be 2000 feet per minute (10.2 meters per second) providing the following conditions are met:

1. Public access to the guideway is not possible
2. Guideway alignment is straight or incorporates minimum curves as specified under 9.1.3.1.
3. Carriage wheel mounts are spring loaded

Operating speeds must be approved by the Authority Having Jurisdiction and may be more or less than 2000 feet per minute.

Acceleration and speed controls are important considerations in order to avoid passenger discomfort caused by excessive acceleration.

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

Provisions shall be made for an overhauling load so that the system shall always operate at the designated speed within the following tolerances:

<table>
<thead>
<tr>
<th>Class</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B</td>
<td>± 6%</td>
</tr>
<tr>
<td>D</td>
<td>± 3%</td>
</tr>
</tbody>
</table>
The energy developed by the overhauling load shall be dissipated in a satisfactory manner without the use of brakes as listed in section 9.1.2.5

9.1.1.2 Design Passenger Weight.

For purposes of design, a passenger shall be considered as having a weight as shown in Table 9-2

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Design Weight (lbs)</th>
<th>Design Weight (Kilo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>250 lbs</td>
<td>(113 KILO)</td>
</tr>
<tr>
<td>2 - 15</td>
<td>180 lbs</td>
<td>(82 KILO)</td>
</tr>
<tr>
<td>ABOVE 15</td>
<td>150 lbs</td>
<td>(69 KILO)</td>
</tr>
</tbody>
</table>

9.1.1.3 Location.

In selecting the location and alignment of an installation, consideration shall be given to the following items, and to any others that may be particularly pertinent to the lift type and location:

1. Electric power lines and their supports
2. Railways
3. Highways
4. Structures
5. Rock and earth slides, cave-ins and washouts
6. Snow creep avalanches
7. Wind action
8. Icing
9. Ski slopes and trails
10. Rivers and gullies
11. Buried installation, including pipelines
12. Crossing or close proximity to other tramways
13. Control of air space adjacent to the installation
14. Carrier height above ground or surface

9.1.1.4 Guideway Segregation.

Funicular guideways must be designed for right-of-way operation and must provide total track segregation.
from any other vehicular traffic patterns.

9.1.1.5 Clearances.

9.1.1.5.1 Vertical Clearances.

In the areas at the terminals and intermediate stations, a minimum space of 3 feet (0.9 meter) shall exist between the upper edge of the carrier and the roof cover. In the tunnels or other covered areas, a minimum space of 8 inches (20.3 cm) shall exist between the upper outside edge of the carrier and the tunnel wall or any projection. Whenever a passageway is constructed underneath the guideway, appropriate clearances shall be maintained and conspicuously posted.

9.1.1.5.2 Horizontal Clearances.

The minimum horizontal clearance between two passing carriers shall be 8 inches (20.3 cm) experiencing the maximum horizontal movement allowed by the design of the carriers in normal operation, provided that the carriers are enclosed such that a passenger cannot encroach upon the clearance. If such enclosure is not provided, then the minimum horizontal clearance between two passing carriers shall be 4 feet (1.2 meter).

The minimum horizontal clearance between a carrier and any stationary item, except terminal and station loading/unloading platforms, shall be 2 feet (.6 meter) provided that the carrier is enclosed such that a passenger cannot encroach upon the clearance. If such enclosure is not provided, then the minimum horizontal clearance shall be 4 feet (1.2 meter).

In tunnels, a minimum clearance of 8 inches (20 cm) is acceptable on one side of an enclosed car provided there are no exits to that side of the car. Where exit doors are provided, at least a two foot (.6 meter) clearance must be provided on one side of the car.

If emergency doors open out, the minimum clearance shall be measured from a fully-opened door.

The loading/unloading platforms in terminals and stations shall be designed to allow for the unobstructed passage of the carrier during all operating conditions. The maximum opening between the doorstep of the car and the platform shall not exceed four inches (10.2 cm).

9.1.1.6 Structures and Foundations

9.1.1.6.1 General.

All structures and foundations shall be designed and installed in conformance with applicable criteria listed in rule 1.3. Applied design loads shall consider dead, live, snow, wind and dynamic loads due to normal operations and for foreseeable abnormal conditions. Maximum wind velocity and other design limits used for structures under non-operating conditions, and the limiting values intended for operating conditions, shall be specified by the designer.

Wind and snow loading shall be as specified by the local building code official.

9.1.1.6.2 Structures.

Structures are considered to be that which is composed of parts joined together in some definite manner encompassing such items as terminals, machinery supports, buildings, tensioning systems, bridges, guideways, towers or other appurtenances directly related to the operation of the funicular.

Applicable portions of the criteria listed in Rule 1.3 shall apply and steel structures shall be in compliance with the Manual of Steel Construction, Specification for the Design Fabrication and Erection of Structural
Steel for Buildings Including Commentary, 1985 edition. Whenever it may be proposed to depart from the American Institute of Steel Construction Specification, the authority having jurisdiction may grant exceptions.

Structures and components fabricated of material other than steel shall be designed in accordance with the appropriate codes of Rule 1.3 which are applicable.

9.1.1.6.3 Foundations.

In determining the resistance of earth to motion of the foundation, the sub-soil conditions at the site shall be considered, including any buoyancy due to groundwater that may be present. If the resistance of the soil is not practically determinable, the foundation or anchorage should be designed as a gravity anchor, using a coefficient of friction appropriate to the general character of the soil. Foundations on rock shall be firmly anchored to solid rock unless designed as gravity foundations. The design of foundations shall consider the freezing and thawing of the soil.

With any set of applied design loadings, the factor of resistance of the foundation to overturning and to sliding, concurrently, shall be equal to or greater than 2, unless wind or earthquake are included simultaneously, then the factor of resistance shall be 1.5.

9.1.2 Terminals and Stations

9.1.2.1 Power units.

9.1.2.1.1 Fuel tanks for combustion engines.

This rule is superseded by CPTSB Section 11. Please refer to CPTSB Rules and Regulations Section 11, Fuel Handling.

9.1.2.1.2 Main power unit.

All prime movers shall be net rated to handle all loading conditions including starting, continuous loading, and deceleration under the most unfavorable conditions.

Where manual multispeed transmissions are used on either the prime mover or auxiliary power unit, gears shall not be shifted when the funicular is moving, and provisions shall be made to prevent shifting.

Where reverse capability is provided on the prime mover or auxiliary power unit for any funicular, provisions shall also be made to prevent accidentally shifting into reverse whenever the funicular is operating.

9.1.2.1.3 Auxiliary power unit.

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

9.1.2.2 Mechanical Power Transmission Equipment.

All speed reducers, gearing, chains and belts shall be capable of transmitting the horsepower and torque to start a funicular under the most unfavorable design loading conditions and without exceeding design rating. They shall have a service factor appropriate for the application.

9.1.2.3 Bearings, Clutches and Couplings.

9.1.2.3.1 Power Transmission Components.
Bearings, clutches, and couplings shall be selected on the basis of the manufacturer's published data for
the particular use. Provision shall be made for adjustment and lubrication of all bearings, clutches, and
couplings when required.

9.1.2.3.2 Shaft Design.

All power transmission shafts shall be designed in accordance with the American National Standard for

For the purpose of using this standard, shafts for tramways shall have the following minimum factors:

\[
\begin{align*}
\text{kc} & \leq 753 \\
\text{kg} & = 0.6 \text{ for cantilevered terminal sheave shafts} \\
\text{F.S.} & \geq 2.0 \\
\text{kg} & = 1.0 \text{ for all other shafts}
\end{align*}
\]

The design torque of a shaft shall be the maximum stress to which the shaft will be subjected under all
conditions of acceleration and deceleration.

A qualified engineer shall determine that the bending and torsional deflections of the shaft do not exceed
the limits of the power transmission components to which the shaft is attached. In addition, a qualified
engineer shall determine that the operating speed of the shaft is within acceptable limits for dynamic
stability.

Universal joint shafts (universal shafts) shall be selected in accordance with the manufacturers published
data. All unsupported universal joint shafts shall be constrained for the purpose of retaining the shaft in
the event of a universal joint or shaft failure.

9.1.2.5 Brakes.

Each funicular drive system shall have the two independent, friction brake systems. These brakes shall
be designed in such a way that failure of one system will not impair the function of the other system. Each
brake system shall be designed to stop and hold the funicular under the most unfavorable design loading
conditions.

Each brake shall be designed for a minimum average horizontal deceleration rate of 2 feet (0.6 meter) per
second squared under the most unfavorable condition.

The maximum horizontal deceleration rate of the carrier under any combination of service/emergency
brake application shall not exceed the following rates under any conditions including power loss:

- Standing passengers: 4 ft./sec*sec
- Sitting passengers: 7 ft./sec*sec

All brakes shall be fail safe with the braking force directly applied by a preloaded system of springs,
weights, and a counter-acting system to keep the brake open.

9.1.2.5.1 Service Brake.

The service brake shall be applied to a drive shaft so that there is no clutch, chain, or similar device,
between the brake and the drive sheave.

Application of the service brake shall activate a normal stop.
9.1.2.5.2 Emergency Brake.

The emergency brake shall be applied to the main drive sheave.

Activation of the emergency brake must also be possible by a second independent system readily available to the operator.

Application of the emergency brake shall activate an emergency stop.

9.1.2.5.3 Overspeed Device

A mechanical type overspeed device shall be provided to apply the emergency brake in case the funicular exceeds the rated speed by more than 15 percent.

The automatic mechanical overspeed device shall comply with the following requirements:

1. Must be mounted on main drive sheave
2. Must operate in both directions
3. Must be independent of electrical circuits
4. Must measure speed within ± 5% accuracy
5. Must not reset automatically

9.1.2.6 Location of Machinery

9.1.2.6.1 General.

Moving machine parts that normally may be in reach of personnel shall be fitted with safety guards conforming to American National Standard Safety Standard for Mechanical Power Transmission Apparatus, ANSI B15.1-1972.

9.1.2.6.2 Machinery Not Housed in a Machine Room.

Provisions shall be made to keep the public away from the machinery. All power units, all components of the drive train, and all safety devices, such as backstops, brakes, relays, and the like, shall be protected from the weather.

9.1.2.6.3 Machinery Housed in a Machine Room.

The machine room shall be well-ventilated. It shall have a permanently installed lighting system, adequate for proper machinery maintenance and safety of operating personnel. The arrangement of the machinery shall permit proper maintenance. A door with a suitable lock shall be provided, and the design shall keep the public away from the machinery. When a passageway is provided between machines or machinery and walls, a minimum passageway width of 18 inches (46 cm) shall be maintained. Means shall be provided to heat the machine room unless the designer or manufacturer certifies that the drive machinery is rated for operation in an unheated room.

9.1.2.7 Sheaves in Terminals and Stations

9.1.2.7.1 General.

All sheaves, including their mountings and frames, shall be designed to withstand static and dynamic
loads. Sheave bearings and mountings shall be selected, designed, and installed in accordance with the recommendations of the manufacturer of the bearings.

When unlined sheave grooves are used for wire rope, they should be V-shaped and shall have rounded bottoms with a radius equal to approximately 55% of the rope diameter.

When lined sheave grooves are used, the allowable bearing pressures of the liner material shall not be exceeded.

9.1.2.7.2 Haul Rope Terminal Sheaves (Bull Wheels and Deflection Sheaves).

Haul rope terminal sheave frames shall be designed to retain the rope in the event of the failure of a 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 haul rope terminal sheaves that act as driving, braking or deceleration 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 1-1/2 times the rope diameter (measured from the bottom of the rope groove) shall be deemed adequate for retention.

In areas where icing conditions exist, ice scrapers shall be mounted on all haul rope terminal sheaves.

Haul rope terminal sheaves that act as driving, braking, or deviation sheaves shall be so designed that 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:

<table>
<thead>
<tr>
<th>Sheave Liner</th>
<th>Coefficient of Friction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel of cast iron grooves</td>
<td>0.070</td>
</tr>
<tr>
<td>Leather</td>
<td>0.150</td>
</tr>
<tr>
<td>Rubber, neoprene, or others</td>
<td>0.205</td>
</tr>
</tbody>
</table>

9.1.2.7.3 Counterweight Rope Sheave.

The minimum diameters for these sheaves shall be indicated in Table 9-4.

Condition A is applicable where rope bending around sheaves is of major importance.

Condition B is applicable where rope bending around sheaves is important, but some sacrifice in rope life is acceptable to achieve reduction in weight and economy in design.

Condition C is applicable to sheaves that should not rotate due to any tension sheave movement but should rotate only due to counterweight adjustment.

Provisions shall be made to assure that all counterweight sheaves rotate freely.

<table>
<thead>
<tr>
<th>Rope Type</th>
<th>Sheave Diameter</th>
<th>Condition A</th>
<th>Condition B</th>
<th>Condition C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 X 7</td>
<td>72d</td>
<td>42d</td>
<td>24d</td>
<td></td>
</tr>
</tbody>
</table>
9.1.2.7.4 Haul Rope Sheaves and Mounts

Haul rope sheaves shall be located between the guideway rails and spaced to prevent the haul rope from contacting members of the guideway.

In the event of a deropement from a sheave, provision shall be made for the rope to be returned to the sheave groove as a carrier passes over the sheave.

Sheave mounts must be installed for proper guidance of the rope along the guideway.

9.1.2.8 Counterweight and Tensioning Systems

9.1.2.8.1 Counterweights.

Counterweights or other suitable devices shall be provided to determine and regulate the tension of all haul ropes whenever necessary. Counterweights, when used, shall be arranged to move freely up and down. Enclosures for counterweights shall be provided where necessary to prevent snow or ice from accumulating under and around the counterweights and interfering with their free movement. As a minimum, 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.

The counterweight, or other suitable device, shall have sufficient travel to take care of all normal operating changes in loading and temperature. Counterweights if used, shall determine and regulate the tension during all operating periods.

Friction and other forces developed in the tensioning system composed of the movable carriage, counterweight sheaves, reeving, and guide system shall be included in calculating haul rope tension for all conditions of loading. Carriage and counterweight movement shall be evident in normal operation or the resistance to movement shall be measured and its magnitude approved by the engineer responsible for design.

9.1.2.8.2 Counterweight Ropes.

Counterweight ropes shall have a minimum factor of safety of 6, when new. The factor of safety is equal to the nominal breaking strength of the rope (see 7.1.3) divided by the maximum static design tension. 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.

Counterweight ropes shall be adjusted so that the counterweight will reach the end of its travel before the attached tension sheave carriage comes within 6 inches (15 cm) of the end of its travel.

See 7.3 for additional requirements for wire ropes.

9.1.2.8.3 Anchoring Devices.

All wire rope anchoring end connections shall be above finished grade.
Sections of rope bent around thimbles, sheaves, or other anchorage devices not meeting the minimum diameters specified by Condition C in 9.1.2.7.3, or permanently deformed or damaged sections, shall not be reused as a part of the section under load.

9.1.2.8.4 Tension Sheave Carriages.

The available travel of the tension sheave and carriage shall be adequate for the maximum limits of motion under normal operation. For all carriage arrangements other than those whose motion is vertical, the mounting that travels under the action of the counterweight shall be supported on rigid straight rails by means of wheels. For carriage arrangements with vertical motion, guides shall be provided for the carriages.

9.1.2.9 Loading and Unloading Areas.

Platforms shall be provided with sufficient space to accommodate passengers waiting to embark and passengers disembarking the carriers. Railing shall be provided to guide passengers safely to and from the carriers. The platforms should be as level as possible.

9.1.2.10 Provisions for Operating Personnel.

Operator and attendant stations shall be located to provide visual surveillance of the line and station. 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: (1) the communications and controls required of the station, (2) the operating instructions and emergency procedures, and (3) 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.

The operator shall be located where he/she can observe the tramway in operation. The operator's controls and communicating devices shall be within reach without leaving his/her position.

9.1.3 Line Structures

9.1.3.1 Guideway.

The design of the support structure and foundation shall be in accordance with the requirements of 9.1.1.6.

Means shall be provided for ready access from the ground to the guideway. This requirement will be fulfilled if the guideway structure is safe to climb. Otherwise, means such as permanent ladders or light, portable ladders shall be provided. The latter, if used, shall be in at least sufficient quantity to be available at each point where attendants are stationed.

9.1.3.2 Width of Clearing.

The clearing shall be wide enough to prevent interference with the funicular system by adjacent vegetation. Such clearings shall be protected, if necessary, to avoid washouts, avalanches, snow creep, or other natural hazards that might endanger the installation. Potentially dangerous trees shall be cleared far enough back to avoid their falling on the funicular guideway. In no case shall trees or vegetation extend within 5 feet (1.5 meter) of any portion of the guideway under normal operating conditions.

9.1.3.3 Rails.

Guideways and terminals shall be arranged so as to keep the rails securely fastened to the guideway and terminal structure under the most adverse operating and non operating conditions. These provisions shall not interfere with any carrier track brake operation.
9.1.3.4 **Guideway Curves.**

Horizontal curves shall have a minimum radius of:

\[ r = 1.85 \left( v^2 \right) \]  
\[ r = 6 \left( v^2 \right) \]

v feet per second  
v meters per second

Vertical curves of the guideway are permissible provided minimum/maximum sheave loading limits are satisfied.

9.1.3.5 **Guideway Cross-overs.**

Where guideway cross-overs are required for the passage of the carriers at mid-point, minimum clearances between the carriers in accordance with 9.1.1.5.2 shall be maintained for a length equal to or greater than the length of a carrier or line of carriers.

9.1.3.6 **End Buffers.**

End-of-track buffers shall be provided at each end of each guideway lane to prevent carriers from impacting the terminal structure in the event of drive brake failures. These buffers shall be designed to be capable of stopping a fully loaded carrier travelling at 400 feet per minute (2 meters per second), at a deceleration rate not to exceed 7 feet per second.

9.1.4 **Line Equipment**

9.1.4.1 **Haul Rope.**

See Section 7 for basic wire rope design and installation requirements.

9.1.4.1.1 **Factor of Safety.**

The haul rope shall have a minimum dynamic factor of safety of 4 when new. The dynamic factor of safety is equal to the nominal breaking strength (see 7.1.3) divided by the computed maximum dynamic tension caused by the composite loads due the tensioning system, friction, acceleration/deceleration and braking loads, and grade.

9.1.4.1.2 **Minimum Rope Tension.**

Minimum rope tension shall be greater than the actual minimum rope tension responsible for the automatic triggering of the track brake. If necessary, a counterrope with gravity type counterweights shall be installed.

9.1.4.2 **Haul Rope Sheaves and Mounts.**

The diameter of a haul rope sheave shall not be less than 10 times the nominal diameter of the haul rope for metallic sheaves or 8 times for sheaves with elastomer treads.

9.1.4.2.1 **Maximum Allowable Sheave Load.**

The maximum allowable load per sheave should be determined by the tramway designer.

9.1.4.2.2 **Sheave Design.**

Sheave flanges shall be as deep as possible, considering other features of the system. At the same time,
rope attachments on the carriers 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.

Suitable guards of sufficient strength to resist the lateral forces caused by deropement shall be installed to prevent the rope from falling into a dangerous position within the guideway structure.

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

Suitable deropement detection devices shall be installed and maintained that will stop the funicular in case of deropement. They shall be installed on funiculars at horizontal curves or other locations where a deropement may result in a dangerous condition. Sheave and mounting frames shall be aligned and held in the plane of the rope.

9.1.5 Carriers.

9.1.5.1 General.

Carriers may be either of the open or enclosed type.

The carriers and carrier components shall be designed in accordance with accepted design practices.

The weight of the loaded carrier and haulage rope reactions shall be distributed to carriage wheels so that the load on any wheel shall not exceed that recommended for the wheel material for the wheel diameter selected.

In areas where icing conditions may exist, the carrier shall be equipped with ice scraping devices that cannot contact the rail under normal anticipated operating conditions.

9.1.5.2 Capacity.

The maximum design load capacity of each carrier in pounds and kilograms shall be posted conspicuously in each carrier and at each loading area.

9.1.5.3 Carriage Attachments.

Haul rope attachments to carriages shall comply with the requirements of Section 7.3.2. Use of a type of attachment other than those listed in this section shall be approved by the authority having jurisdiction. The qualified engineer shall establish the criteria and frequency for periodic inspection of the haul rope attachment. In the event detachable grips are used they shall comply with the requirements of Section 3.1.4.3.

9.1.5.4 Carrier brakes.

Each carrier shall be equipped with a braking system which shall be capable of stopping and holding a fully loaded carrier on the maximum gradient of the guideway. The application of this brake shall be automatic in the event of:

1. a haul rope failure
2. 30% overspeed

Class D funiculars must be equipped with a track brake.
The braking system shall have a maximum deceleration rate of 7 feet per second squared.

The braking system shall not cause any excessive discomfort to passengers when applied in a flat section of the guideway. In case of excessive deceleration, the brake force shall be regulated as a function of deceleration.

The design coefficient of friction for the design of the clamping force mechanism of the track brake shall not exceed 0.08.

The design coefficient of friction for the design of the carrier and carriage part shall not exceed 0.24.

The track brake may be of the disk or drum type acting on truck wheels or be omitted if the profile of the funicular guideway is such that an uncontrolled carrier will not reach abnormal speeds or crash into a terminal.

9.1.5.5 Cabin design.

9.1.5.5.1 Structural Design.

Cabin structures shall be designed in accordance with accepted standard practices with regard to loads, rigidity, vibration and tipping stability.

Structural parts shall be designed so that application of worst case loads involving cabin weight, live load and wind loads multiplied by a safety factor of 3.0 does not exceed the material yield strength at any point. In addition, the cabin shall withstand 2.0 with respect to yield, times the special loadings resulting from the braking force and vehicle end buffer impact as outlined in 9.1.3.6.

All structural members shall be protected against corrosion.

For multi-car operation, the carrier coupling shall be of a type designed to resist all forces associated with the loads imposed upon the carrier carriage. The system shall be designed to maintain a safe distance between carriers under all adverse conditions, including a collision with the end-of-track buffers.

9.1.5.5.2 Allowable Occupancy.

Cabin floor space available per compartment to standing passengers shall be not less than 2.5 square feet (0.23 square meter) per person for the first 15 passengers and 2.0 square feet (0.19 square meter) per passenger thereafter. Standing passengers must have access to either vertical stanchions or hand supports attached to seat backs, walls or roofs.

Where seats are required, a minimum space allocation of 3.0 square feet (0.28 meter) shall be provided.

9.1.5.5.3 Materials.

All carrier glazing and windows shall be of tempered glass or shatterproof material.

Interior and exterior materials shall be in accordance with accepted design practices with respect to flammability.

9.1.5.5.4 Doors.

Each door shall be provided with a lock located in such a manner that it can be locked and unlocked only by authorized persons or by automatic means.

Automatic doors must not exert a closing force in excess of 30 pounds at any point in its travel. All
automatic doors shall be equipped with “touch stop” edges that will stop and reopen the door in the event that it is obstructed while closing.

All doors shall be equipped with a mechanism accessible from the carrier exterior to manually unlock the doors without carrier power.

Swing type doors may only be opened to the outside.

9.1.5.5 Emergency Exits.

All enclosed carriers shall be have an emergency exit.

9.1.5.6 Ventilation.

Enclosed carriers shall be ventilated.

9.1.5.6 Evacuation.

Means shall be provided for the evacuation of passengers from carriers to either terminal along the entire length of the guideway.

9.2 Electrical Design and Installation

(revised 5-14-85)

9.2.1 Applicable Codes.


9.2.2 Location.

All electrical power transmission wiring located near, or crossing over or under a funicular guideway shall comply with the applicable requirements of ANSI C2-1981. For the purpose of ANSI C2-1981, funiculares shall be considered as trains.

Signal, communication, and control circuits may be supported on towers or standards above or adjacent to the funicular. Voltage on overhead circuits shall be limited to 50 volts with the exception of intermittent ring-down circuits for telephone systems.

9.2.3 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.

9.2.4 Wiring.

All wiring shall be in accordance with the designer's specifications and applicable codes.

9.2.4.1 Communication Wiring.

All communication wiring and systems are excluded from the requirements in Article 725-5 of ANSI/NFPA
9.2.4.2 Insulation.

All control wiring is excepted from the requirements of Article 725-16 of ANSI/NFPA 70-1981. The designer shall specify conductor size, type, and insulation suitable for the electrical and mechanical requirements of the application.

9.2.5 Grounding.

9.2.5.1 Structures.

All structures shall be grounded as per ANSI/NFPA 70-1981, section 250.

9.2.5.2 Haul Rope Grounding.

Grounding sheaves or equivalent means shall be provided at one location for the purpose of grounding of haul ropes, as applicable, for static electrical discharge.

Where an isolated or insulated haul rope is incorporated in the operating circuitry, grounding is not required. The design of operating circuitry should be such that a static charge will not build up on the rope.

Class D funiculars require electrical supervision of the haul rope for ground fault shut-down.

9.2.5.3 Lightning Protection.

If lightning protection is provided, it shall comply with the American National Standard Lightning Protection Code, ANSI/NFPA 78-1980.

9.2.6 Operating Control and Safety Circuits.

As used in this standard, operating control circuits are distinguished from safety circuits.

9.2.6.1 Operating Control Circuit.

An operating control circuit shall be defined as one which, if the circuitry fails, cannot lead to a dangerous situation.

9.2.6.2 Safety circuit.

A safety circuit shall be defined as one which, if the circuitry fails, may lead to a dangerous situation. A safety circuit must either be FAIL SAFE or have CHECKED REDUNDANCE.

The emergency stop shall have priority over all other control stops or commands.

9.2.6.2.1 Fail Safe Definition.

The hardware components utilized in any control system may have certain types of failures that occur so rarely that they may be disregarded in the safety analysis. These same hardware components have other failures with probabilities of occurrence so high that they must not be disregarded. The general approach to fail safe circuit design is to activate a potentially dangerous function utilizing the state into which the device will revert when the low probability failure occurs. Conversely, the state into which the component will revert upon the occurrence of a high probability failure must result in a safe condition.
9.2.6.2 Checked Redundance Definition.

Components which lack a low probability failure mode may be utilized by duplicating the component and/or function and arranging the circuit such that two failures must occur to lead to a dangerous situation. Inherent with this approach is the requirement for a cross-checking of duplicating components/functions on a periodic basis.

9.2.6.3 Responsibility for Identifying Safety Circuits.

It shall be the responsibility of the tramway engineer to properly identify those functions which require a safety circuit.

9.2.6.4 Minimum Required Safety Functions.

As a minimum, the following functions shall be monitored by a safety circuit:

1. Car overspeed and acceleration
2. Terminal station overtravel
3. Terminal entrance supervision
4. Counterweight beyond position limits
5. Drive disable in stations (fully automatic only)
6. If the car is equipped with automatically operated doors, then they must be closed before departure and while traveling.

9.2.6.5 Switches.

All control switches shall be conspicuously and permanently marked with the proper function.

All stop switches shall be of the manually reset type and be positively opened mechanically and their opening shall not be dependent upon springs.

9.2.6.6 Manual Controls.

As a minimum, there shall be a manual stop device at each attendant/operator station main control panel, and machine room. These manual stop devices shall be red.

These switches shall be of the manual reset type only.

9.2.7 Electrical Prime Mover and Power Circuits

9.2.7.1 Electrical Prime Mover.

Funicular systems equipped with electrical prime movers (electrical motors) shall have phase loss protection on all power phases.

9.2.7.2 DC (Direct Current)-Powered Drives.

All DC electronic speed regulated drives and DC-powered electric motors shall shut down in the event of:

1. Field loss
2. Speed feedback loss

3. Overspeed

4. Overcurrent

9.2.8 Lighting.

For nighttime operation, funiculars shall be provided with lighted facilities.

9.2.8.1 Normal Operation.

Lights shall be located at all loading/unloading platforms and stations. The track or guideway need not be illuminated. The vehicles shall be equipped with a headlight which is functional in the direction of travel.

9.2.8.2 Emergency Lighting.

Emergency lighting shall be provided in the event of electric power failure at the following locations:

1. Unloading platforms at stations, including means of egress from the platforms.

2. Interiors of all carriers or cabins

3. Emergency exits of all carriers or cabins

9.2.8.3 Illumination level for Normal Operations.

Lights shall be located in a manner as to provide generally uniform illumination. The following shall be considered as minimum illumination levels:

<table>
<thead>
<tr>
<th></th>
<th>Foot Candles</th>
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<tbody>
<tr>
<td>Cars</td>
<td>25</td>
</tr>
<tr>
<td>Platforms</td>
<td>25</td>
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</table>

The illumination level shall be measured at floor level.

9.2.9 Communication.

A permanently installed two-way voice communication system shall be provided between the prime mover and auxiliary power unit control point, drive machinery building, loading stations and unloading stations. The power for this system shall be independent of the primary power and the communication system shall be functional and audible during a power failure.

Audible indicators (bells, etc.) shall be audible over all ambient noise levels, and visual indicators shall be visible even in bright sunlight.

9.3 Operation, Maintenance, and Inspections

THIS SUBSECTION COVERS THE REQUIREMENTS FOR OPERATION, MAINTENANCE AND PERIODIC INSPECTIONS OF THE FUNICULAR SYSTEMS.

9.3.1 Personnel

9.3.1.1 General.
Funiculars shall be operated by trained and competent personnel, and the licensee shall be responsible for their supervision and training. One or more persons familiar with emergency procedures shall be on site at all times when the facility is in operation. Personnel shall comply with the operational rules and safety regulations of the specific installation.

9.3.1.2 Definitions and Duties of Operating Personnel

9.3.1.2.1 Supervisor.

A supervisor is the individual in responsible charge of all operating personnel and attendants. This individual shall be responsible for safe operation, and shall have the authority to deny access to the funicular to any person who, in the supervisor's opinion, is not fit or competent to use the funicular without danger to that person, to others, or to the equipment. The supervisor shall also have the authority to prohibit operation of the system under adverse weather or operational conditions. Although he/she may delegate authority to others, the supervisor has the final responsibility.

9.3.1.2.2 Operator.

An operator is the individual in charge of each funicular. The operator shall be trained and experienced in normal operational and emergency procedures.

9.3.1.2.3 Attendant.

An attendant is an individual assigned to particular duties under direction of the operator. The attendant shall be familiar with operational and emergency procedures pertaining to his/her assignment.

9.3.1.2.4 Conductor.

A conductor is an individual trained for duty in the carrier. The conductor shall be familiar with load limits and applicable safety regulations, well-versed in the use of any safety switches under his/her control and thoroughly drilled in the use of emergency evacuation equipment and procedures.

9.3.1.3 Minimum Operating Personnel

The following personnel are the minimum that shall be required;

1. An operator shall be in charge of the funicular unless the system meets the requirements of an enclosed, fully-automated funicular.

2. An attendant shall be on duty at each loading/unloading platform or station unless automatic or locked station gates are provided.

3. A conductor shall be required in each carrier when the design or operational plan so requires.

4. A conductor may also serve as a station attendant when adequate manually locked station gates are provided and the requirements of 9.3.3.2 are complied with.

9.3.2 Control of Passengers

9.3.2.1 Passenger Control.

Each funicular shall have a definite method for marshalling passengers for safe loading and unloading. Fences and gates may be required to implement these procedures.

9.3.2.2 Signs.
All signs shall be bold in design and the wording shall be short, simple and to the point. Signs shall be adequately lighted for night operation.

1. The following information shall be prominently posted on the interior of each carrier and at each loading station:
   (a) the maximum capacity of each carrier in pounds and kilograms and number of passengers.
   (b) Instructions for emergency procedures.

9.3.3 Operational Procedures

9.3.3.1 Starting.

While operating for the public, no funicular shall be started except from the designated operator's station. Capability of starting from other stations may be provided for maintenance operation or for fully automatic operation.

9.3.3.2 Stops.

After any unscheduled stop of a funicular, the operator shall determine the cause of the stop and take appropriate action before restarting the funicular.

9.3.3.3 Precautionary Shutdown.

Each installation shall prepare a plan based on the area's operational experience and the designer's design criteria to limit or discontinue operations in the event of unfavorable weather conditions.

If necessary under the predetermined criteria, wind and lightning monitors shall be installed in appropriate locations and properly monitored by operating personnel.

9.3.3.4 Equipment Damage.

In the event equipment is damaged in service, the funicular shall not be restarted except at the direction of the supervisor.

9.3.4 Daily Inspection.

A daily inspection shall be made prior to the operation of any funicular. If the funicular is in continuous operation an inspection shall be made at least once every 24 hours.

As a minimum, the inspection shall consist of the following:

1. A visual inspection of each terminal area and the condition of the guideway, ropes and carriers.

2. Assurance that tension carriages, counterweights, or other tensioning devices are functional, and that these devices have adequate travel and clearance.

3. Operation of all manual switches in terminals, stations, and loading platforms.

4. Operation of the service and emergency brake.

5. Operation of the communication systems.

6. Verification of available fuel for internal combustion engines.
7. Operation of mechanical features of the carriers (does not include car braking systems).

8. Operation of the electronic control functions.

9. Verification of the circuit integrity of the automatic stop switches.

9.3.4.1 Termination of Daily Operations.

Procedures shall be established for terminating daily operations. Loading ramps shall be closed during off-hours and so marked.

9.3.5 Evacuation and Emergency Procedures

An emergency action plan shall be prepared for each installation and filed with and approved by the authority having jurisdiction.

The plan shall outline actions in the event of:

1. passenger evacuation
2. first aid
3. fire
4. rescue
5. equipment and power failure

9.3.6 Maintenance

9.3.6.1 General.

Foundations and all structural, mechanical, and electrical components shall be regularly inspected and properly maintained at all times. The maintenance requirements and procedures outlined in the designer's operating and maintenance manuals shall be closely followed.

9.3.6.2 Systematic Schedule.

A written systematic schedule for maintenance shall be developed and followed. The schedule shall establish specific frequencies for periodic lubrication, inspection, testing, and adjustments as required by the designer. This schedule and documentation of work completed shall be entered in the maintenance manual.

9.3.7 Tests and Inspections

9.3.7.1 Annual inspection.

Each installation shall be inspected annually as per 22.3.

9.3.7.2 Wire Rope and Strand Inspection.

Wire rope shall be inspected as per 7.4.1 and 7.4.2.

9.3.7.3 Acceptance Tests.
Before a new, relocated or modified funicular is operated for the public, it shall be thoroughly inspected by a qualified Professional Engineer to verify compliance with the plans and specifications of the designer. The designer or manufacturer shall propose and submit for approval an acceptance test procedure to the authority having jurisdiction.

The results of these tests and inspections shall be properly documented in a report and kept with other required logs.

9.3.7.4 Component and System Testing.

All critical components and system shall be identified by the designer. The designer shall specify the method and frequency at which these critical components shall be tested.

9.3.8 Records

9.3.8.1 Operational Log.

A log shall be maintained for each funicular. Daily entries shall be made, giving the following minimum information:

1. date
2. names and duty stations of operating personnel
3. operating hours and purpose of operations
4. temperature, wind and weather conditions
5. record of compliance with the daily operational inspection
6. position and condition of the tension carriage, counterweights or other tensioning devices
7. malfunctions and abnormal occurrences during operation
8. unscheduled stoppages with duration of stop and cause
9. signature of operator

9.3.8.2 Wire Rope and Cable Log.

A log book shall be maintained for each funicular, giving the following information on each rope and cable:

1. approved specification
2. copy of certified test reports
3. date installed
4. splicing certificate for each splice or laid in strand
5. record of lubrication, including type of lubricant and date applied
6. report of wire rope and cable inspections
7. report of accidents or injury to the rope
8.  documentation of end attachment

9.3.9  Manuals

9.3.9.1  Operational Manual.

The manufacturer of each funicular or a qualified professional engineer 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.

9.3.9.2  Maintenance Manual.

The manufacturer of each funicular or a qualified professional engineer shall prepare a maintenance manual for each installation. The manual shall describe recommended maintenance and routine inspection procedures, including:

1.  types of lubricants required and frequency of application
2.  definitions and measurements to determine excessive wear
3.  recommended frequency of service for specific components
4.  recommended type and frequency of periodic inspections

9.3.10  Fire Protection

9.3.10.1  Fire Extinguishers.

Fire extinguishers shall be located at all loading/unloading stations, in each fully-enclosed carrier, in the operator's stations, and in the motor rooms.

Section 10  Reserved

Section 11  Fuel handling

11.1  Definitions.

11.1.1  Gasoline.

A class I liquid.

11.1.2  Diesel.

A class II liquid.

11.1.3  Flue gas temperatures.

The temperatures of the flue products at the point or points of passing close to or through combustible materials, whichever is applicable.

11.1.4  Tank, day.

A fuel tank, located inside a structure, that provides fuel to an engine.

11.1.5  Tank, integral.
A fuel tank furnished by the engine or lift manufacturer and mounted on the engine.

*Exception: The aerial lift manufacturer or a qualified engineer may supply an integral tank to be mounted on the engine or day tank for mounting on a combined drive tension carriage or an overhead fixed drive terminal.*

11.1.6 Tank, supply.

A separate fuel tank for supplying fuel to the engine or to a day or integral tank.

11.1.7 Atmospheric storage tank.

A storage tank that has been designed to operate at pressures from atmospheric through 0.5 psig measured at the top of the tank. All fuel tanks shall be atmospheric tanks.

11.1.8 Engines used for tramway evacuation only.

An engine utilized for the evacuation of a tramway that, once engaged, passenger loading ceases and the tramway operation is shutdown when the tramway has been unloaded.

11.1.9 Engines used for continuous tramway operation.

An engine utilized for normal tramway operation.

11.2 Engines.

11.2.1 Detached structures.

Detached structures, within the tramway's air space, must be of noncombustible or fire-resistive construction. If a combustion engine is enclosed within a detached structure, provisions shall be made for adequate ventilation to prevent a hazardous accumulation of flammable vapors or gasses, both when the engine is operating or shut down.

If a combustion engine is not enclosed within a detached structure, the requirements of 2.1.1.2.2, 3.1.1.2.2, 4.1.1.2.2, 5.1.1.2.5, and 6.1.1.2.5 Air space requirement shall apply to the structure and its contents.

11.2.2 Engine rooms.

Engine rooms located within structures shall have interior walls, floors, and ceilings of at least 1 hour fire-resistant rating. One layer on walls and two layers on ceiling of properly installed 5/8” Type X gypsum wallboard, or its equivalent, covering all combustible wall and ceiling members would meet this requirement.

These rooms shall have provisions for adequate ventilation to prevent a hazardous accumulation of flammable vapors or gases when the engine is either operating or shut down (see 11.2.4).

Openings in the engine room that open into other mixed occupancy sections of the structure shall be provided with automatic or self-closing fire doors or dampers to contain a fire to the engine room.

11.2.3 Engines.

Engines shall be situated so that they are readily accessible for maintenance, repair and fire fighting.

11.2.4 Air supply.
Provisions shall be made to supply sufficient air for combustion, proper cooling, and adequate ventilation. The air supply requirements will vary with the types and sizes of engines, the driven equipment and other air-consuming equipment within the engine room.

11.2.5 Flammable materials.

Flammable materials except the engine's appurtenances shall not be located in a room housing an engine, unless contained in a UL listed cabinet approved for the purpose.

11.2.6 Open flames.

Gasoline, natural gas or liquid phase LP-gas fueled engines shall not be installed in rooms or locations containing fired equipment or open flames.

11.2.7 Engine support.

Engines shall be supported on firm foundations or suitable steel framework that is properly secured.

11.3 Electrical installations.

11.3.1 Electrical installations.

Electrical installations in rooms containing engines shall comply with NFPA 70, National Electrical Code.

11.3.2 Hazardous locations.

Engine rooms or other locations shall not be classified as hazardous locations as defined in Article 500 of the NFPA 70, National Electric code, solely by reason of the engine fuel.

11.4 Engine protective devices.

11.4.1 Engines used for tramway evacuation only.

Engines used only for evacuation purposes shall be equipped with the following devices:

(a) An automatic engine shutdown device for low lubricating oil pressure or, in the case of a splash lubricated engine, for low oil level;

   **Exception: All engines 50 HP or less.**

(b) All engines must be wired into the emergency stop circuit.

(c) If the evacuation engine can drive the rope to exceed 100% of design rope speed under the most unfavorable loading conditions, one of the following shall be required:

   (i) The rope speed shall be continuously monitored while in operation.

   (ii) Overspeed Device. The overspeed device shall initiate an engine shutdown if the line speed exceeds the design speed by more than 10%.

11.4.2 Engines used for continuous tramway operation.

Engines intended for continuous use shall have the devices specified in 11.4.1 (a) and (b) and the following additional protection devices shall also be provided:
(a) An automatic engine shutdown device for engine over speed which shall initiate an engine shutdown when the lift speed exceeds the design speed by 10%;

(b) An automatic engine shutdown device for high coolant temperature.

(c) Engine Governor. The governor shall limit the engine speed to a maximum of 100% of the design rope speed.

11.5 Fuel supply.

11.5.1 Structural members used as fuel tanks.

Structural members shall not be used as fuel tanks or contain fuel tanks.

11.5.2 Fuel tanks for combustion engines.

Fuel tanks shall have adequate capacity to permit uninterrupted operation during the normal operation period.

11.5.3 Integral or day tanks.

Integral or day tanks shall be of steel or aluminum with welded or brazed joints.

11.5.4 Outside aboveground or underground fuel supply tanks.

Outside aboveground or underground fuel supply tanks, including those incorporating secondary containment, shall be built in accordance with recognized standards of design or approved equivalents. Tanks shall be built, installed, and used within the scopes of their approvals.

11.5.4.1 Location with respect to haul and counterweight rope.

Every aboveground tank at ground level for storage of class I or class II liquids shall be located a minimum of 10 feet horizontal from a vertical plane created by the path of the rope(s).

11.5.5 Underground tanks and piping.

Underground tanks and piping containing flammable liquids shall comply with all federal, state and local regulations.

11.5.6 Provisions for internal corrosion.

When tanks are not designed in accordance with the American Petroleum Institute, American Society of Mechanical Engineers, or the Underwriters Laboratories Inc. Standards, or if corrosion is anticipated beyond that provided for in the design formulas used, additional metal thickness or suitable protective coatings or linings shall be provided to compensate for the corrosive loss expected during the design life of the tank.

11.5.7 Fuel quality.

Area operators shall have a procedure or program to ensure their liquid fuel’s quality is suitable for use in a combustion engine.

11.5.8 Fuel tanks inside structures.

11.5.8.1 Integral tanks.
Class I fuels. Only “integral tanks” of 25 gallons or less are allowed in a structure. Other supply tanks may be located underground or outside of structures.

Class II fuels. The fuel storage of an “integral or day tank” shall not exceed 660 gallons per tank.

11.5.8.2 Day or supply tanks.

Day or supply tanks inside structures shall be securely mounted on substantial noncombustible supports.

11.5.8.3 Supply tanks.

Fuel tanks greater than 25 gallons located above grade shall have either a wall, curb or dike having a capacity at least equal to that of the largest surrounded tank, or a wall, curb or dike of lesser capacity equipped with an overflow or drainage system that shall be adequate in size and location to convey any spillage of fuel to a tank (inside or outside the structure) or to a safe area outside the structure.

11.5.8.4 Enclosed fuel tanks.

When a structural system is partially or totally enclosing a fuel tank, the structural systems exterior surfaces shall be suitably marked to warn personnel of the hazard hidden from view. Markings shall define the limits and contents of the hidden fuel tank.

11.5.9 Fuel flow control.

11.5.9.1 Liquid fuel supply systems.

Liquid fuel supply systems, including drains from carburetors, shall be designed and installed to minimize as far as practicable the accidental discharge of fuel into the engine room or structure. Adequate alarms, float-controlled valves, and mechanical or remote reading level gauges or protected sight gauges shall be installed to aid personnel in properly operating the fuel system. Stationary powered fuel pumps supplying integral or day tanks shall have “stop” controls sensitive to a tank’s high liquid level.

If a supply tank is located higher than the motor room floor, an anti-siphon device is required.

11.5.9.2 Pumps.

Where supplied by pumps, day tanks or integral tanks shall be provided with an overflow return line, a high level alarm, and a high level automatic shutoff. The overflow line shall be continuous piping to the supply tank without valves or traps. Its capacity shall exceed the delivery capacity of the supply lines it serves.

11.5.9.3 Air intake.

Overflows, vents, and fuel piping of fuel tanks shall not be located at or near engine air intake, exhaust piping, mufflers or filters.

11.5.10 Filling.

11.5.10.1 Fill pipes.

Fill pipes located beyond the sides of a building or motor room shall have a locked fuel cap. Fill pipes shall be located to avoid toxic fumes and fire hazard during refueling.

11.5.10.2 Gasoline and diesel fuel tanks.
Fuel tanks shall be filled by a closed piping system.

Exception: Fuel tanks may be filled by other than closed piping systems when engine is shut down and with no passengers on the ropeway. If containers are utilized for filling, they must be UL listed.

11.5.11 Fuel piping, valves, venting, piping and fittings.

11.5.11.1 Atmospheric storage tanks.

Atmospheric storage tanks shall be adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank or exceed the design pressure in the case of other atmospheric tanks, as a result of filling or emptying and atmospheric temperature changes.

Exception: Integral tanks do not require venting.

11.5.11.2 Normal vents.

Normal vents shall be sized in accordance with either: (1) the American Petroleum Institute Standard No. 2000, Venting Atmospheric and Low-Pressure Storage Tanks; or, (2) another accepted standard, or shall be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1 1/4 inch nominal inside diameter.

11.5.11.3 Fill or withdrawal connection.

If any tank or pressure vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.

11.5.11.4 Pipe outlets.

Wherever pipe outlets for tanks storing class I liquids are adjacent to buildings or public ways, they shall be located so that vapors are released at a safe point outside of buildings and not less than 12 feet above the adjacent ground level. In order to aid their dispersion, vapors shall be discharged upwards or horizontally away from closely adjacent walls. Vent outlets shall be located so that flammable vapors will not be trapped by eaves or other obstructions and shall be at least 5 feet from building openings.

11.5.11.5 Location and arrangement of vents for class II liquids.

Vent pipes from tanks storing class II liquids shall terminate outside of the building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens, or other devices to minimize ingress of foreign material.

11.5.11.6 Vent piping for storage.

Tank vent pipes and vapor return piping shall be installed without sags or traps in which liquid can collect. Condensate tanks, if utilized, shall be installed and maintained so as to preclude the blocking of the vapor return piping liquid. The vent pipes and condensate tanks shall be located so that they will be protected from physical damage. The tank end of the vent pipe shall enter the tank through the top.

Vent piping for storage tanks storing class I liquids shall not be manifolded with vent piping for tanks with class II liquids unless positive means are provided to prevent the vapors from class I liquids from entering tanks storing class II liquids. This is to prevent contamination and possible change in classification of the less volatile fuel.

11.5.11.7 Emergency relief venting.
Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure to fires.

11.5.11.8 Piping systems.

Piping systems shall be substantially supported and protected against physical damage and excessive stresses. The use of approved metallic or nonmetallic flexible connectors for protection against damage caused by settlement, vibration, expansion, contraction or corrosion is acceptable.

11.5.11.9 Valves.

Sufficient valves that are adequately labeled at the valve shall be provided to control flow of liquid fuel in the normal operation and to shut off the flow of fuel in the event of a pipe break.

11.5.11.10 Openings for gauging.

Openings for gauging on tanks storing class I liquids shall be provided with a vapor tight cap or cover. Such cover shall be closed when not gauging.

11.5.11.11 Fill pipes.

Fill pipes that enter the top of a tank other than day or integral tanks shall terminate within 6 inches of the bottom of the tank. Fill pipes shall be installed or arranged so that vibration is minimized.

11.5.12 Transfer of liquid fuel to engines.

Liquid fuel shall feed to engines by pumps only. If the fuel tank(s) are located above the engine fuel intake, the fuel tank shall be equipped with an anti-siphon device.

11.6 Exhaust piping.

11.6.1 Design and construction.

11.6.1.1 Engine exhaust.

Engine exhaust discharge systems shall be designed on the basis of flue gas temperatures (see definition).

11.6.1.2 Exhaust pipes.

Exhaust pipes shall be of wrought iron or steel and of sufficient strength to withstand the service. Fittings of cast iron shall be acceptable.

11.6.1.3 Low points.

Low points in the exhaust system shall be provided with suitable means for draining of condensate.

11.6.2 Installation.

11.6.2.1 Exhaust pipes.

Exhaust pipes shall terminate outside the structure at a point where the hot gases or sparks will be discharged harmlessly and not be directed against combustible material or structures, or into atmospheres containing flammable gases or vapors or combustible dusts. Exhaust pipes shall not terminate under loading platforms or structures, or near ventilation air inlets. Additionally, exhaust pipes
shall be adequately supported and shall be connected to the engine or muffler so that emission of sparks, flame or gas within the structure is prevented.

11.6.2.2 Flexible connections.

Where necessary, a flexible connector shall be provided in an exhaust pipe from the engine to minimize the possibility of a break in the engine exhaust system because of engine vibration or heat expansion. This connection shall not permit the release of dangerous quantities of gas into the engine room.

11.6.2.3 Exhaust system guards.

Exhaust stacks, manifolds and turbochargers within reach of personnel shall be equipped with guards or heat shields.

11.6.3 Clearance from combustible materials.

11.6.3.1 Exhaust pipes.

Exhaust pipes shall be installed with clearances of at least 9 inches to combustible material, except as provided in 11.6.3.2 and 11.6.3.3.

11.6.3.2 Exhaust pipes through roofs.

Exhaust pipes passing directly through combustible roofs shall be guarded at the point of passage by ventilated metal thimbles that extend not less than 9 inches above and below roof construction and are at least 6 inches in diameter larger than the exhaust pipe.

11.6.3.3 Exhaust pipes through walls.

Exhaust pipes passing directly through combustible walls or partitions shall be guarded at the point of passage by one of the following methods:

(a) Metal ventilated thimbles not less than 12 inches larger in diameter than the exhaust pipe; or,

(b) Metal or burned fire clay thimbles built in brickwork or other approved fireproofing materials providing not less than 8 inches of insulation between the thimble and combustible material.

11.7 Fire protection.

11.7.1 Fire extinguishers, classification.

11.7.1.1 Low hazard.

Structures used for the operation and maintenance of a ropeway which are not designated as a Moderate Hazard shall be classified as Light (Low) Hazard, as defined by NFPA 10. Light (Low) Hazard areas shall be protected by a minimum of a 10 lb. (or two 5-lb.) Dry Chemical ABC fire extinguisher or equivalent.

11.7.1.2 Moderate hazard.

Structures containing a ropeway motor room and meeting one or more of the following criteria shall be classified as Ordinary (Moderate) Hazard, as defined by NFPA 10.

a) Motor room enclosures utilizing wood structural components.

b) Detachable lift motor rooms.
Ordinary (Moderate) Hazard areas shall be protected by a minimum of a 20 lb. (or two 10-lb. or four 5-lb.) Dry Chemical ABC fire extinguisher or equivalent.

11.7.2 Fire extinguishers, location.

Extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably, they shall be located along normal paths of travel, including exits from areas.

11.7.2.1 Obstructions.

Extinguishers shall not be obstructed or obscured from view.

11.7.2.2 Mounting.

Extinguishers shall be installed in a bracket and protected from dislodgment and physical damage.

11.7.2.3 Travel distances.

Travel distances within a motor room for portable extinguishers shall not exceed 30 feet. Extinguishers should be placed at regular intervals within a motor room so that the maximum walking distance from any point to the nearest extinguisher does not exceed the maximum travel distance.

Exception: The travel distance between fire extinguishers can be increased to 50 feet maximum, if the area is protected with a 20 lb. Dry Chemical ABC fire extinguisher or equivalent.

11.7.3 Inspection of fire extinguishers.

11.7.3.1 Frequency.

Extinguishers shall be inspected when initially placed in service and thereafter at approximately 30-day intervals.

11.7.3.2 Procedures.

Periodic inspections shall include a check of at least the following items:

(a) Located in designated place.

(b) No obstructions to access or visibility.

(c) Operating instructions on nameplate legible and facing outward.

(d) Seals and tamper indicators not broken or missing.

(e) Determine fullness by weighing or “hefting”.

(f) Examine for obvious physical damage, corrosion, leakage, or clogged nozzle.

(g) Pressure gauge reading or indicator in the operable range or position.

Each extinguisher shall have a tag or label securely attached that indicates the month and year of inspections, maintenance, and recharging and shall identify the person performing the service.

When an inspection of any rechargeable extinguisher reveals a deficiency in any of the conditions listed in
(c), (d), (e), (f), and (g) stated above, it shall be subjected to applicable maintenance procedures. When an inspection of any non-rechargeable dry chemical extinguisher reveals a deficiency in any of the conditions listed in (c), (d), (e), (f), and (g) stated above, it shall be discharged, marked "used" and removed from service.

11.7.4 Maintenance of fire extinguishers.

11.7.4.1 Frequency.

Extinguishers shall be subjected to maintenance not more than one year apart or when specifically indicated by an inspection.

11.7.4.2 Maintenance.

Maintenance procedures shall include a thorough examination of the three basic elements of an extinguisher:

(a) mechanical parts,

(b) extinguishing agent, and

(c) expelling means.

Exception: During annual maintenance, it is not necessary to internally examine non-rechargeable extinguishers, carbon dioxide extinguishers, or stored pressure extinguishers except for those types specified in NFPA 10, 4-4.1.1. However, such extinguishers shall be thoroughly examined externally in accordance with the applicable item (a) stated above.

Every six years, stored rechargeable pressure extinguishers shall be emptied and subjected to the applicable maintenance procedures. When the applicable maintenance procedures are performed during periodic recharging and hydrostatic testing, the six year requirement shall begin from that date.

Exception: Non-rechargeable extinguishers shall not be hydrostatically tested but shall be removed from service at a maximum interval of 12 years from the date of manufacture.

11.7.5 Recharging of fire extinguishers.

All rechargeable extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance. When performing the recharging, the recommendation of the manufacturer shall be followed. Only those agents specified on the nameplate, or agents proven to have equal chemical composition and physical characteristics shall be used.

11.7.6 Operating instructions of fire extinguishers.

Operating instructions shall be located on the front of the extinguisher. Other labels and markings shall not be placed on the front.

Exception: In addition to manufacturers' labels, other labels that specifically relate to operation, classification, or warning information shall be permitted on the front.

11.7.7 Fire alarms.

All machine rooms located beneath the rope of the tramway (vaulted) shall have a fire detection system conforming to NFPA 72 - 1990. This system shall initiate a visual and audible indication at the operators' station.
11.8 Fuel handling.

11.8.1 Liquefied petroleum gases.

Gas fuels shall be handled in accordance with the latest edition of *American National Standard for the Storage and handling of liquefied petroleum gases*, ANSI/NFPA 58.

11.8.2 All other fuels.

Section 11, FUEL HANDLING, of the CPTSB Rules and Regulations replaces all references to ANSI/NFPA 30 or ANSI/NFPA 37.

Section 12 Reserved

Section 13 Reserved

Section 14 Reserved

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Section 20 Tramway Licensing

20.1 License Required.

A passenger tramway not in compliance with these rules and regulations may be licensed if it has been granted the necessary exceptions pursuant to Section 1.2.3. Terms, conditions or requirements limiting any license may be imposed if reasonably necessary to effect compliance with these rules and regulations or to protect the safety of the public.

20.2 Issuance of License.

No license applied for shall be issued by the Board until it has received a verified and notarized statement from the area operator that the deficiencies in the inspector's report have been remedied and the authority appointed by the Board has corroborated such statement. Such corroboration may be made by review of the above verified statement; subsequent inspection; the Board's own investigation; the receipt of additional documentation requested by the Board; or any other means which the Board or appointed authority deems appropriate. The certificate shall be issued as soon as possible, but no later than seven (7) days after receipt of such statement, unless the Board has reasonable grounds to delay issuance and has given notice of such action and its reasons to the area operator affected prior to expiration of such seven (7) day period. The license, or copy thereof, shall be displayed prominently at the place where passengers are loaded.

20.3 Expiration of licenses.

Tramways are licensed during the fall licensing period or the spring licensing period as designated by the Board for one calendar year.
1. The fall licensing period shall be prior to the winter operating season.

2. The spring licensing period shall be prior to the summer operating season.

If the tramway is closed, the requirements of X.3.3 Maintenance must be current before the tramway can reopen for public operation. Licenses shall expire one calendar year from the date of issue.

Section 21 New Installations and Modifications

21.1 Definitions.

21.1.1 New Installation.

“New Installation” means any passenger tramway installation not previously licensed and shall include both new and relocated passenger tramways (also reference rules 1.2.4.1 and 1.2.4.2).

21.1.2 Major Tramway Modification.

“Major Tramway Modification” means any modification to a passenger tramway which alters its verified design or verified construction and which results in a substantive change:

(a) in design speed of the system; or

(b) in capacity by changing the number of carriers, spacing of carriers, or load capacity of carriers; or

(c) in the path of the rope; or

(d) in the type of brakes and/or backstops or components thereof; or

(e) in structural arrangements; or

(f) in power or type of prime mover or auxiliary engine; or

(g) to control system logic.

Design and construction verifications are required. A major tramway modification may be deemed a new installation by the Board and current requirements shall be applicable (reference rule 1.2.4.3).

21.1.3 Minor Modification.

“Minor Modification” means any modification, addition, or deletion to a passenger tramway which does not meet the criteria of a major modification but which results in a significant change in the tramway’s verified design or verified construction and materially affects its integrity, operation or control. A design verification is required, however, no construction verification is required. A minor modification may be considered a major modification at the discretion of the Board. If the authority appointed by the Board disagrees with the classification of the modification as “minor”, the matter may be referred to the Board for a final decision.

21.1.4 Minor Alteration.

“Minor Alteration” means any other addition or deletion to a passenger tramway which does not meet the criteria of a major or minor modification or one for one replacement, and which does not materially affect the tramway’s integrity, operation or control. No design or construction verification is required. A minor alteration may be considered a minor modification or a major modification at the discretion of the Board.
21.1.5 **One for One Replacement.**

“One for One Replacement” means the replacement of a component with an equal component. A one for one replacement shall be considered as normal maintenance and not as a modification. No design or construction verification is required.

21.2 **Procedures Prior To Public Operation for New and Relocated Installations.**

21.2.1 **Submittal of Notice of New or Relocated Installation.**

Before construction of the new or relocated installation begins, the area operator shall give notice of such activity to the Board on the required forms and include the appropriate fee.

21.2.2 **Acknowledgment of New or Relocated Installation.**

Upon receipt of the notice, the Board shall send an acknowledgment of such to the area operator together with the appropriate forms and requirements to complete the procedure as set forth in these rules and regulations.

21.2.3 **Submittal of Request for Exception.**

If the area operator proposes to depart from these rules and regulations, a request for exception must be made in writing by the area operator as set forth in rule 1.2.3.

21.2.4 **Exception Request Procedure.**

Within thirty (30) days after receipt of the request for exception as provided for in 21.2.3, the Board shall notify the area operator in writing of its action on the requested exception. If the Board denies or limits the requested exception, the Board's notification shall set forth the reasons for such action. Within sixty (60) days of the mailing of such notification, the area operator may appeal the Board's decision as provided for in Article 4 of Title 24 of the Colorado Revised Statutes.

21.2.5 **Submittal of Verification of Design.**

Before construction of the new installation is begun, the Professional Engineer in responsible charge of the design shall verify to the Board on the appropriate forms that the passenger tramway design conforms to all rules and regulations of the Board. Copies of such designs, plans and specifications shall be submitted with this written verification.

21.2.6 **Submittal of Acceptance Test Request.**

Acceptance tests will be scheduled by the Board on a first come, first served basis. At least thirty (30) days before a requested acceptance test, the area operator shall notify the Board of a projected date for the required acceptance test. Upon receipt of such notification the Board shall establish a tentative acceptance test date for such passenger tramway and shall notify the area operator of the same. If the projected date changes the area operator shall immediately notify the Board of same, and the Board shall reschedule the acceptance test. No later than three (3) days before the date of the acceptance test, the area operator shall notify the Board that the passenger tramway is completed and ready for testing. The area operator shall verify to the Board that the required hours of continuous operation have been accomplished in accordance with 2.1.1.11.2 or 3.1.1.11.2 or 4.1.1.11.2. Upon receipt of such timely notifications, the initial inspection and acceptance test shall proceed as scheduled.

21.2.7 **Submittal of acceptance test procedure.**

At least thirty (30) days before the scheduled acceptance test date, the area operator shall submit an
acceptance test procedure which was prepared by the Professional Engineer in responsible charge of the design (see 2.1.1.11, 3.1.1.11, 4.1.1.11, 5.1.1.11, 6.1.1.11, 8.1.1.11, or 9.3.7.3) for approval by the Board or the authority appointed by the Board.

21.2.8 Submittal of Verification of Construction.

After the new installation or relocation is completed and before the initial inspection is conducted, and before the acceptance test is observed, the Professional Engineer in responsible charge of the tramway construction shall verify to the Board on the appropriate forms that the foundations, soils and concrete test samples have been inspected and completed according to the design, plans and specifications for such work. This document shall be required prior to the acceptance test.

21.2.9 Submittal of As-Built Drawings and Additional Documents.

Prior to or during the acceptance test, the “As-Built” designs, plans, specifications and drawings signed and sealed by the design engineer shall be submitted to the Board.

Within thirty (30) days after the acceptance test, the authority appointed by the Board shall notify the area operator of any additional documents which must be submitted.

21.2.10 Inspection and Acceptance Test.

All inspections and acceptance tests shall be according to these rules and regulations. Items failing to pass the acceptance test shall be retested if so directed by the Board.

21.2.11 Submittal of Verification of Initial Inspection and Acceptance Test.

The Board inspector shall report to the Board the results of the Acceptance Test and any deficiencies.

21.3 Procedures Prior to Public Operation for Tramways with Major Tramway Modifications.

In addition to the applicable requirements of Section 20 and rule 1.2, the following procedure shall be completed prior to public operation of the passenger tramway.

21.3.1 Submittal of Notice of Modification.

Before the major tramway modification commences, the area operator shall give notice of such activity to the Board on the required forms and include the appropriate fee.

21.3.2 Acknowledgment of Major Tramway Modification.

Upon receipt of the notice, the Board shall send an acknowledgment of such to the area operator together with the appropriate forms and requirements to complete the procedure as set forth in these rules and regulations.

21.3.3 Submittal of Request for Exception.

If the area operator proposes to depart from these rules and regulations, a request for exception must be made in writing by the area operator as set forth in rule 1.2.3.

21.3.4 Exception Request Procedure.

Within thirty (30) days after receipt of the request for exception as provided for in 21.3.3, the Board shall notify the area operator in writing of its action on the request. If the Board denies or limits the requested exception, the Board's notification shall set forth the reasons for such action. The area operator may
appeal the Board's decision as provided for in Article 4 of Title 24 of the Colorado Revised Statutes.

21.3.5 Submittal of Verification of Design.

Before construction of the major tramway modification is begun, the Professional Engineer in responsible charge of the design of the tramway major modification shall verify to the Board on the appropriate forms that the design, plans and specifications for the major tramway modification conforms to all rules and regulations of the Board and is compatible with the existing tramway design. Copies of such designs, plans and specifications shall be submitted with this written verification.

21.3.6 Submittal of Acceptance Test Request.

Acceptance tests will be scheduled by the Board on a first come, first served basis. At least thirty (30) days before a requested acceptance test, the area operator shall notify the Board of a projected date for the acceptance test. Upon receipt of such notification, the Board shall establish a tentative acceptance test date for such passenger tramway and shall notify the area operator of the same. If the projected date changes, the area operator shall immediately notify the Board of same and the Board shall reschedule the acceptance test. No later than three (3) days before the date of the acceptance test, the area operator shall notify the Board that the passenger tramway modification is completed and ready for testing.

21.3.7 Submittal of Acceptance Test Procedure.

At least thirty (30) days before the scheduled acceptance test date, the area operator shall submit an acceptance test procedure which was prepared by the Professional Engineer in responsible charge of the design of the major tramway modification for approval by the Board or the authority appointed by the Board. The acceptance test procedure shall take into consideration the modification which was made to the passenger tramway and should be tailored to test the critical components of said modification.

21.3.8 Submittal of Verification of Construction.

After the major tramway modification is completed and before the initial inspection is conducted and before the acceptance test is observed, the Professional Engineer in responsible charge of the construction of the modification shall verify to the Board on the appropriate form that the construction and/or installation of the modification has been completed according to the design, plans and specifications for such work. This document shall be required prior to the acceptance test.

21.3.9 Submittal of As-Built Drawings and Additional Documents.

Prior to or during the acceptance test, the “As-Built” designs, plans, specifications and drawings signed and sealed by the design engineer shall be submitted to the Board.

Within thirty (30) days after the acceptance test, the authority appointed by the Board shall notify the area operator of any additional documents which must be submitted.

21.3.10 Inspection and Acceptance Test.

All inspections and acceptance tests shall be according to these rules and regulations. Items failing to pass the acceptance test shall be retested if so directed by the Board.

21.3.11 Submittal of Verification of Initial Inspection and Acceptance Test.

The Board inspector shall report to the Board the results of the Acceptance Test and any deficiencies.

21.4 Procedures for Tramways with Minor Modifications.
21.4.1 Submittal of Notice of Modification.

Before the minor modification commences, the area operator shall give notice of such activity to the Board on the required forms.

21.4.2 Acknowledgment of Minor Modification.

Upon receipt of the notice, the Board shall send an acknowledgment of such to the area operator together with the appropriate forms and requirements to complete the procedure as set forth in these rules and regulations.

21.4.3 Documentation of Minor Modifications.

The area operator shall keep a log documenting all minor modifications made to each of its passenger tramways. Such log shall be readily available for inspection by the Board or designated representatives of the Board and shall contain at a minimum the following information:

(a) tramway name or other means of identification;
(b) name of design engineer;
(c) verification of design engineer on form approved by the Board;
(d) date of modification;
(e) purpose of modification;
(f) description of modification;
(g) names of personnel performing such modification;
(h) date of modification review and acceptance by area operator or its authorized agent.

Each area operator's log of minor modifications shall be readily available to the Board's inspectors during every inspection.

21.5 Documentation of Minor Alterations.

The area operator shall keep a log documenting all minor alterations made to each of its passenger tramways. Such log shall be readily available for inspection by the Board or designated representatives of the Board and shall contain at a minimum the following information:

(a) tramway name or other means of identification;
(b) date of alteration;
(c) purpose of alteration;
(d) description of alteration;
(e) names of personnel performing such alteration;
(f) date of alteration review and acceptance by area operator or its authorized agent.

Each area operator's log of minor alterations shall be readily available to the Board's inspectors during
Section 22 Inspections

22.1 Duty of the Area Operator.

It is the primary responsibility of the area operator to perform such inspections on passenger tramways that are necessary to protect the safety of the public.

22.2 Duty of the Board.

The Board may cause to be made such inspections of passenger tramways as it may reasonably require and may require the area operators to keep such records, make such tests, and produce such evidence as may be necessary in order to make the following determinations:

(a) compliance with these rules and regulations and C.R.S. 25-5, Part 7;
(b) compliance with any terms, conditions and requirements of licensure;
(c) compliance with any requirements of a granted exception (variance);
(d) inspection disclosed no unreasonable safety hazard.

22.3 Required Inspections

22.3.1 Annual Licensing Inspection.

The annual licensing inspection shall be made prior to approval of any application for licensure.

22.3.2 Annual Unannounced Inspection.

(1) In addition to the annual licensing inspection, an unannounced inspection of every passenger tramway shall be made at least once a year during the high-use season. No passenger tramway shall be shut down for an unannounced inspection during normal operating hours, unless sufficient daylight is not available for the inspection. Up to five tramway stops, not to exceed three (3) minutes in the aggregate, may be ordered by an inspector during normal operating hours. If additional stop time is required, it shall be done before or after normal operating hours.

Notwithstanding the provisions of this subsection, the Board reserves the authority to order a shutdown of a passenger tramway for any reason set forth in these rules and regulations or in the Act.

(2) The inspector conducting the annual unannounced inspection shall take particular note of any deficiencies noted in the annual licensing inspection report. The inspector shall note any uncorrected deficiencies in the inspection report. Any uncorrected deficiencies noted in the prior inspection may be grounds for revocation or suspension of license.

22.3.3 Acceptance Test Inspection. All new tramways, tramways on which major tramway modifications have been performed, and tramways which have not been operated for routine maintenance within the previous 2 years shall have an acceptance test inspection in accordance with 21.2.10 and 21.3.10.

22.3.4 Special Inspections. In addition to the annual licensing and unannounced inspection of each passenger tramway, the Board may order such special inspections as it may require. Depending
on the circumstances, the Board may reasonably require special procedures and conditions to be followed, including but not limited to, the following:

(a) that such special inspections be unannounced;

(b) that the passenger tramway to be inspected be shut down during the inspection;

(c) that the inspection be conducted by a person other than a regular inspector employed by the Board when special expertise is required;

(d) that, in appropriate cases, the area operator conduct the inspection.

22.4 Inspection Procedures for Annual Licensing and Unannounced Inspections

22.4.1 Inspection of Equipment.

The inspector employed by the Board shall conduct a visual and audible inspection. The inspection shall determine whether any item of equipment does not appear to be in proper working order.

The inspector is not required to conduct specialized testing or inspection of devices which can only be accomplished by persons with special expertise, but the inspector shall recommend to the Board that further, specialized inspections be conducted if either visual and audible inspection, review of the relevant records and documents, or presentation of any other evidence reasonably indicates that such a inspection is warranted.

22.4.2 Inspection of Records and Other Documents

(1) The inspector, employed by the Board, shall reasonably review the required logs, manuals, test reports of required self inspections, and manufacturer's recommended operation and maintenance manuals.

(2) If the logs and records required by these rules and regulations or by order of the Board are not properly kept, the inspector shall so advise the Board in writing. If any of the documents to be inspected exist, but are not present for the inspection, the inspector shall not certify the passenger tramway being inspected to the Board for licensure until he has had an opportunity to review such documents.

22.4.3 Other Areas of Inspection.

The Board shall determine whether the area operator has established a reasonable training program for its operation and maintenance personnel and whether practices reasonably necessary for safe operations are being followed.

22.4.4 Inspection report.

Upon completion of the inspection, the inspector shall provide the area operator of the passenger tramway(s) being inspected, or his agent, with a copy of the preliminary report of observations made during the inspection. As soon as possible, but no later than fifteen (15) days after the completion of the inspection, the inspector shall transmit to the Board a final report. This report shall include a statement as to whether it reasonably appears to the inspector that the passenger tramway(s) inspected comply with the statutes, these rules and regulations, and any other applicable orders of the Board, and that the inspection of such passenger tramway(s) disclosed no unreasonable safety hazards.

For each passenger tramway inspected, the inspector shall list the items not in compliance with these rules and regulations. The area operator of the passenger tramway(s) inspected shall also receive a copy
of the inspector's final report.

Deficiencies stated in the annual inspection report shall be remedied as set forth in section 20.2. A notarized letter from the area operator, stating that all the deficiencies listed in the annual unannounced inspection report have been corrected, must be received by the Board office within twenty-eight (28) days from the completion of the inspection.

The inspection completion date shall be noted on both the preliminary and final inspection report.

22.4.5 Report of Unreasonable Hazard.

If the inspector finds a condition in the passenger tramway construction, operation or maintenance, logs, records or other documents (including the absence of these documents) exists which may endanger the safety of the public, the inspector shall immediately notify the area operator, or his agent, in writing, to this effect at the time of the inspection. The inspector shall also issue an immediate report to the Board for appropriate investigation and order. In the event that any of the documents required to be inspected or the lack thereof indicates that a violation of the Board's rules and regulations exists, or that a condition in passenger tramway construction, operation, and maintenance exists, either of which may endanger the safety of the public, the inspector shall not certify the passenger tramway being inspected to the Board for licensure. Additionally, an immediate report shall be made to the Board for appropriate investigation and order.

22.5 Qualified Inspectors

22.5.1 General Inspectors.

All required inspections as listed in Rule 22.3 in these rules and regulations shall be conducted by qualified engineers who shall have demonstrated to the Board's satisfaction that they have a working knowledge of the Board's current rules and regulations and inspection procedures.

22.5.2 Inspector conflict of interest.

No person, except a full-time employee of the Board, shall observe an acceptance test or conduct an inspection of a passenger tramway if:

(a) during the past two (2) years the inspector has been an employee of the owner or area operator of the tramway; or,

(b) the inspector was involved at any level of the design, construction or modification of any tramway at that area in the past five years; or,

(c) the inspector provided any other services to that area in the past five years.

Each year, prior to July 1st, each contract inspector shall make known all potential conflicts of interest on appropriate forms provided by the Board.

Inspectors shall disclose all known and potential conflicts of interest, business association or other circumstances that could influence their judgment or the quality of their inspections each year prior to July 1st on appropriate forms provided by the Board. Should any conflicts arise during the year, the inspector is obligated to report them to the Board staff immediately.

This policy is not intended per se to prohibit employees or members of an inspector's firm or company from doing work for an area operator, provided that disclosures of potential conflict are made and that appropriate measures are in place to ensure that the inspector is not involved in, or privy to, information concerning the work.
Section 23  Passenger Tramway Incidents

23.1 Definitions.

“Reportable passenger tramway incident” is defined as the following.

(a) Any incident from a possible malfunction of a passenger tramway in which a person is injured or killed. The tramway shall cease operation as defined by Section 23.3 Limitation of operation.

For the purposes of Section 23, the term “injured” is defined as bodily damage requiring immediate medical attention.

(b) Any incident in which a passenger is injured falling or jumping from a chair which is outside of the load or unload zone.

For the purposes of this rule, the “load zone” is defined as the area from the “wait here” sign to a point where the “no ski closure” ends or in the event there are no ski closures, at a point where the vertical clearance of the lift line is greater than eight (8) feet. This is measured from the bottom of the chair seat of an open carrier to the terrain or snow surface.

For the purposes of this rule, the “unload zone” is defined is the area approaching the unload area where the vertical clearance is less than eight (8) feet. This is measured from the bottom of an open carrier to the terrain or snow surface.

(c) Any unintentional deropement of an aerial tramway regardless of whether or not the tramway is evacuated. This does not apply to Surface Lifts, Tows and Conveyors.

(d) Any unplanned evacuation other than by prime mover or auxiliary power unit, regardless of cause. This does not apply to Surface Lifts, Tows and Conveyors.

(e) Any fire involving tramway equipment or structures that poses a risk to passengers, operating personnel or the structural integrity of the tramway.

(f) Failure of any electrical or mechanical component which results in the loss of control of the tramway, unless the loss of control is a direct result of the malfunction of a single manual stop or speed control switch. Any of the following five (5) conditions is considered a loss of control:

(1) tramway will not slow down when given the command to do so;

(2) tramway will not stop when given the command to do so;

(3) tramway accelerates faster than normal design acceleration;

(4) tramway self starts or self accelerates without the command to do so;

(5) tramway reverses direction unintentionally and without the command to do so.

(g) The failure of the following components or their primary connections are reportable:

Failure is defined as the inability of the listed components to continue to function as designed and continued operation would represent a hazard.

(1) Terminal Structure;

(2) Bullwheel;
(3) Brake System Components;
(4) Tower Structure;
(5) Sheave, Axle or Sheave Assembly;
(6) Carrier;
(7) Grip;
(8) Haul, Track or Counterweight Cable.

23.2 Reporting to the Board

(a) All reportable passenger tramway incidents occurring during public operation shall be orally reported to a Board member or the authority appointed by the Board as soon as reasonably possible but no later than twenty-four (24) hours after the time of such incident or within twenty-four (24) hours after the incident becomes known to the area personnel. A written report shall be delivered to the Board on forms approved by the Board postmarked within five (5) days of such incident or postmarked within five (5) days after the incident becomes known to the area personnel.

(b) A reportable incident discovered on dates when the lift is not open to the public shall be orally reported to a Board member or the authority appointed by the Board as soon as reasonably possible, but no later than seventy-two (72) hours after such incident becomes known to the area personnel. A written report shall be delivered to the Board on forms approved by the Board or postmarked within fifteen (15) days following the verbal report. However, all oral reports must be made prior to reopening a lift.

Area personnel is defined as personnel involved with the operation, supervision and maintenance of the tramway. This includes, but is not limited to, lift maintenance, lift operations, ski patrol and all supervisory staff.

23.3 Limitation of Operation.

When a death or injury results from a possible malfunction of a passenger tramway, as defined in Section 23.1 (a), the owner or area personnel of the tramway shall immediately cease operation and notify the Supervisory Tramway Engineer or a member of the Board by telephone. No part of the tramway shall be removed or disturbed before permission has been given by a Board member, the Supervisory Tramway Engineer, or his designated representative, except to the extent that such action is necessary to avoid further death or serious injury.

An investigation of the occurrence shall then be initiated within 24 hours and shall precede any authorization to resume public operation of the tramway. The report of investigation shall include a factual account of the incident, the nature and extent of injuries to persons, damage to the passenger tramway, any witness statements, any other pertinent details, and recommendations for remedial measures to be taken prior to resuming operating.

23.4 Logs - Components.

Area operators shall maintain a log in a format approved by the Board which shall contain reports of components replaced or repaired that do not meet the definitions of CPTSB section 23.1(g) and are not part of maintenance due to normal wear. These reports shall be submitted during public operation to the Board at monthly intervals not to exceed 60 days from the date of occurrence. When the lift is not open to the public, the Component Log shall be submitted on a monthly basis when routine maintenance is being performed.
23.5 Logs - Stoppages.

Area operators shall maintain a passenger tramway log which shall contain reports of all passenger tramway stoppages over ten (10) minutes. For each such stoppage, the log shall contain the following information:

(a) name and/or number of the passenger tramway;
(b) date of stoppage;
(c) reason for stoppage;
(d) description of any mechanical, structural, electrical, or other problem (if known);
(e) under investigation (yes or no);
(f) action taken, if any;
(g) length of time the tramway was down.

This log shall be available for inspection and, if requested by the Board or its duly authorized representative, the area operator shall make copies available of the relevant records relating to any of the stoppages.

23.6 Logs - Loading, Unloading Incidents and Passengers Falling or Jumping from Lifts

Area operators shall maintain a log which shall contain reports of all loading and unloading incidents in which injury occurs. This log shall also contain any incident in which a passenger falls or jumps from a chair with no injury, of which the area personnel has knowledge, that is outside the load or unload zone. For the purposes of this rule, the “load zone” and “unload zone” is defined in 23.1(b).

For each such loading and unloading incident, the log shall contain the following information:

(a) name and/or number of the passenger tramway;
(b) date the incident occurred;
(c) name, address and age of person injured;
(d) description of the injury;
(e) description of the incident;
(f) under investigation (yes or no).

For each such fall or jumping incident, the log shall contain the following information:

(a) name and/or number of the passenger tramway;
(b) date the incident occurred;
(c) age and gender of person involved, if known;

(d) location of incident;

(e) under investigation (yes or no).

This log shall be available for inspection and, if requested by the Board or its duly authorized representative, the area operator shall make copies available of the relevant records relating to any of the incidents.