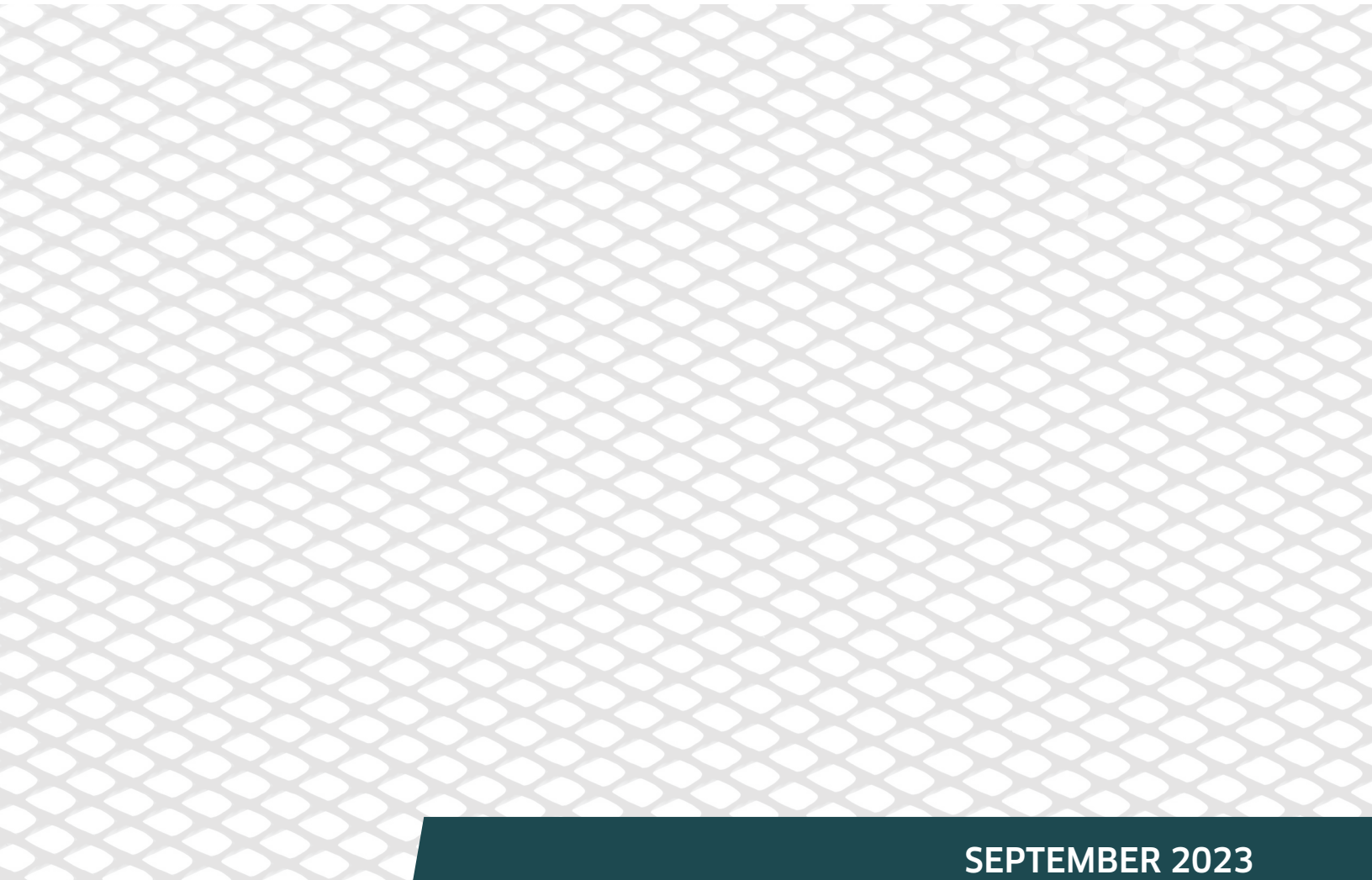




ADVISORY

Wire Mesh Grips in the Telecommunications Industry



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NATE: The Communications Infrastructure Contractors Association

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This advisory is a collaboration of subject matter experts within the industry consisting of tower owners, engineers, carriers, contractors, cable manufacturers, and wire mesh grip manufacturers to determine best practices regarding the use of wire mesh grips. The scope and purpose of this document is to make recommendations for the design, identification, selection, use and inspection of wire mesh grips (WMG) while used in conjunction with transmission line and hybrid fiber/power cables on ANSI TIA-222 Antenna Supporting Structures.

Currently there are no industry standards or regulations regarding the qualification of components, compatibility, and use of wire mesh grips. In accordance with the applicable standards utilized within the industry the use of a wire mesh grip with transmission line and hybrid fiber/power cables (cable), together comprise a lift system and ultimately a suspension system supported by the structure. Traditionally testing for compatibility of components has been left to the discretion of the cable manufacturers and the wire mesh grip manufacturers. Therefore, we recommend a uniform testing protocol/standard to ensure compatibility.

Additionally, because there are no regulatory standards for lifting/supporting transmission lines and hybrid/power cables, and wire mesh grips are not recognized by ANSI/ASME B30 as a rigging component, we reference ANSI/ASSP A10.48 10.5.2 (Rigging Hardware and Slings) for rigging hardware and recommend that wire mesh grips utilized for lifting activities meet a minimum 5 to 1 Safety Factor (SF).

Selection of Equipment

When selecting/identifying the appropriate cable/WMG for lifts, we recommend gathering the necessary certifications, information and documents as outlined below:

Documentation of Compatibility of the WMG and Cable from the Cable Manufacturer

- Manufacturers Certificate of Compliance to demonstrate compatibility of cable with WMG
- Intended use:
 - Hoisting/lifting grip
 - Support/suspension grip or
 - Combination hoisting/suspension grip
- Cable diameter
- Cable weight
- Cable jacket composition/material
- Environmental exposure factors for equipment -22° F to 140° F
- Environmental concerns that affect metal composition of WMG (stainless steel, galvanized, beryllium copper, bronze, etc.)
- WMG spacing/intervals.

In lieu of a Certificate of Compliance from the Manufacturer, Approval by Qualified Engineer of the System

- Refer to the recommendations for the manufacturer's Certificate of Compliance/compatibility of cable with WMG criteria above.

Identification on Wire Mesh Grip

This advisory is recommending that all WMGs have a permanently affixed ID tag, with the following label information.

- Name or trademark of the wire mesh grip manufacturer
- Type of wire mesh grip material
- Manufacturer model or part number

- Cable diameter range
- Max load capacity of WMG/safe working load limit (WLL)
- Manufacturing date/lot (traceability)
- Warning or QR code to manufacturer's website
- Blank for installation date
- Designed for hoisting, suspension, or both.

Note: Tag material to meet requirements of Associated Wire Rope Fabricators (AWRF)

Wire Mesh Grip System - Line Hoist Procedure

The advisory committee recommends that cable and WMG manufacturers work together to develop line hoist procedure guidelines to provide clear and precise cable installation, utilizing a WMG System. Line hoist procedure guidelines shall include, but not limited to the following, how to attach the WMG to the cable, method and spacing of attachment to the load line, attachment procedures for rigging, working load limits, etc.

- Use the manufacturer provided line hoist procedure Instructions:
 - Method of attachment – WMG to cable
 - Location or required head room of the WMG
 - Spacing/intervals of WMG to handle load and to avoid cable crushing
 - Intermediate hoisting WMG(s) requirements, if any, for hoisting and suspension
 - Accessible installation instructions (i.e. structures such as self-support, guyed towers, etc.)
 - Enclosed/inaccessible structure installation instructions (i.e., monopoles, water tanks, elevator shafts, chase ways, etc.)
 - Method of attachment – best practice for installation which may include use of additional load line attachment - messenger cable(s)
 - Contact information for questions
- Verify line type and weight as part of a comprehensive construction (rigging) plan.
- Verify, from cable manufacturer, that the hoisting WMG being used is specified for line being installed and check the recommended placement (Certificate of Compliance).
- Verify where, quantity required and how WMGs will attach to the structure.
 - Refer to tower owner policies (structural members) for placement
 - Anchorages acceptable for tower owner's application
 - Grip attachment per manufacturer's instruction to allow for transfer to the structure.
- For ease of transfer, manufacturer instructions may require a secondary WMG (for suspension) installed below the hoisting WMG to be used as the permanent attachment to the structure.
- When intermediate hoisting WMGs are being utilized, each WMG must be equally attached and supported by the hoisting system. Utilize an additional **load line/messenger cable**, for hoisting when using a WMG **if required** by manufacturer's instructions, that maintains a minimum 5:1 safe working load limit per ANSI/ASSP A10.48.
- Secure the bottom of hoisting WMG with metal hose clamp or manufacturer provided clamp if required by instructions.
- Attach a safety line or use other methods to provide redundancy in the event a grip slips or fails.
- Rig for straight in-line pulls only – ensure messenger cable is not wrapped around line before attaching to WMG.

- Attach messenger cable to load line and attach hoisting WMGs to messenger cable, to ensure that hoisting WMGs can be transferred to structure without disconnecting messenger cable.
- Set WMGs from top down, ensuring messenger cable is not wrapped around, or trapped between line and structure.
- Hoist the cable in a smooth continuous manner. Avoid shock loading from sudden stops, jerks or drops that could cause additional stress (shock load) to the cable/hosting WMG system.
- Always keep tension on the WMG.
- Maintain a small bow in the cable between hoisting WMGs, to assure the WMG stays secure to the cable. Consider marking below WMG to help monitor slippage.
- Maintain distance between hoisting WMGs and structure to prevent catching or snagging of assembly while lifting.
- When pulling consider any possible points applying additional load, such as resistance from pulling off the spool, wind load, or drag for (construction) rigging plan consideration.

Anchorage Requirements on the Structure

Follow Manufacturer/Engineer of Record (EOR)/carrier/tower owner requirements when permanently installing the WMG system. This includes what structural members' WMGs may be attached to, where they are allowed to be attached and how they may be attached. Safety Factor to be determined per ANSI/TIA-222 and the tower owner/EOR.

- Attachment points/brackets shall be capable of supporting the intended load and identified as part of the scope of the work.
- WMG shall be secured directly to a tower structural member via an approved tower owner attachment device and/or methods.
- If attachment bracket is used, bracket should include an ID label/load tag stamped.
- Once the line is in desired location attach WMG, as provided per the installation instructions, to proper attachment point on the structure.
 - Ensure the attachment point on structure is directly above the WMG.
 - The grip should be set vertically with a minimal angle. Refer to manufacturer's recommendations.
 - Multiple cables should be staggered and attached to different structural members to distribute weight.
- Set WMGs from top down, ensuring messenger cable is not wrapped around, or trapped between line and structure.
- Once WMGs are set/properly attached to the structure you may lower the load line and messenger cable.
 - Install secondary clamps, as provided and per instructions, to secure line to structure. (This does not apply to monopole installations)
 - The full length of the cable should be secured with properly sized and spaced cable hangers (per cable manufacturer instructions) after WMG is set and secure, and before the rigging is removed.
- After the WMG system is secured to the structure, relieve connections to disconnect rigging from WMG system.
- Confirm structural adequacy with EOR before attaching WMG.
- Appurtenances such as most existing waveguide ladder rungs were not designed to be a single point of attachment for WMGs.
- Do not wrap the WMG around members to anchor them. Wrapping around an edge can reduce the WMGs capacity and accelerates wear.

- Do not anchor the WMG with angle adapters or beam clamps, or any other non-approved hardware.
- Do not use quick links to anchor the cable. Utilize load-rated galvanized pinned shackles or approved hardware.
- Climbing facilities shall not to be used as an anchorage point.

Inspection

In accordance with ANSI/TIA-222-H transmissions lines (including hybrid cables) and WMGs (anything attached to the structure) are considered appurtenances. Therefore, WMGs are to be part of the ongoing maintenance and condition assessment cycles as outlined in Annex J (Appurtenances such as Mount, Antennas and Lines) 2) (Feed line condition) c) (Hanger condition – including Kellum grips (WMGs)).

Maintenance and condition assessment recommendations for communication structures are as follows:

1. Three-year intervals for guyed masts and five-year intervals for self-supporting structures.
2. After severe wind and/or ice storms, severe seismic events, or other extreme conditions.
3. Shorter intervals may be required for Risk Category III or IV structures and structures in coastal regions, in corrosive environments, and in areas subject to frequent vandalism.

APPENDIX

Potential Factors that Contribute to Failures on Structures

Self-Supported (SST)/Guyed Towers

Attaching WMGs to unapproved locations and utilizing improper hardware on structures can lead to structure and or WMG failure.



Figure 1 - Failed bracing due to improper WMG attachment.



Figure 2 - Steel angle is flexing due to weight and cable and grip installation method.

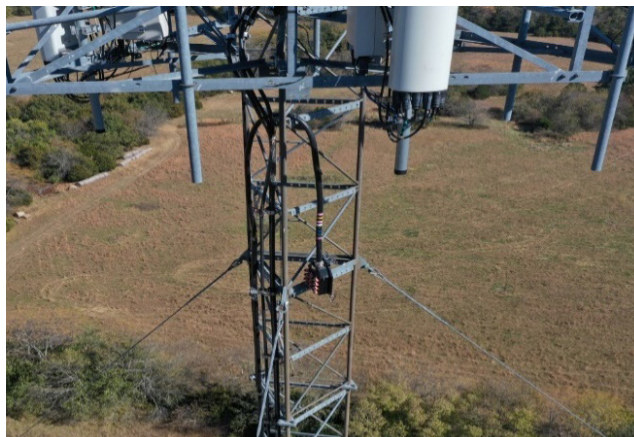


Figure 3 - Cable isn't attached with hangers and is missing mid WMG.

- a. In figure 1, the structure did not have a specific engineered and/or manufactured attachment point for WMGs. As a result, the WMGs were attached in locations incapable of supporting the point load of the cable.

In this example a potential failure point is created (WMG or structure member) due to the improper use of hardware. For example: Utilizing beam clamps/angle adaptors to support the WMG – in this case the WMG is wrapped around the brace/angle steel, which can cause premature failure of the WMG due to improper installation (sharp corner/edges) and use of hardware.

- b. In figure 2, WMGs improperly attached to a horizontal member caused a deformation of that angle. The tower leg in many cases may be the best solution for attachment to handle the point load applied by the WMG. Although attaching the WMG to the tower leg can prove problematic when cables are routed on the center face of an SST. Structural considerations/accommodations by the Engineer of Record (EOR) may be required for specific placement. Specialized hardware may also be required. Best practice dictates that multiple cables should be staggered and placed on different structural members to distribute weight.

- c. Figure 3 shows a cable and WMG installed incorrectly. The top WMG is supporting the entire cable. Frequently found on structures, are “temporarily secured” cables that cause unnecessary hazards. This situation adds undue stress to the structure, cable, and grip. The full length of the cable should be secured to the structure with the correct size cable hangers (Snap-Ins), WMGs, and anchorages in accordance with the manufacturer’s specifications and/or EORs recommendations. Ensure WMG system is properly installed and secured before the rigging is removed.

Monopoles

Recently deployed hybrid cables are heavier than coaxial cable used in earlier deployments and as a result we have seen an increased failure rate of integrated J-hooks.



Figure 4- Failed J-hook from weight of hybrid cable on monopole.

- a. Figure 4 shows a failed J-hook. Monopoles with integrated J-hooks are susceptible to failure when supporting hybrid cables with WMGs. J-hooks must meet the manufacturers specifications for strength and proper diameter to diameter (d:d) ratio. J-hooks are not to be utilized until the EOR determines it meets all structural requirements to properly support the intended loads.

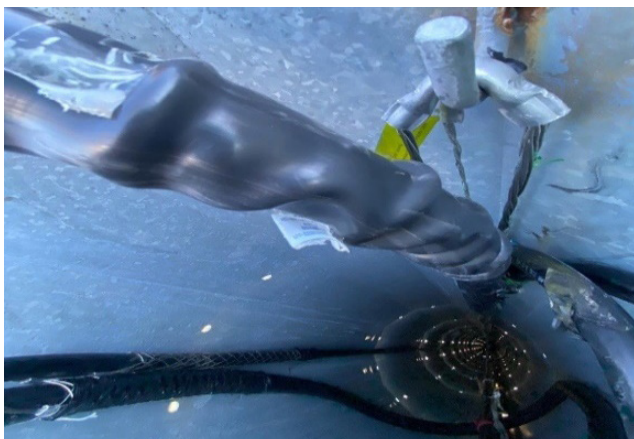


Figure 5 - Single grip holding the weight of the cable and damaging the outer jacket.

- b. Figure 5 shows a single grip holding the weight of the cable and damaging the outer jacket of the cable.

- c. All connecting hardware utilized must meet the required safety requirement and be approved by the tower owner/EOR.
- d. Due to the design of specific cables with oversized terminated pendants / canisters that will not fit through the porthole, back-feeding of the cable from the outside down the structure through the porthole may be required. This procedure may cause hazards, such as potential shock loading of the wire mesh grip. Cable manufacturers should provide straightforward methods for load transfer and installation from the outside to the inside of the structure, meeting industry rigging standards.
- e. SSTs, guyed towers, and monopoles with cables installed on the outside may have additional WMGs placed on the cable and can be secured for the entire length with cable hanger hardware. Typically cables routed inside a monopole do not have this capability; therefore, the top wire mesh grip is the only device holding the weight of the cable. If required, cable manufacturers and carriers must provide a reasonable method of attachment that will allow a mid-grip to be utilized if required.