



# TIA / OSHA

***Working Together to Provide Safe Working  
Environments for Communication Structures Through  
Understanding and Application of the Standards***



# **TIA - Introduction**

- **Cooperation between regulators (OSHA, Building Officials), manufacturers (Rohn, Valmont, Sabre, etc.), carriers (ATT, Verizon, etc.), tower owners (SBA, Crown Castle, American Tower. Etc.) and contractors (MUTI, Shenandoah, etc.)**
- **Proper application/enforcement of TIA Standards will provide a safe working environment**
- **TIA as an ANSI approved Standard/Organization seeks collaborative development contributions**
- **TIA Standards are recognized by the International Building Code (TIA-222)**

# **Overview of the Telecommunications Industry Association (TIA)**

**Marianna Kramarikova - TIA  
Mark Uncapher – TIA**

# Who is TIA?

**Trade association**

- **Global information and communications technology (ICT) industry**



- Standards development
- Policy initiatives
- Business opportunities
- Market intelligence
- Networking events





# **TIA “Technology & Standards”**

- **Accredited by the American National Standards Institute (ANSI)**
  - Develop voluntary, consensus-based industry standards for a wide variety of communications products and systems
- **MOU between Occupational Safety and Health Administration and the American National Standards Institute (2001)**



# **TIA “Technology & Standards”**

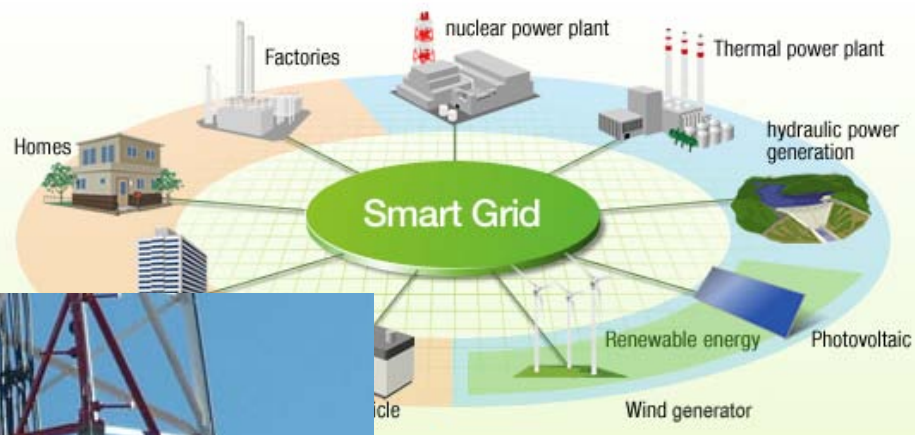
Since 1920's our publications are developed through a consensus process that brings together over 1,000 volunteers from nearly 20 countries representing varied viewpoints and interests in our 110+ committees, subcommittees, task groups and working groups

# TIA “Technology & Standards”

- **12 Engineering Committees**
  - Representatives from manufacturers, service providers, consultants and end users including federal, state and local government
- **Secretariat**
  - to groups that develop international standards, such as Third Generation Partnership Project 2 (3GPP2) and Technical Advisory Groups (TAGs) for forums such as IEC, ISO and JTC-1

# TIA “Technology & Standards”

- 12 Engineering Co
- TR-8 Mobile and P
- TR-14 Structural S
- Small Wind Turbin







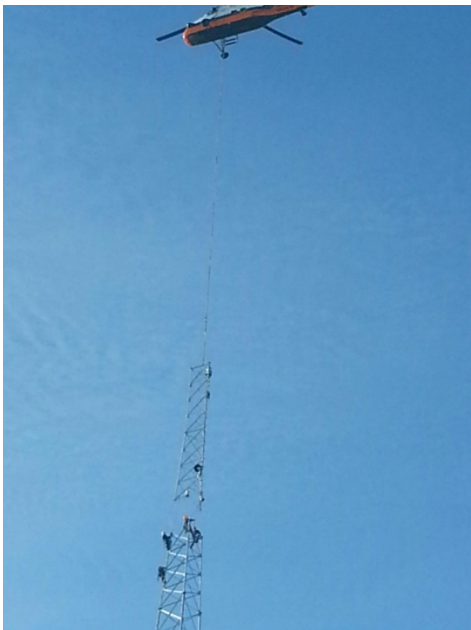
# **TIA “Technology & Standards”**

- **TR-14 Structural Standards for Communication and Small Wind Turbine Support Structures**



# TIA “Technology & Standards”

- **TR-14 Steering Committee Task Group**
  - Reviews technical questions generated from general public related to TR-14 published standards (FAQ System: <http://eetllc.info/TIA-222-GRFQFAQ/>)
- **TR-14 ANSI/TIA-222-H Task Group**
  - Develops a new revision to the ANSI/TIA-222 standard. Revision of referenced standards and related updated design provisions pertaining to the unique characteristics of communications and small wind turbine support structures



# Why Standards?

- Creates uniformity
- These standards ensure that the network will perform to all participants expectations
- Eliminates confusion
- The National Technology Transfer and Advancement Act of 1995 directs the federal government to adopt private-sector standards whenever possible, in lieu of creating proprietary, non-consensus standards.



# TIA “Policy”

- Participate in Policy Decisions
  - Regulations that impact the communications industry to ensure consistency
- Regulatory Issues
  - Industry considerations
  - Support regulatory agencies
- Events, Publications and Filings
- Committees and Working Groups



# TIA 222

TIA-222-G to TIA-222-H

Continuing the evolution and improvement process

- Emphasis on climbing facilities
- Change to risk categories, exposure, & topography for structural loading
- Updated wind, ice and seismic provisions (ASCE and ATC web site)
- New structural engineering research (AISC)
- Reference to TIA-322 (existing 1019A), rigging plans and PMI's
- Mount classification and safety requirements
- Enhanced inspection criteria
- Feedback from industry participants

**Expected completion 2nd half of 2016**

# TIA 222

- **Feasibility Structural Analysis**
  - Defines impact of proposed changes
  - Macro view of the structure
  - Does not include connections
  - May assume the structure is properly constructed and maintained.
- **Rigorous Structural Analysis**
  - May assume the structure is properly constructed and maintained.
  - Use to determine the final acceptance of proposed changes.
  - Must determine the overall stability and adequacy of the structural members, foundations and connection details.
  - Foundation analysis must be site specific
  - Assumptions about details that are not visible or cannot be discerned without extensive field testing must be documented.

# Existing Structures – The minimums

- The report must state the type of analysis performed.
- A feasibility report shall state that final acceptance of changed conditions shall be based upon a rigorous structural analysis.

# Existing Structures - Modifications

- Must be based upon a Rigorous Structural Analysis
- Design Document shall be prepared indicating modifications
- Prior to implementation of the modifications the items designated by the engineer shall be verified



# Climbing Facilities



# TIA-222-G

- Climbing facilities are divided into two classes, A and B.
- New Structures must have a climbing facility with a safety climb device
- The Safety Climb system must be labeled to ensure the climber selects the appropriate safety sleeve
- Standard cable size is 3/8"
- Strength requirements are defined

# Climbing Facilities

- **Table 12-1: Classification of Climbing and Working Facilities**

User		Class
Authorized (Basic) or Competent (Skilled) Climbers		A
Competent (Skilled) Climbers only		B

# Climbing Facilities

- Rung spacing shall be from 10" to 16".
- Clear Spacing from side to side is 12"
  - Safety Rail: Must increase clear spacing equal to rail width.
- Step bolts:
  - 0.625" diameter minimum
  - Horizontal spread cannot exceed 24"
  - Clear width for step bolts shall not be less than 4.5 in. [110 mm]; provisions shall be made to ensure a climber's foot cannot slide off the end of a step bolt;
- Round rungs cannot be less than 0.625" diameter or greater than 1.50".
- Flat rungs shall not be wider than 1.50"
- Rest Platforms every 150' for Structure 500' and taller
- The size of steps, rungs and side rails shall be uniform in the same continuous length of climb.
- Note: Structures that do not meet the requirements of this section shall be equipped with warning signs.

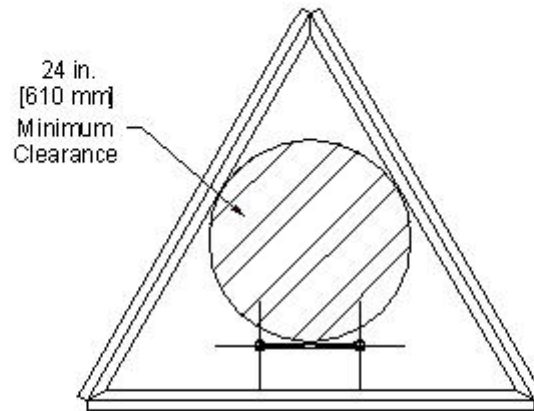


# Climbing – Notes

- When a safety climb device is not continuous over the entire height, climber attachment anchorages shall be available at a maximum spacing of 4 ft [1.2 m] over the height not equipped with a safety climb device.
- A safety climb device is not required for each climbing facility when multiple climbing facilities are provided. The safety climb device shall be provided for the climbing facility that is continuous over the height of the structure.
- Ladder cages and hoops are not recommended for communication structures due to the need to service the structure at various locations. If provided, a separate safety climb device is not required.
- Climbing and safety climb devices need not be installed over the entire height of a structure when their installation would adversely affect the performance of an antenna. In such case, the structure shall be equipped with a warning sign or climber attachment anchorages shall be provided in accordance with the requirements of Note 1.
- Structures not designed for nor equipped with a climbing facility over their entire height (i.e. structures not intended to be climbed that are maintained by other access means), need not have warning signs.

# Climbing – Notes

- Class A facilities
  - 24” clearance shall be provided from the centerline of a climbing facility
  - A minimum clear space shall be provided at rungs, steps, step bolts, or applicable tower members equal to 4 in. [100 mm] vertically, 4.5 in. [110 mm] horizontally, and 7 in. [180 mm] deep.



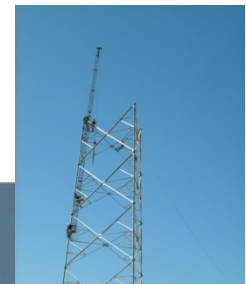
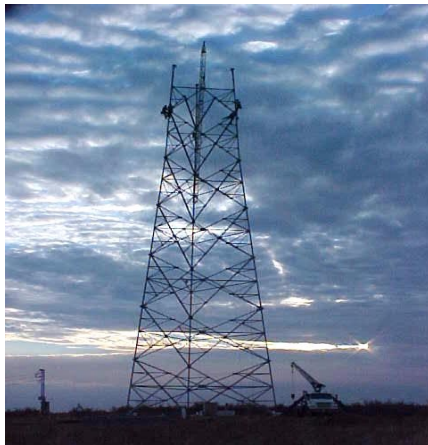
# Climbers – Defined

- **Authorized (Basic) climber:** an individual with the physical capabilities to climb who may or may not have previous climbing experience but has training in fall protection regulations, the equipment that applies to the field including instruction for their proper use; able to climb designated fixed access routes equipped with safety climb devices.
- **Competent (Skilled) climber:** an individual with the physical capabilities to climb, has actual climbing experience and training in fall protection regulations including the equipment that applies to the field and who is capable of identifying existing and potential fall hazards; and who has the authority to take prompt corrective action to eliminate those hazards; and who is able to climb safely a structure away from fixed access routes.

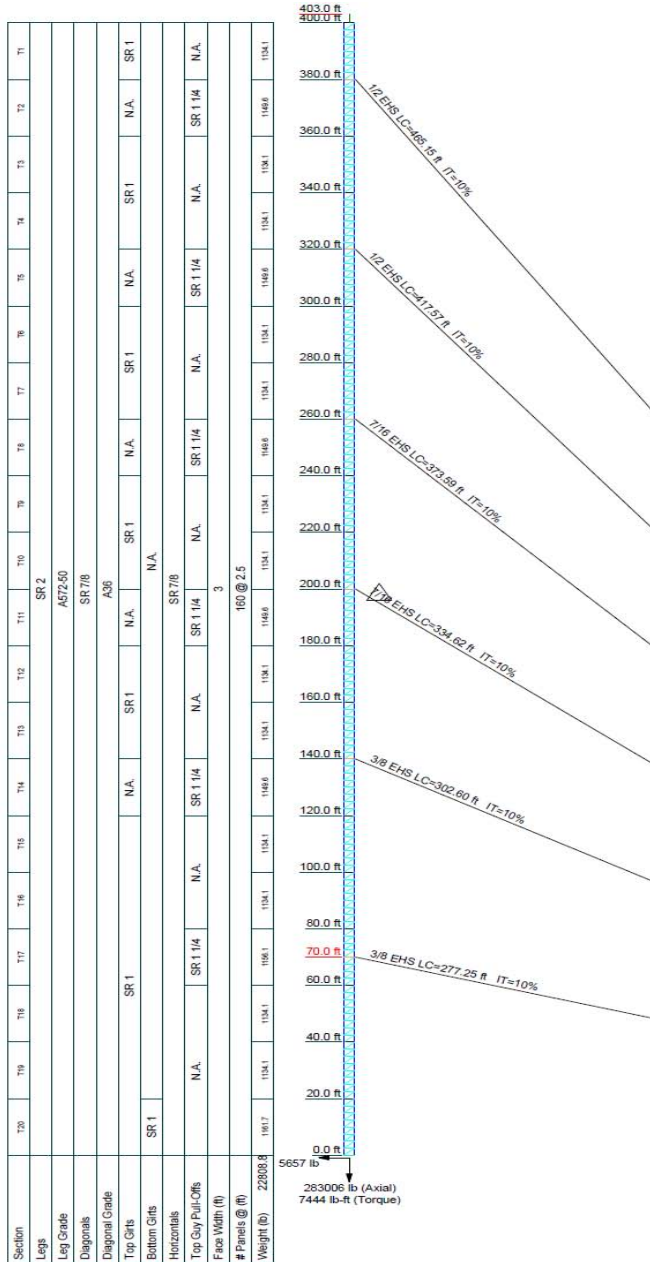
# TIA-1019

## Standard for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas

- Outlines the construction loads to be considered for structural analysis
- Typical construction equipment considered
  - Cranes
  - Gin Poles
  - Lifting Blocks
  - Attached Rigging



# Customer Supplied Drawings to Contractor



- Elevation and plot plans
- Section face width (36")
- leg size maximum (2")
- Z-bracing detail (7/8")
- Section length (20')
- Section maximum weight (1,200 lbs.)
- Guy wire sizes (3/8, 7/16 and 1/2 inch)
- Guy wire maximum tension (2,600 lbs.)
- Distance vertically between guy wires. (70')

# Operational and Non-Operational Conditions

- Operational [During a Lift]
  - **Conditions in which the structure is subject to loading during a lifting sequence, or other construction activity.**
    - **Gin pole and rigging equipment loads**
    - **Unequal guy forces (pulling or slippage)**
    - **Hoist loading**
- Non-Operational
  - **Any other time during the construction duration.**
    - **Wind load conditions based on a construction duration factor**

# Operational Conditions

- Loading conditions during construction activity

- Wind speed loading – 30 mph

- Over 30 mph is a special condition

- Gin Pole Loads

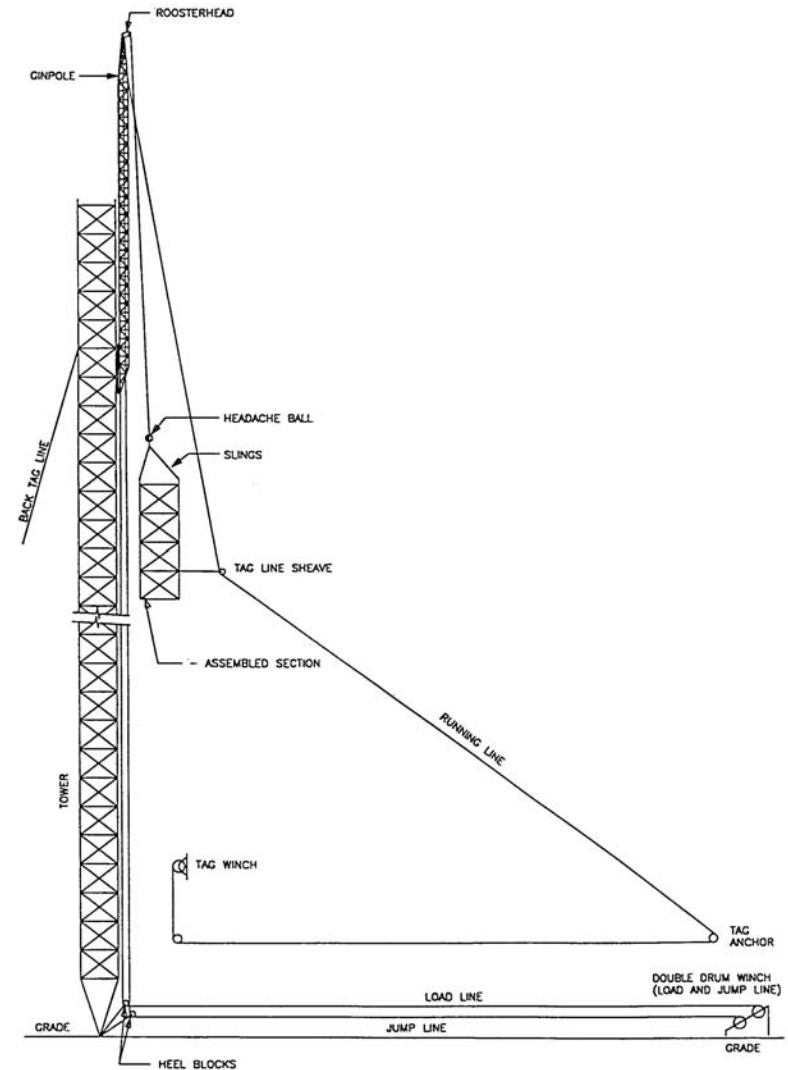
- **Bridle forces**
- **Basket forces**

- Hoist load line forces

- **Crown block loading**
- **Heel block loading**

- Guy Cable Forces During Erection

- **Unequal forces on the mast**
- **Includes potential slippage**





# Non-Operational Wind Loads [During Construction]

## Construction Period

Continuous work period

## Minimum Factor

0.50 (0.5 x 90 mph = 45 mph)

Less than 24 hours  
(overnight conditions)

0.60 (54 mph)

24 hours to 1 week

0.67 (60 mph)

1 week to 6 weeks

0.75 (67.5 mph)

6 weeks to 6 months

0.80 (72.0 mph)

Greater than 6 months

1.00 (90 mph or greater)

[Wind Speeds are 3-Second Peak Gust]

# Rigging Plan Classes

- **Class I (Competent Rigger)**
  - The scope of a work as determined by a Qualified Person does not effect the integrity of the structure and the proposed rigging loads are minor in comparison to the strength of the structure.
- **Class II (Competent Rigger)**
  - The scope of work involves the removal or the addition of appurtenances, mounts, platforms, etc. that involve minor rigging loads in comparison to the strength of the structure and that do not require the use of gin poles rated higher than **Class A**.
- **Class III (Qualified Person)**
  - The scope of work involves the use of pre-approved rigging plan.
- **Class IV (Qualified Person and Qualified Engineer)**
  - The scope of work involves custom or infrequent construction methods, removal of structural members, special engineered lifts and unique situations.

“Note” Written rigging plans are required for class II, III & IV plans

# Rigging Plan Definitions

- **Competent Rigger:**

Is a person knowledgeable and experienced with the procedures and equipment common to the Communication Structures Industry, and trained to identify hazards with authorization to take prompt corrective measures.

- **Qualified Person:**

Is a person knowledgeable, experienced, trained and capable of developing rigging plans and that has successfully demonstrated the ability to solve, resolve and coordinate construction related to the Communication Structures Industry.

- **Qualified Engineer:**

Is a professional engineer knowledgeable and experienced in the Communication Structures Industry.

# Tower Information Template

- Information required for documented Rigging Plan.
- Sample template to input tower information.

<b>Rigging Plan</b>		<b>Date:</b> February 5, 2010	
<b>Site Information:</b>			
<b>Site Location:</b>	Mars, Texas		
<b>Customer:</b>	Customer X		
<b>Job Number:</b>	637		
<b>Rigging Plan Class:</b>	<input type="checkbox"/> I <input type="checkbox"/> II <input checked="" type="checkbox"/> III <input type="checkbox"/> IV		
<b>Persons Responsible:</b>	<b>Name:</b>	<b>Company:</b>	<b>Phone:</b>
<b>Competent Rigger:</b>	Joe Smith	Z Company	210-456-6789
<b>Qualified Person:</b> <input type="checkbox"/> N/A	Terry Smith	Z Company	210-456-6789
<b>Qualified Engineer:</b> <input checked="" type="checkbox"/> N/A			
<b>Type of Structure:</b>			
<input type="checkbox"/> Pole <input type="checkbox"/> SST <input checked="" type="checkbox"/> Guyed <input type="checkbox"/> Rooftop <input type="checkbox"/> Other			
<b>Type of Work:</b>			
<input checked="" type="checkbox"/> Installation of New Structure		<input type="checkbox"/> Add or Remove Antennas	
<input type="checkbox"/> Add or Remove TX Lines		<input type="checkbox"/> Add or Remove Mounts	
<input type="checkbox"/> Replace Structural Members		<input type="checkbox"/> Add Reinforcement	
<input type="checkbox"/> Change Guys		<input type="checkbox"/> Other	

# RESPONSIBILITIES

- THE CONTRACTOR CREATES THE RIGGING PLAN TO PERFORM THE MODIFICATION.
- Determine the class of the rigging plan
- Engineer knows what needs to happen
- Contractor knows how it must happen

# RIGGING PLAN

## **QUALIFIED ENGINEER**

- DOES NOT CREATE THE RIGGING PLAN
- VERIFIES THE IMPACT OF THE RIGGING PLAN ON THE STRUCTURE



# RIGGING PLAN REVIEW

## THE PROCESS

1. THE RIGGING PLAN IS CREATED
  - Contractor communicates the how
  - Sets expectations i.e. re-use, time, adaptability
2. QUALIFIED ENGINEER REVIEWS THE STRUCTURES *STATIC* STATES THAT ARE REPRESENTED IN THE RIGGING PLAN.
  - A REANALYSIS IS A STATIC REVIEW OF THE STRUCTURE.
  - EACH STAGE OF THE RIGGING PLAN REQUIRES AN ANALYSIS

## PRIMARY QUESTION

WHAT IS THE IMPACT TO THE STRUCTURE AT EACH STAGE OF CONSTRUCTION?

# TIA-1019-A IS CHANGING

- What is TIA-1019-A
  - Will be replaced by two standards.
- ANSI/ASSE A10.48-2015 (Means and Methods)

American National Standard Construction and Demolition Operations  
Criteria for Safety Practices with the Construction, Demolition, Modification  
and Maintenance of Communication Structures

  - Increased scope compared to TIA-1019-A
- TIA-322 (Design)

Loading Criteria, Analysis, and Design Related to the Installation, Alteration  
and Maintenance of Communication Structures

# The Essentials

- Must maintain a communicative language between ASSE 10.48 and TIA-322.
  - Common terms
    - Qualifications
    - Duration periods
- Standards must stay in Sync

# ANSI/ASSE A10.48-2015 and TIA-322

- Cooperative approach between ASSE and TIA – MOU
- Coordinate publication
- Joint Editorial Relationship

# ANSI/ASSE A10.48-2015 - CONTENT

- 1 General
- 2 References
- 3 Definitions

## SOME COMMON TERMS WITH TIA-322

- COMPETENT CLIMBER
- COMPETENT PERSON
- COMPETENT RIGGER
- CONSTRUCTION DURATION
- CONSTRUCTION LOADS
- LOAD CHART
- OPERATIONAL LOADS
- NON-OPERATIONAL LOADS
- QUALIFIED ENGINEER
- QUALIFIED PERSON
- RIGGING PLAN

# ANSI/ASSE A10.48-2015 - CONTENT

## **4 Pre-Job Planning**

- 4.1 Objective
- 4.2 Risk Assessment
- 4.3 Scope of Work (SOW)
- 4.4 Job Hazard Assessment (JHA)
- 4.5 Pre-Job Meeting
- 4.6 Multi-Employer Work Sites
- 4.7 Competent Person
- 4.8 Rigging Plans
- 4.9 Emergency Information
- 4.10 Rescue Plan (Site Specific)
- 4.11 Training



# ANSI/ASSE A10.48-2015 - CONTENT

## **5 Job Site Conditions**

## **6 Fall Protection**

## **7 Radio Frequency/Electro Magnetic Energy**

7.1 Objective

7.2 RF Hazard Overview

7.3 RF Safety Program

7.4 Hazard Identification and Assessment

7.5 Hazard Prevention and Control

7.6 Control Options

7.7 Multi-Employer Work Sites

7.8 Information

7.9 Training

# ANSI/ASSE A10.48-2015 - CONTENT

- 8 Base Mounted Hoists Used for Overhead Material Lifting and Personnel Lifting**
- 9 Personnel Lifting Accessories and Process**
- 10 Rigging**
- 11 Gin Poles and Other Lifting Devices**
- 12 Climbing Facilities and Access**
- 13 Structure Construction Loading Considerations**
- 14 Training**
- 15 Capstan Hoist**
- 16 Demolition**
- 17 Helicopter Used for Lifting Loads**

**Appendix – Various forms and resources**

# ANSI/ASSE A10.48-2015 - CONTENT

## Appendix

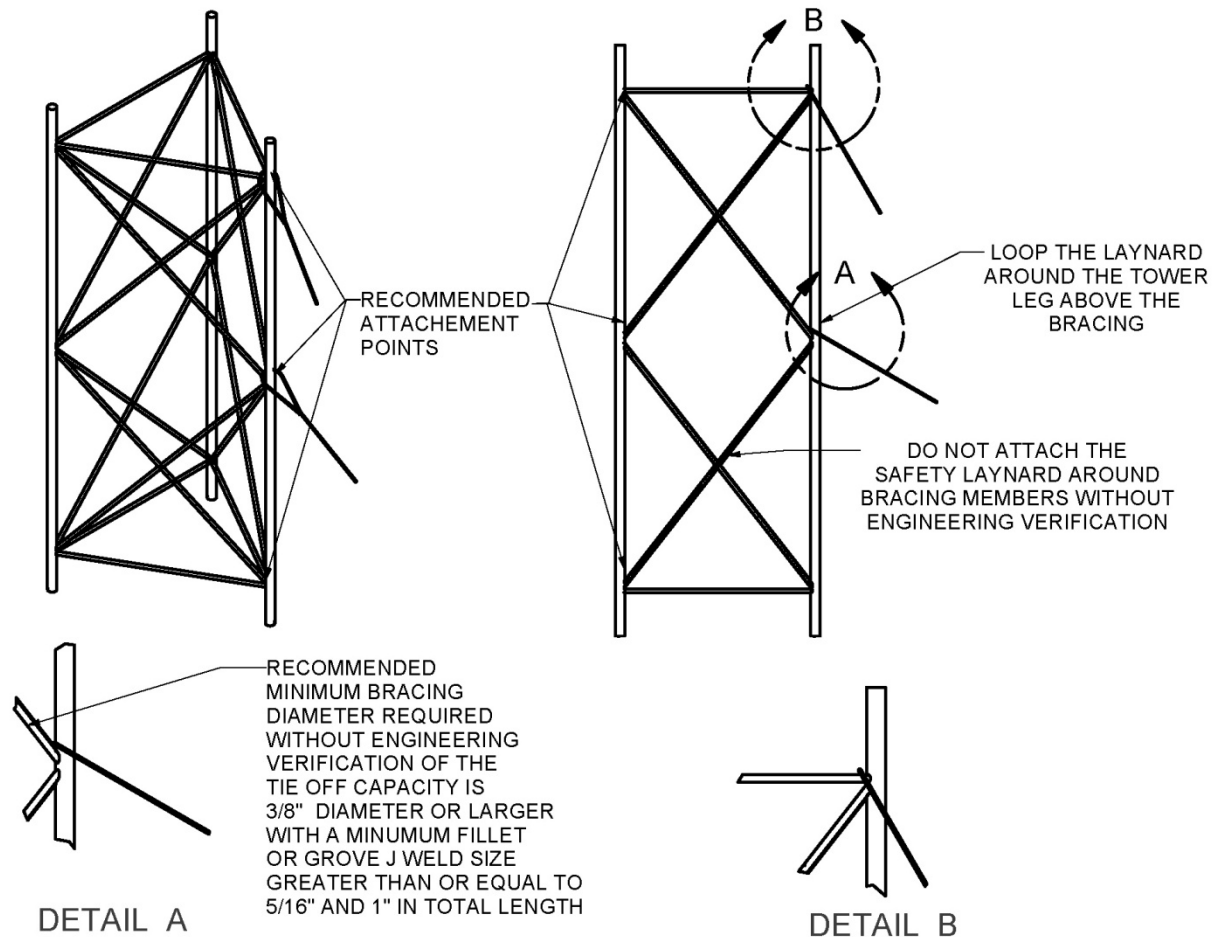
- A-4(a) Pre-Job Survey Form
- A-4(b) Emergency Data Sheet
- A-4(c) Site Specific Rescue Plan
- A-4(d) Rigging Plan Template
- A-5(a) Job Hazard Assessment
- A-8(a) Hoist Daily/Monthly Checklist
- A-8(b) Hoist Hand Signal Chart
- A-11(a) Typical Vertical Gin Pole Arrangement With Straight Tag
- A-11(b) Typical Vertical Gin Pole Arrangement With Trolley Tag
- A-11(c) Tilted Gin Pole
- A-11(d) Typical Rooster Head Assembly
- A-11(e) Typical Load Part Configurations
- A-11(f) Typical Bridle and Basket Supports
- A-11(g) Vertical Gin Pole Standard Load Chart Template
- A-11(h) Gin Pole Free Body Diagram with Straight Tag
- A-11(i) Lifting Pole Arrangements
- A-13(a) Heel Block Attachment
- A-13(b) Sling Load Angles
- A-13(c) Wrap Efficiency
- A-13(d) Lift Arrangements
- A-13(e) Tag Force Loads
- A-13(f) Example of Information for Determination of Load Line & Tag Line Forces
- A-13(g) D:d Ratios for Wire Rope Sheave Efficiency
- A-13(h) Load Line Conversion Chart Degrees to Inches and Feet
- A-13(i) Horizontal Support Bracing
- A-13(j) Horizontal and Diagonal Support Bracing
- A-13(k) Diagonal Support Bracing
- A-13(l) Temporary Guy Wire Support
- A-13(m) Non-Slip Connections with 95 to 100 Percent End Efficiency
- A-13(n) Non-Slip Connections with 70 to 80 Percent Efficiency
- A-13(o) Connections That May Slip Under Certain Use Conditions
- A-13(p) Typical Wire Rope Clip Torque Requirements (Torque Under Load)
- A-14(a) Telecommunication Guidelines for Skills Based Training

## TIA-222-G

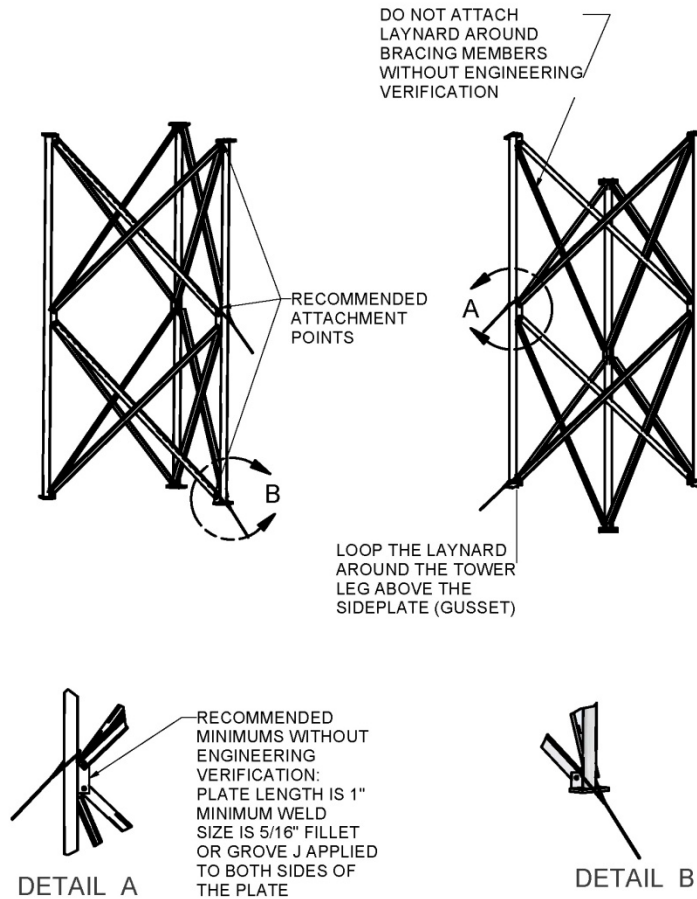
Climbing Attachment Anchorages – A guideline for the climber.

- Intent is to provide guidelines
- Diverse climbing situations
- Conservative
- Cannot replace knowledge and experience

# Annex I – Climbing Attachment Anchorages – A guideline for the climber.



# Annex I – Climbing Attachment Anchorages – A guideline for the climber.





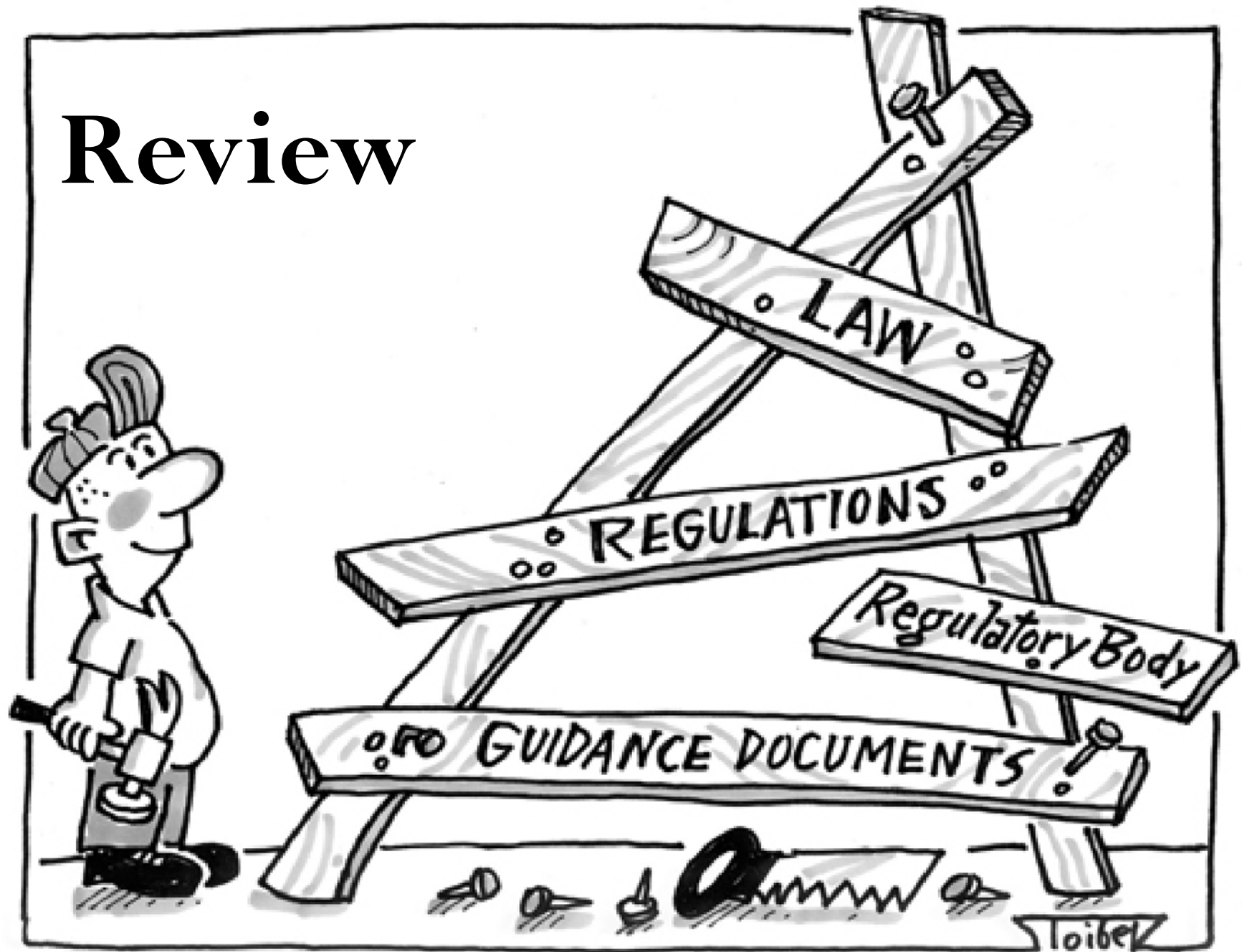
# TIA-222-H Climbing

- Improved facilities at exit ports on Pole Structures
  - 360 degree access
  - Engineered Anchorages
  - Overhead Engineered Anchorages?
- Review of step bolt quality to improve reliability
- Review retrofit designs
- Review Engineered anchorages  
(increase number of locations and type)

# Measuring Risks – Climbing Safety



# Review



# Safety Climb Overview

- 
- Safety climb cables/rails are considered part of the structure by the TIA Standards
- The TIA maintenance and condition assessment requirements apply to the structure and safety climb cable/rails and their attachments to the structure.
- The periodic inspections of the safety climb cable are not a substitute for the inspections required prior to use as part of a fall protection plan in accordance with OSHA and manufacturer requirements.
- General Contractors are required by OSHA to ensure a safe working environment for their employees which includes the training and proper use of fall protection equipment.
- The safety climb cable becomes part of the Personal Protective Equipment (PPE) when the contractor elects to use the cable as part of the fall protection plan.
- In accordance with OSHA requirements, all PPE to be utilized in the fall protection plan must be inspected prior to use.

# Some of the TIA Standards regarding climbing facilities?

**Climbing facilities:** a climbing facility is a series of attachments installed on a support structure, or antenna, on which a climber may step while ascending or descending, and which may incorporate or employ:

- (a) steps, rungs, cleats and/or structural members which form an integral part of the structure;
- (b) rungs, cleats or step bolts which are attached to the structure; or
- (c) climber attachment anchorages.

## Notes:

1. When a safety climb device is not continuous over the entire height, climber attachment anchorages shall be available at a maximum spacing of 4 ft [1.2 m] over the height not equipped with a safety climb device.
2. A safety climb device is not required for each climbing facility when multiple climbing facilities are provided. The safety climb device shall be provided for the climbing facility that is continuous over the height of the structure.
3. Ladder cages and hoops are not recommended for communication structures due to the need to service the structure at various locations. If provided, a separate safety climb device is required for structures over 30 ft. [9 m] in height.
4. Climbing and safety climb devices need not be installed over the entire height of a structure when their installation would adversely affect the performance of an antenna. In such case, the structure shall be equipped with a warning sign or climber attachment anchorages shall be provided in accordance with the requirements of Note 1.
5. Structures not designed for nor equipped with a climbing facility over their entire height (i.e. structures not intended to be climbed that are maintained by other access means), need not have warning signs.

# Climber Attachment Points - Examples

- When a Safety Climb Cable is blocked on a monopole there are several possible solutions available so the climber can maintain 100% tie off. **Anchorage attachments must meet the strength requirements of the TIA-222 Standard including the attachment to the structure, e.g. step bolt clips.**



*Climb Leg Mount Applications*

# Alternate Means of Access

- Some sites may not have a climbing facility
- Alternate means of access, i.e. mechanical lift, crane, etc.



# Obstruction to Climbing (Example)

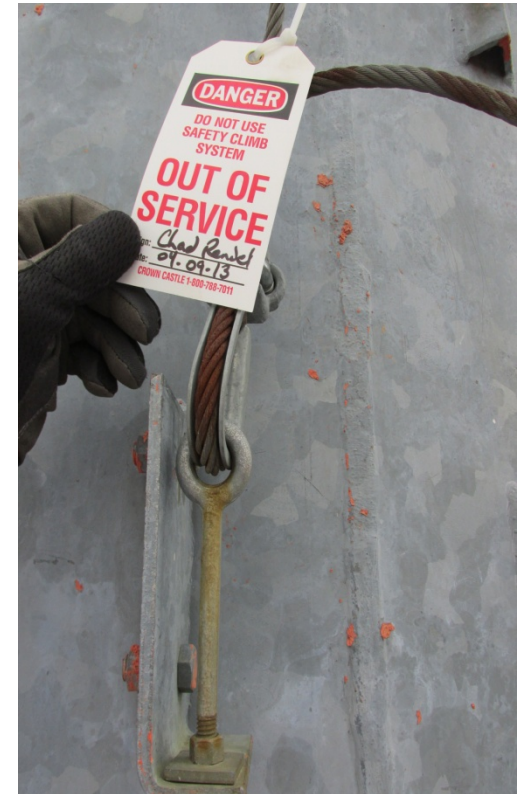
- If obstructions are observed during TIA Inspections or identified by a contractor signage is required alerting future Contractors that the Climbing Facilities are blocked so they can plan accordingly:





# Sites Requiring Immediate Action

- Immediately tag out the safety climb
- Open a Safety Climb Trouble Ticket



# Safety Climb Inspection– Damaged Cables

**Safety Climb Cables  
damaged by the Antenna  
Mount. Open Safety  
Climb Ticket.**



# Capital Safety - Carrier Inspection Points and Required Actions

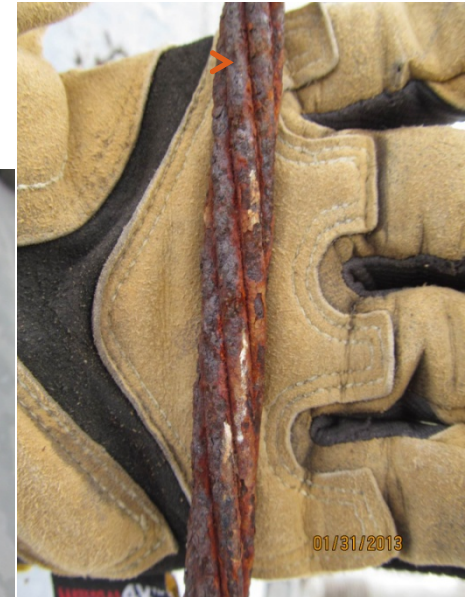
- Corrosion
- Does not have the
- 1" – 2" required tail?
- Anything else?
- Replace Strandvise/carrier
- assembly if you have the
- parts and capabilities
- Tag out and open a ticket



04/09/2013

# Safety Cable Inspection Points and Recommended Actions

- Damaged Cables
- Tag Out and replace





# Capital Safety – Strandwise guidance

- If the cap is missing and any of the following conditions exist – debris in carrier, the cable is below 1", water is present or corrosion is noticeable in the Carrier, replace the cap and all internal components



# Rust





# Cable Impingement



# Cable Blockage





# Cable Blockage



# Cable Impingement





# Cable Impingement



# Cable Impingement



# Cable Issues





# What's up Top?



# What's Up Top?





# What's Up Top?



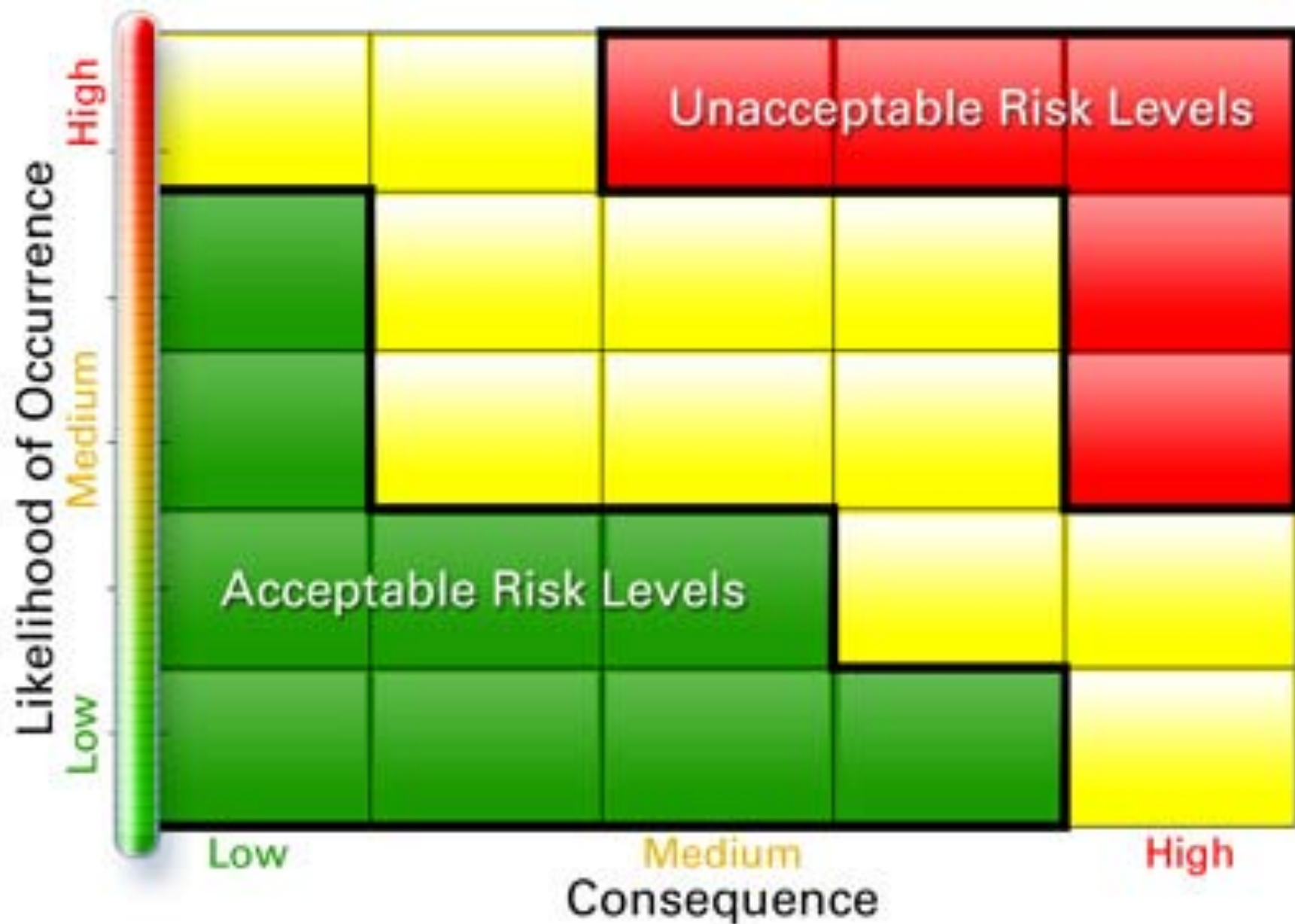


# Newly Installed... A Serious Concern



# Positive Connection with Anchorage Points





# Discussion – Cutting the Risk



- Pinched cables
- Trapped cables
- Worn cables
- Deteriorating cables
- Rust
- Improper installation
- Obstructions

- Anchorage Points
- Signage
- Tag out
- Vendor selection
- Increased inspection
- Photo documentation
- Training
- Consistent standards



# Proposed Mount Standard

# Summary of Standard

- The mount class provide a means of establishing a mount “rating” or capacity that can be used to complete a comparative analysis when new loads are contemplated.
- Eliminates rigorous analysis each time the load changes
  - Compute the new antenna lateral and vertical loads which are compared to a mount rating
- Allows regional and site specific review
- Universal approach





The specification will address overload issues.

# How does it work?

- Lateral and vertical loads are applied to the antenna locations, i.e. 400 lbs. at 4 locations
- The application of the loads are defined (standardized). The definitions are referred to as a “Mount Class”
- A standard nomenclature is assigned to each “Mount Class”

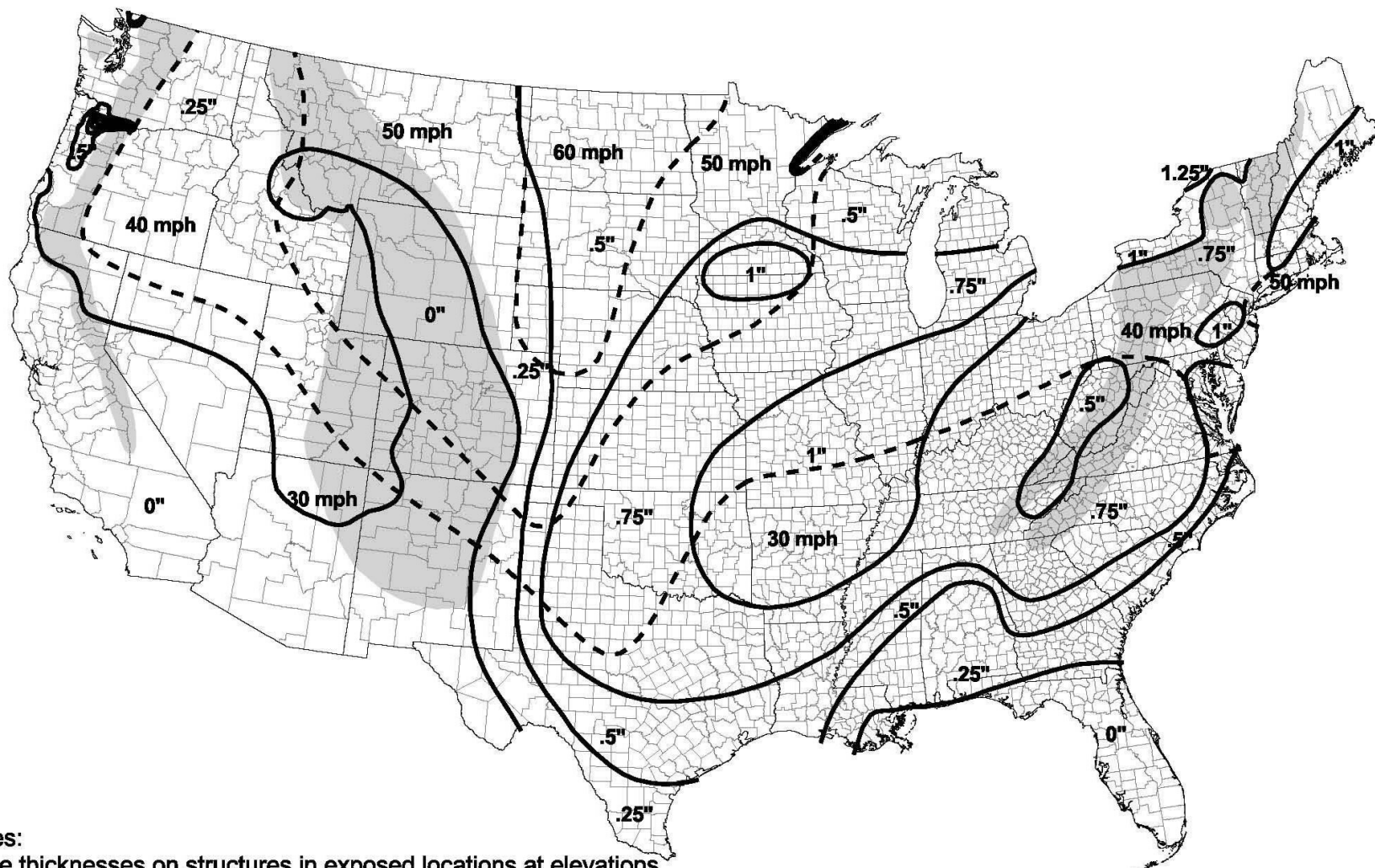


# Example:

- M600R5
  - Mount has 5 locations, M600R5
  - Will support 600 lbs. per antenna pipe location, M600R5
  - “R” category, M600R5

Category R mounts are intended to support mounting configurations where the effective projected areas of the front and side faces at a mounting pipe location are similar. Examples would be panel antennas mounted back-to-back, single panel antennas with radio equipment or other appurtenances mounted behind the antenna and single symmetrical shaped antennas.

Equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval



Notes:

1. Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.
2. In the mountain west, indicated by the shading, ice thicknesses may exceed the mapped values in the foothills and passes. However, at elevations above 5,000 ft, freezing rain is unlikely.
3. In the Appalachian Mountains, indicated by the shading, ice thicknesses may vary significantly over short distances.

Ice thickness zones ———  
Gust speed zones - - -

$t_i$ inch [mm]	$V_i$ mph [m/s]
0.25 in. [6.4 mm]	30 mph [13 m/s]
0.50 in. [12.7 mm]	40 mph [18 m/s]
0.75 in. [19.0 mm]	50 mph [22 m/s]
1.00 in. [25.4 mm]	60 mph [27 m/s]
1.25 in. [31.8 mm]	70 mph [31 m/s]

# Other Content

- Requires mount marking
- Requires mount drawings to contain the minimum amount of information required to allow a third party engineer to complete an analysis.

# Future

- Will be added to TIA-222-H as an Annex.
- Some feed back indicates additional clarification is required

# Economics

- May increase the cost of some mounts
  - Ice loads
- Some cost increases can be mitigated by using regional wind loading values instead of values listed in the specification when comparing the induced loading to the load rating
  - 90 mph at 200' instead of 140 mph at 400'.
  - 0.5" of ice instead of 1" of ice or in the Southwest no ice.



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