

# *Safety Equipment Manufacturer Committee*

## *Consensus Document*

### **A. Scope and Application**

This manufacturer consensus document is intended to address use of a wire rope safety climb/system in the telecommunications industry. This consensus document is only intended to apply to structures that are governed by the ANSI/TIA-222 standard, as adopted by the IBC (International Building Code) and other jurisdictional building codes.

The objective is to provide detailed information applicable to the performance, compatibility testing, installation, inspection, maintenance, and repair of a wire rope safety climb(s) for antenna supporting structures. This document will provide the structure owner, or the Engineer of Record (EOR), the loading and placement requirements necessary to analyze the wire rope safety climb connection to the structure as well as quantify the number of users who may utilize the wire rope safety climb/system. Information shall be provided by the manufacturer in a format defined by this document.

### **B. Definitions**

**Authorized Climber** – An individual with the physical capabilities to climb, and who may or may not have previous climbing experience; has been trained in fall protection regulations, the equipment that applies to communication structures work and instruction for proper use and inspection of the equipment. Documented training must take place that shows the individual can identify hazards, inspecting equipment and has demonstrated the practical skills of an authorized climber. An authorized climber is to be supervised by a competent climber.

**Appurtenance** – Items attached to the structure such as antennas, antenna mounts, transmission lines, conduits, lighting equipment, climbing devices, platforms, signs, anti-climbing devices, etc.

**Base Anchorage** – Attachment hardware provided by the safety climb manufacturer to transition from the structure to the base assembly.

**Base Assembly** – A positive means of attachment of the wire rope to the bottom anchorage assembly by means of the wire rope tensioner.

**Carabiner** - A connector, conforming to ANSI/ASSE Z359, generally comprised of a trapezoidal or oval shaped body with a closed gate or similar arrangement that may be opened to attach another object and when released auto latches and auto locks to retain the object.

**Climbing Facilities Obstruction** - Obstructions are allowed per ANSI/TIA-222 and is any appurtenance and/or structural modification that physically blocks the climbing facility, as necessary, for the antenna supporting structures primary purpose.

**Connection Linkage** – A connector or a combination of elements, which forms the link between the wire rope safety sleeve and the attachment element of the full body harness. This connection consists of the carabiner and may include additional components as specified by the manufacturer.

**Connector** – A component (such as a carabiner) or element (such as a D-ring sewn into a full body harness) that is used to couple parts of a system together.

**Competent Climber** – An individual physically able to climb; has actual tower climbing experience; is trained in the fall protection regulations including the equipment that applies to tower work; is capable of identifying existing and potential fall hazards; and has the employer's authority to take prompt corrective action to eliminate those hazards. A competent climber is responsible for the authorized climbers when working at heights.

**Competent Person** – One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate or control exposure to the hazards.

**Confined Safety Climb** – Occurs when the safety climb wire rope is physically trapped behind an appurtenance, feed lines and/or structural modification, without adverse impact to the wire rope, and the competent climber must use alternate means of fall protection to navigate the obstacle.

**Engineer of Record (EOR)** – A registered professional engineer with expertise in the discipline applicable to the scope of work and responsible for the structural adequacy of the design of the structure in the completed project.

**Flexible Carrier** – The 3/8" diameter wire rope spanning from base assembly to top assembly, which supports the wire rope safety sleeve.

**Full Body Harness** – A body support designed to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest and shoulders. The full body harness must contain a sternal D-ring.

**May** – Denotes a permissive or possible statement

**Procurement** – The act of obtaining or buying goods and services. The process includes preparation and processing of a demand as well as the end receipt and approval of payment.

**Owner** – The public body, authority, corporation, association, firm or person for who work is to be performed via a contract document.

**Shall** – A mandatory practice.

**Should** – A recommendation which is advised, but not required.

**Top Anchorage** – A secure connecting point or termination component of a safety climb, capable of supporting the impact forces applied during a fall arrest event.

**Top Assembly** – A positive means of attachment, or termination, of the wire rope to top anchorage assembly. Top assembly may be integral with top anchorage.

**Wire Rope** – A 3/8" (0.375") solid core galvanized or stainless steel cable as a flexible carrier.

**Wire Rope Safety Climb Obstruction** - Any appurtenance and/or structural modification that diverts the safety climb (horizontally or vertically), and shall not harm the wire rope, or affect the function of the top assembly.

**Wire Rope Tensioner** – A spring, eye bolt, or other device that connects the wire rope to the base assembly to accommodate the manufacturer’s specified force.

**Wire Rope Guides** – A device that acts to guide or connect a flexible carrier to the climbing facility or structure at intermediate points along the flexible carrier.

**Wire Rope Safety Climb** – Consists of the top anchorage, top assembly, wire rope (flexible carrier), wire rope guides, base assembly and base anchorage; considered an appurtenance on the structure.

**Wire Rope Safety Climb System** – Consists of a wire rope safety climb which is inspected, and put in service by a competent climber, and used in conjunction with the wire rope safety sleeve, connection linkage and full body harness.

**Wire Rope Safety Sleeve** – A mechanical device that connects to and travels along the wire rope safety climb, designed to lock automatically in the event of a fall, connecting the wire rope to connection linkage, and allowing a competent/authorized climber to ascend and descend the wire rope safety climb.

**C. Wire Rope safety climb static load matrix.**

This section conveys the information to be provided by a manufacturer for the static loading of a system. Each manufacturer shall provide the following information to the procurement entity for their wire rope safety climb which shall be considered by the EOR in design:

1. Upper/top mount bracket self-weight
2. 3/8” diameter wire rope weight at 0.25 lbs./ft.
3. Lower/bottom mount tension

**Static Load Chart**

System Length	Top Mount Self Weight (lbs.)	3/8” Wire Rope Weight (lbs.)	Anchor Tension (lbs.)	Subtotal (lbs.)	Load Factor Multiplier	Total (lbs.)
100'	35	25	300	360	1.5	540
200'	35	50	300	385	1.5	578
300'	35	75	300	410	1.5	615
400'	35	100	300	435	1.5	653
500'	35	125	300	460	1.5	690
600'	35	150	300	485	1.5	728
700'	35	175	300	510	1.5	765
800'	35	200	300	535	1.5	803

Static Load Chart Notes:

1. Data shown in the above example is for illustrative purposes only. Specific static loads may vary per manufacturer’s design and/or additional mount requirements.

2. The format of the above table is normative.
3. All loads conveyed above are vertical.
4. Transverse loads at the wire rope guides have not been considered within this chart.
5. Wire rope accommodating a taper beyond 15° will require specific design consideration from the safety manufacturer and are not covered within this document.

**D. Wire Rope Safety Climb Arresting Force Load Matrix**

Arresting force on wire rope safety climb system to be added to static loading per specified structure for a total load matrix value with a load factor of 2.0 and 310 lb. user as defined by ANSI Z359.

1. One person (310 lb.) average arresting force = 1350#<sup>1</sup> X load factor of 2.0 = 2700 #
2. Two person (310 lb.) average arresting force 2700 # + 620 # = 3320 #
3. Three person (310 lb.) average arresting force 2700 # + 1240 # = 3940 #
4. Four person (310 lb.) average arresting force 2700 # + 1860 # = 4560 #

<sup>1</sup> Per ANSI Z359.16 - 3.1.3.2

**Anticipated loading chart for wire rope safety climb system based on number of users**

System Length	Appurtenance Static Load (lbs.)*	Minimum Top Anchorage Capacity Single User (lbs.)*	Minimum Top Anchorage Capacity Two Users (lbs.)*	Minimum Top Anchorage Capacity Three Users (lbs.)*	Minimum Top Anchorage Capacity Four Users (lbs.)*
100'	540	3,240	3,860	4,480	5,100
200'	578	3,278	3,898	4,518	5,138
300'	615	3,315	3,935	4,555	5,175
400'	653	3,353	3,973	4,593	5,213
500'	690	3,390	4,010	4,630	5,250
600'	728	3,428	4,048	4,668	5,288
700'	765	3,465	4,085	4,705	5,325
800'	803	3,503	4,123	4,743	5,363

\*Loading Values:

1. Single user addition to appurtenance load is 2,700 lbs.
2. Multiple user load (i.e. 2, 3, 4 users) is single user 2,700 lbs. plus 640 lbs. / additional user.
3. The safety climb shall be marked by the installer with the number of intended users.

Dynamic Load Chart Notes:

1. The data shown in the above example is for illustrative purposes only. Specific dynamic loads may vary per manufacturer's design and/or additional mount requirements.
2. The format of the above table is normative.
3. All loads conveyed above are vertical.
4. Transverse loads at the wire rope guides have not been considered within this chart.
5. Wire rope accommodating a taper beyond 15° will require specific design consideration from the safety manufacturer and are not covered within this document.

## **E. Wire Rope Cable Safety Climb as an Appurtenance Inspection Guidelines**

### **SCOPE AND APPLICATION**

This section is to define the maintenance and condition assessment requirements of a wire rope safety climb.

The wire rope safety climb is considered an appurtenance and therefore maintenance and condition assessments shall occur in accordance with recommended ANSI/TIA-222 intervals or tower owner/EOR recommendations, who may shorten or lengthen ANSI/TIA-222 intervals based upon an established maintenance and condition program.

If deficiencies, outside of routine maintenance or manufacturer specifications, are found in any of the wire rope safety climb components, the manufacturer of the wire rope safety climb or tower owner/EOR shall be consulted for corrective action.

For questions associated with the ANSI/TIA-222 antenna supporting structure, including climbing facilities and appurtenance connections, communication shall occur with the tower owner/EOR.

### **1) TOP ASSEMBLY/ANCHORAGE AND WIRE ROPE TERMINATION**

- a) Ensure compliance with the manufacturer's installation requirements.
- b) Top anchorage is installed in compliance with the requirements of the EOR/TIA-222 for the conveyed loads.
- c) Inspect the following components per manufacturer's instructions:
  1. Top assembly
  2. Top anchorage
  3. energy absorber
  4. Inspect hardware/fastening system
- d) Inspection may include but is not limited to the following:
  1. signs of a fall arrest event
  2. weld cracks
  3. deformations
  4. degradation
  5. excessive corrosion/wear
  6. ensure wire rope and termination is secure per manufacturer's instructions, no excessive corrosion, (proper method and amount of wire rope captivated)
  7. protective cap

### **2) WIRE ROPE**

- a) Wire rope shall be installed per manufacturer's specifications.

- b) Document the information from the existing identification tag.
- c) Inspect wire rope to ensure it is clean and free of any contaminants that would impede the proper function of the wire rope safety sleeve, such as paint, animal debris, etc.
- d) Measure diameter of wire rope to confirm 3/8" (9.5mm).
- e) Check for corrosion (i.e. red rust) on the wire rope. If so, ensure there is no loss of material due to the corrosion.
- f) Inspect wire rope for defects, including but not limited to, excessive wear, kinks, bird caging, fraying, broken wires, signs of electrical arcing such as burn marks, etc.
- g) Ensure wire rope is not pinched, or does not contact any portion of climbing facilities, structure or other appurtenances.
- h) If the safety climb is obstructed, ensure the obstruction is not causing damage to the safety climb wire rope.
- i) Confined safety climb is acceptable if the wire rope is not being damaged. Alternative forms of fall protection may be required when safety climb wire rope is obstructed.
- j) Check to ensure the wire rope is tensioned in compliance with the manufacturers' specifications.
- k) Ensure the wire rope is properly terminated to the top assembly, in compliance with the manufacturers' specifications.

### **3) WIRE ROPE GUIDES**

- a) Wire rope guides shall be provided and installed per manufacturer's specifications.
- b) Check the rubber grommets for degradation, wear, etc.
- c) Check wire rope guides for weld cracks, deformations, degradation, and excessive corrosion/wear, etc.
- d) Inspect hardware/fastening system (i.e. U-bolts, clamp plates, brackets) for damage, excessive corrosion, and ensure all fasteners are present and secure.
- e) Ensure guides are clean and free of any contaminants that would impede the proper function of the wire rope safety sleeve (i.e. paint, animal debris, etc.)
- f) Ensure all wire rope guides firmly clasp the wire rope as to prevent the wire rope from becoming free and causing damage. Check to ensure the wire rope guides are in correct position and aligned with the wire rope.
- g) Check spacing of the wire rope guides are compliant with manufacturers' specification and the maximum spacing of 25' to 40' is not exceeded. Wire ropes guide spacing frequency may be decreased for extreme wind, ice, and other environmental factors.
- h) Ensure spacing of wire rope guides vary to cancel the tendency of harmonic vibration of the wire rope during a wind event.
- i) Locking wire rope guides are properly installed and the locking mechanism is not damaged.

### **4) BASE/BOTTOM ANCHORAGE ASSEMBLY**

- a) Installation shall be compliant with the manufacturer's installation requirements.
- b) Wire rope termination method shall be installed in accordance with the manufacturer's specification (example: wire rope clips).
- c) Inspect hardware (including spring tensioner/turnbuckle and fastening system) for damage, excessive corrosion, defects (cracks, defective welds, bends or wear), and ensure all fasteners are present and secure.

- d) Ensure it is clean and free of any contaminants that would impede the proper function of the installation, such as paint, animal debris, etc.
- e) Ensure wire rope tension is in accordance with the manufacturer's specification. Such tension adjustments are typically facilitated by hardware located at the base/bottom anchorage assembly.

#### **5) IDENTIFICATION (ID) TAG INSPECTION**

- a) Ensure ID tag is present and all required information is fully legible.
- b) Ensure ID tag is located where the user typically accesses the system (typically at the base of the structure) and is clearly visible to the user.

#### **6) MINIMUM REQUIREMENTS FOR ID TAG ON NEW INSTALLATIONS**

- a) Cable type and size 3/8 solid core wire rope and construction (i.e. 1 x 7, 7 x 7, 7 x 19, etc.) as per manufacturer's specification
  - 1. Minimum Applicable compliance standards based on country of use (ie: ANSI Z359.16, CSA Z259.2.5, etc.)
- b) Minimum anchorage requirements and number of users allowed on the system (1-4 persons at 310 lbs. each person including tools, PPE, etc.)
- c) Use warnings
  - 1. Do not remove this ID tag
  - 2. Read and understand all manufacturer's instructions before each use
  - 3. install system components per manufacturer's instructions
  - 4. inspect system for proper installation before each use
  - 5. use only compatible personnel protective equipment as per manufacturer's instruction (i.e. wire rope safety sleeve, carabiner, connector, full body safety harness per ANSI Z359 and/or CSA Z259)
  - 6. never alter or modify any system components
  - 7. never use a safety climb system that has been altered from manufacturer's design
  - 8. failure to follow warnings may lead to serious injury or death (Should come with the warning sign)
- d) Manufactured date(s) and install date.
- e) Manufacturer name and Lot and/or Serial number.

### **F. Wire Rope Safety Climb as PPE (Personal Protective Equipment) Inspection Guidelines**

#### **SCOPE AND APPLICATION**

This section defines the inspection requirements of a wire rope safety climb when it is used as part of a complete fall protection plan in compliance with ANSI/ASSE A10.48. The wire rope safety climb must have a maintenance and condition inspection completed in compliance with this consensus document and the manufacturer's requirements. The PPE inspection is not intended to supersede the maintenance and condition assessment requirements and intervals of ANSI/TIA-222.

The wire rope safety climb shall be considered PPE when the climber elects to connect to it using a wire rope safety sleeve as part of an overall fall protection plan supervised by a competent person. The entire safety climb system shall be inspected prior to each use.

While inspecting wire rope safety climbs, for use as PPE, refer to the manufacturer's instructions for specific inspection and maintenance guidelines along with the minimum PPE inspection criteria containing below. For safety climbs not meeting manufacturer's specifications, and deemed unsafe by the competent person on site, the tower owner/EOR or safety climb manufacturer shall be notified for corrective action.

For questions associated with the TIA antenna supporting structure, including climbing facilities and appurtenance connections, communication shall occur with the structure owner.

## 1) PPE Inspections Outline

- a) The safety climb is considered PPE when utilized with a compatible 3/8" wire rope safety sleeve as part of a system.
- b) The system must have an inspection at the point of access prior to each use as outlined below by a competent person.
- c) If deficiencies are identified during the inspection by the competent person, equipment is to be removed from service.
- d) PPE equipment inspections shall include, but not be limited to:
  - i. Inspection of wire rope safety sleeve in addition to manufacturers recommendations:
    1. Inspect energy absorber / fall indicator (if present) for bends, cracks and deformities.
    2. Inspect components for:
      - a. wear or damage
      - b. secure attachment/attachment hardware if present
      - c. deformation
    3. Locking mechanism(s) shall operate smoothly and freely. Inspect for wear or damage. Check for proper engagement of the wire rope safety sleeve on the wire rope to ensure performance.
    4. Verify the compatibility of the wire rope safety sleeve with the installed wire rope safety climb, including but not limited to wire rope size, type and manufacturer specified tension.
    5. Inspect anti-inversion mechanism for proper function (if applicable).
    6. Inspect all marking. Marking shall be secured to safety climb sleeve and clearly legible. Marking shall include:
      - a. Capacity
      - b. Correct orientation
      - c. Indication of correct wire rope type (size, construction, shape)
      - d. Restrictions of use
      - e. Manufacturer
      - f. Lot number
  - ii. Carabiner/connector
    1. Utilize manufacturer specified/supplied carabiner for compatibility
    2. Ensure that connector freely aligns appropriately with attachment on a full body harness.
    3. Test gate to ensure that it closes and locks automatically.
    4. The carabiner/connector shall be an integral attachment to the wire rope safety sleeve.



5. Connection distance shall be compliant with manufacturers specification (OSHA requirement is no more than 9" between the carrier and harness attachment).
- iii. Full body harness with sternal (D-ring) attachment point
    1. Inspect per manufacturer's instructions.
    2. Ensure that carabiner/connector does not bind when connected.
    3. Inspect hardware (buckles, d-rings, pads, loop keepers, etc.) for damage, deformation, burrs, cracks, corrosion, or missing parts. Hardware shall operate freely and smoothly.
    4. Inspect webbing. Material must be free of frayed, cut or broken fibers. Check for tears, abrasion, knots, mold, burns or discoloration.
    5. Inspect stitching. Check for pulled or cut stitches.
    6. Inspect impact indicator (if present).
    7. Check for excessive soiling or wear.
    8. Inspect labels. All labels should be present and legible.
  - iv. Test fit of harness and function of PPE safety climb system by ascending climb facilities ascending and descending the climb facility approximately 6 feet. All PPE should function automatically hands free up and down without any manual manipulation. If the wire rope safety sleeve and carabineer/connector do not function as intended, adjustments shall be made until proper fit and function are achieved.
  - v. Documented visual inspection shall be completed prior to any type of physical testing procedure (i.e. static loading) on the system. The visual inspection shall cover at a minimum the following:
    1. Safety climb system wire rope shall be tensioned, compliant with the wire rope safety sleeve manufacturer's requirements.
    2. Safety climb system wire rope shall not be kinked or damaged (e.g. fraying, broken wires, or strands).
    3. Check for corrosion (i.e. red rust) on the wire rope. If so, ensure there is no loss of material due to the corrosion.
    4. Safety climb wire rope path obstructions shall not cause damage to the wire rope.
    5. Safety climb system wire rope should be secured by wire rope guides, spaced at intervals defined by the manufacture.
    6. Inspect the top assembly and top anchorage of the wire rope safety climb system for proper installation and defects or damage.
    7. Inspect bottom assembly and bottom anchorage for proper installation and defects or damage.
    8. Additional requirements defined by the manufacturer.
  - vi. After visual inspection, a documented physical load test (i.e. static loading) or other means as defined by the manufacturer, shall be applied to the wire rope safety climb to test the top anchorage, top assembly and wire rope condition.
    1. The wire rope safety climb shall be physically tested per manufacturer's guidelines, at a minimum, each work day or changed condition of the safety climb system.
    2. The condition of the safety climb system shall be inspected by the first authorized climber to utilize the system.

Note: If inspections reveal a defective condition, consult competent person, tower owner/EOR and/or safety climb manufacturer for corrective action. If the defect cannot be resolved the safety climb system should be tagged out by the competent person on site, and the tower owner/EOR or safety climb manufacturer shall be notified for corrective action.

### **G. Post Fall Arrest PPE Inspection**

Use of a Safety Climb for the Purposes of Rescue. For a wire rope safety climb system that is subjected to a fall and a rescue is required, the competent rescuer executing the rescue shall be required to assess the means available to efficiently and safely rescue the climber. If the best means is to use the existing wire rope safety climb that has been exposed to a fall, then the competent rescuer shall be required to:

1. Verify that the equipment utilized, including but not limited to the wire rope safety climb, meets the intended requirements for rescue as outlined by the manufacture(s)
2. Visually inspect the wire rope safety climb for changed conditions from the last written PPE inspection in compliance with section F of this document to assess the usability of the safety climb.
3. Communicate the plan to use the system with others involved in the rescue.
4. Once the rescue is complete, the safety climb is to be, reported and repaired or tagged out replaced.
5. The competent rescuer shall ensure that use of the system will not create a greater hazard than other means.

Note: A single user wire rope safety climb is excluded from this section