



BUILDING GLOBAL COMMUNICATIONS

## Approved by General Counsel

TR-14.7 Meeting Report

Date: 05/07/07

Location: Atlanta, GA

Approved: 07/11/07

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BUILDING GLOBAL COMMUNICATION

COMMITTEE CORRESPONDENCE

TELECOMMUNICATIONS INDUSTRIES ASSOCIATION (TIA)  
Standards and Technology Department  
Meeting Report  
Subcommittee TR 14.7 - Steel Antenna Towers and Antenna Supporting Structures  
May 7th, 2007

**Double Tree Hotel Atlanta Airport  
3400 Norman Berry Drive  
Atlanta, GA 30344  
404-763-1600**

Members Present (28)

Members Absent 29

Others Present 25

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Call to Order and Opening Remarks

8:05 – Meeting of TR 14.7 Subcommittee – A quorum was present

8:10 – Roll Call & Introduction – Brian Reese TR 14.7 Chairman

- a. General introduction regarding the TR14 committee & TR 14.7 sub-committee.
- b. The Chair requested members update the distributed TR 14.7 membership list.
- c. Introduction of Marianna...
- d. Introduction of participants
- e. The Chair reviewed the day's meeting agenda.
- f. The Chair encouraged anyone who was aware of intellectual property that relates to the work of TR-14.7 to make the appropriate statements as early as possible in the process. The Chair directed the members to the TIA Engineering Manual, and the TIA web site ([www.tiaonline.org](http://www.tiaonline.org)), for the specific requirements.

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- g. The Chair reviewed TIA rules on sending Subcommittee correspondence. All Subcommittee documents are available on TIA's web site (www.tiaonline.org) and are only available to Subcommittee members. Recent documents will be uploaded to the TIA website by the Secretary.
- h. The Chair reviewed membership requirements and voting eligibility. Voting eligibility is maintained by being current with membership dues and attendance at two meetings.
- g. Acceptance of report from October 10, 2007 in San Francisco. Motion by John Erichsen and seconded by Bill Griswold. Motion carries by unanimous vote.

8:15 – Old Business – none

8:20 – Reviewed submittal forms – Request for Clarification and Request for Proposed Change

8:25 – Tom Hoenninger – Summary of the status of the IBC acceptance of TIA-222-G. The standard was accepted by the formulation committee. The final adoption is anticipated by the end of May. California will adopt the 2006 IBC with 2007 supplement on January 2008. Florida, Ohio, City of New York and City of Phoenix Formal publication by the end of the year.

- Dave Brinker – How will the addendum be accepted by the IBC?  
Tom Hoenninger will investigate this adoption process.
- How will IHS sell the standard with the addendum? Marianna will check with HIS to confirm the sales approach that will be used to distribute the standard and the addendum. Dave Brinker motions that the editorial committee is involved the distribution decision.
- Will the addendum be sold separately? Compiled with revision G? Motion by Dave Brinker to set an effective date (approval date) for the addendum and place it on the summary of changes. The effective date is not the same as the publish date.

8:49 – Structural Reliability Task Group Update

Covered three issues

1. Corrosion – Crown Castle provided a summary of the approach used to inspect for corrosion.
2. Fall radius – Direction for the next phase was discussed and outlined.
3. Monopole Base Plate – Discussed AASHTO findings and experience with Monopole reliability. A representative from AASHTO is invited to the next meeting to outline and discuss AASHTO's experience with monopole design and use.

8:55 – Construction Standard Update – Dave Brinker on behalf of Ernie Jones and Gordon Lyman

No longer a “Gin Pole Standard” It is being broadened to include the construction, alteration and maintenance of a tower.

Additions:

- o Classification of the rigging plan
- o Loads on structure during the construction period

The standard will require another year of formulation for approval by the main committee and approximately another year for editorial review and approval by TIA and ANSI.

Questions:

- Is NATE involved in the formulation of the standard? Yes
- Does the standard address who is in responsible charge of the site? Yes, it will be included in the rigging plans that are outlined in the standard.

A copy of the summary prepared by Ernie Jones will be attached to the minutes

9:00 – Addendum 2 items – Dave Brinker - Issues that have been brought to the attention of the editorial committee. These issues will not affect the pagination and will not require the creation of new sections within the standard. These issues will be very easily adopted into addendum 2. They are:

From Dave Brinker:

**1. Shielding Factor, Ka, Section 2.6.9.2**

Should limitations be placed on allowing  $K_a = 0.8$  for antennas when three or more are mounted at the same relative elevation? For example, when antennas are cantilevered above the structure where shielding effects from the structure would not be present.

**2. Antenna Mounting Pipes, Section 2.6.9.2.1**

Specify what  $C_a$  to use for determining the EPA of mounting pipes for the portion above and below the supported antenna.  $C_a$  depends on the aspect ratio of the mounting pipe. Wind cannot travel around all sides of the mounting pipe. Actual  $C_a$  likely to be between 0.7 and 1.2. Suggest specifying  $C_a = 1.0$  for consistency.

**3. Shielding, Section 2.6.9.4**

Shielding is allowed (2.6.9.2.1) for mounting pipes even when  $K_a < 1.0$  is used for the condition of three or more antennas mounted at the same relative elevation. An exception should be noted in 2.6.9.4 which now states that no shielding is allowed when a  $K_a$  value  $< 1.0$  is used. Clarification should also be given in 2.6.9.2 for shielding of mounting pipes.

**4. Transmission Lines Mounted in Clusters or Blocks, Section 2.6.9.5**

Assuming a single row of lines as individual lines for the wind normal condition and assuming the same row of lines as an equivalent cluster for other wind directions results in lower EPA than intended. A statement should be added to clarify that the treatment of lines must remain the same for all wind directions.

**5. Earthquake Loading, Section 2.7**

Need to review ASCE 7 05 and proposed addendum for impact on TIA-222-G.

**6. Weight Considered for Direct Burial Poles, Section 2.7.7.1**

The term  $W$  is defined as the total weight of the structure. For direct burial poles, clarify that the weight of the pole below grade is not included. Define weight “ $W$ ” as the weight of the superstructure.

**7. Double Angles, Section 4.5.3**

Double angles with close spacing of stitch bolts should not have to be considered as individual angles for the out-of-plane buckling direction. Suggest to allow the use of the modified  $KL/r$  equation that was used in Rev F (first equation in Rev G section 4.5.3) when intermediate connectors result in weak axis slenderness no greater than 75% of the slenderness in the out-of-plane direction considering the angles acting together. This would remove the requirement of multiple bolted end connections.

When both end and intermediate connectors are fully tensioned, the second equation in 4.5.3 may be used, regardless of the spacing of the intermediate connectors. The words high strength should be added to avoid the use of A307 and other similar bolts being tensioned to 70% of their ultimate tensile strength in order to justify the use of the lower modified slenderness equation.

For both equations, a limitation should be given to limit the maximum modified slenderness to the slenderness considering the angles as individual members in the out-of-plane direction.

When large stitch bolt spacing is used and if either the end bolts or the intermediate connectors are snug tight, the slenderness of the individual angles in the out-of-plane direction should be used (the third equation in 4.5.3).

Fonts in this section should be fixed.

#### **8. Joint Eccentricities, Section 4.8.1.1**

When joint eccentricities exceed normal framing eccentricities, the eccentricity to be considered in the combined stress equation should be clarified (from leg centerline or from the face of the leg). This is a significant consideration for solid round legs.

#### **9. Tubular Slip Splice Lengths, Section 4.9.7.1 & 13.3.5**

ASCE 48 has adopted a minimum installed slip joint length ratio of 1.5. The same criteria should be used by TIA-222-G. The design slip and tolerances should be revised accordingly.

#### **10. Anchor Rod Combined Stress, Section 4.9.9**

The combined stress equation from ACI 318 should be used for anchor rods as shear friction is not applicable to ungrouted anchor rods.

#### **11. Compact Polygonal Shapes and Effective Stress Equations, Table 4-8**

Compact polygonal shapes should be treated in a similar manner as compact circular shapes and be able to develop their full plastic moment capacity. This is supported by the test data used for the equations in Table 4-8. The additional strength capacity was not used by ASCE 48 as the strength levels in ASCE 48 were intended to be limited to first yield to avoid permanent deformation under the NESC loading combinations (50 year return extreme wind condition). This is not the case with the TIA-222-G standard (200 to 1000 year returns) as demonstrated for circular shapes. The ASCE 48 equations should be extended in the compact regions limited to a nominal strength equal to the yield strength times the plastic section modulus "Z".

The ASCE 48 equations are based on actual tests and represent the lower bound of all test results. This is equivalent to a nominal strength times a resistance factor. The equations in TIA-222-G should be divided by 0.90 so that the proper design strength levels will be obtained.

This increase in strength is an opportunity to adjust the gust effect factor for poles in section 2.6.7.3. This would result in a value of 1.22 which could be rounded up or down (1.25 or 1.20) at the committee's discretion. The current gust effect factor does not correlate well with the gust effect factor for flexible structures in ASCE 7. The 1.35 gust effect factor for poles supported on other structures may be kept at 1.35 (section 2.6.7.4).

Increasing the gust effect factor would not affect poles governed by strength if the effective stress equations in Table 4-8 were adjusted. Poles governed by stiffness would be affected which would be beneficial in light of the concern with fatigue for these structures.

#### **12. Guy Hardware, Section 7.4.5, 7.4.6.1**

Revise to include 1030 steel.

#### **13. Foundation Designs, Section 9.5**

Revise wording from “this” to “these” in second paragraph.

**14. Existing Foundations, Section 15.5.1**

Distinguish between towers and poles for factor to compare ASD reactions to Rev G. Suggest using a factor of 1.50 poles (1.6 x .95).

**15. Existing Structures, Section 15.7.1**

Revise wording in second paragraph regarding assumptions from “validated” to “resolved” or a similar term.

**16. Survival Condition, Annex A.2.3.2**

Include requirement of using an importance factor of 1.0 for a survival condition.

**17. Wind Ice Maps, Annex B**

Consider including ASCE temperatures occurring with ice (possible Rev H issue).

Revise notes for wind loads to interpolate (rounded to nearest 5 mph wind speed) vs. using the higher wind speed when a site is located between two contours. (Wind map based on contours, ice map based on zones).

**18. Typical Wireless Antenna Loading, Annex C**

Remove number of antennas in description and clarify lines as a single row or a defined cluster.

**19. Guy Tension Field Measurements, Annex J**

Consider adding submitted alternate method (possible Rev H issue).

**20. Nominal Strengths, Section 4.0**

Review latest AISC for changes to nominal strength equations used in TIA-222-G.

From the committee:

1. **Peter Moskal – Grounding: Section 10.0.** – Discusses the grounding in a general way. It requires the inclusion of geotechnical data and the needs of the facility. Section 15.0 – Existing Structures 15.6 exempts existing structures. Do the grounding requirements apply to existing structures? No, it does not apply to existing structures. Existing structures are exempt. The grounding in section 10.0 is intended to be a default or minimum. It does not override site-specific requirements.
2. **Tom Hoenninger – Insulators – Austin Insulators** – Would like to discuss section 8.0 and the phi factors. Mr. Hoenninger would like to revert to a safe working load philosophy. They would also like to review the proof loading requirements. 60% is considered too large. No recommendation for the proof load was provided. Austin would like to present their design philosophy.
3. **Madison Batt - U-Bolts:** Building officials have been rejecting the use of u-bolts based upon the manufacturer design guidelines. The standard does not address the use of U-bolts, their design and pretension. Madison Bate will provide a change proposal. This may be a revision H issue.
4. **John Robinson – Schifflerized angles** – John has researched the various techniques used to calculate the section properties for 60-degree angles. John will have more information at the next meeting.
5. **James Ruedlinger - ERS - Antenna Degradation** – Revision H - progress is ongoing.
6. **David Hawkins - Revise Annex M** to update the reference list and add new items. Dave Brinker will address the changes. The committee is encouraged to submit additions and revision.

Split ring washers in fully pre-tensioned connections –  
Review exposure categories as redefined by IBC and ASCE 7 to confirm an unambiguous definition exists. (See Exposure D – Water Ways)

11:35 - Lunch

1:05 – Introduction of Marianna Kramarikova [MKramarikova@tiaonline.org].

**Introduction to TIA the organization and the web site.**

- Overview of the Web Page – [www.tiaonline.org](http://www.tiaonline.org)
- Benefits of membership and associated fees
- New Contacts at TIA
- Definition of member codes
  - COMM – Committee member participants – Eligible to vote on TR14 issues (\$500 dues)
  - ECP – Committee member participants - Eligible to vote on TR14 issues (\$500 dues)
  - ME – Full member company – Can participate with any TIA committee (Dues are based upon company revenue)
  - FME – Formal member – Do not have voting rights, membership has lapsed
  - GP – Government Participant
- How does TIA-1019 fit into the committee structure? This issue is being investigated. TIA is currently contemplating a reorganization of TR14 committee. The result will affect TIA 1019's designation. 1019 and the structural reliability working groups will most probably be designated as working groups under TIA 14.7.

1:35 - Potential Revision H Issues and Assignments

*Excerpted from TR14.7 Denver (2004), St. Louis (2006), and San Francisco (2006) Meeting Minutes:*

1. Broadcast antenna degradation issues – Leader: James Ruedlinger Member: John Robinson, Adam Jones, and Dave Davies
2. Method for calculating section properties for 60 degree (Schifflerized) angles – Leader: John Robinson
3. Maintenance and inspection: corrosion and fatigue on guyed cables – to be addressed in Structural Reliability Task Group Leader: Craig Snider Member: Bill Griswold
4. Qualification of manufacturers/material testing/submittals – to be investigated by Peter Moskal Leader: Peter Moskal, Members: Doug Pineo, Wayne Davidson
5. New section addressing fatigue and the derivation of fatigue categories– Leader: John Wahba Members: Dave Hawkins
6. Base plate design methodologies/weld details of the base connection on monopole – to be addressed by the Monopole Task Group Leader: Dave Hawkins Member: Bill Griswold, Doug Pineo, Mike Morel, John Wahba (Structural Integrity Task Group)
7. Member replacements/erection stresses – presently being addressed in TIA-1019 Standard Leader: Ernie Jones and Gordon Lyman Members: (1019 Committee)
8. Heavy icing events – to be addressed by Leader: Ernie Jones
9. Design fall radius – to be addressed in Structural Reliability Task Group Leader: Steve Yeo Members: (Structural Integrity Task Group)
10. Structure modification and upgrades – Leader: Mark Malouf & Jean-Alan LeCordier (1019 Committee)
11. Concealed monopole structures – Leader: Mike Morel Member: Marcello Posada, Trey Nemeth
12. Reliability classes – vs. utility structures Leader: Dave Brinker
13. Spec Sheets for antennas - create a standardized approach for dissemination of the antenna data provided to designers Leader: Adam Jones Member: James Ruedlinger, John Robinson
14. Antenna mounts – General safety/adequacy of platform/mount designs; fall anchorages, etc. Leader: John Erichsen may be a 1019 issue
15. U-Bolt connections/design/recommendation Leader: Madison Bate Member: Adam Jones
16. Alternative method for determining guy tensions – Leader: Simon Weisman

2:30 – General questions

- Can ASD be added to the standard? Based upon the review of the current ASD standard, the committee has concluded the following:
  1. Towers are generally flexible structures. LRFD is very applicable to flexible structures
  2. Towers are governed by probabilistic loads, LRFD is very applicable to probabilistic loads
  3. The new ASD approach will eliminate the 1/3<sup>rd</sup> increase and therefore will result in heavier loads. Current ASD theory should not be confused with the past ASD theory.
  4. The addition of ASD to the standard will increase the size and scope without specific benefit to the structure.
  5. All international standards are focused and utilizing LRFD.
- Why is there an abrupt change between sub-critical and super critical flow? Tom Hoenninger will submit a formal question. The standard does not force the use of sub or super critical flow.
- Is there a database or listing of tower comparisons using revision F and revision G? American Tower has completed 75 structural comparisons. Results: Without consideration of exposure changes, most of the structures are comparable. Revision G is more demanding of the engineer. The engineer must consider all of the complexity of Revision G.
- Doug Pineo - Class II to III change – Adding a 911 antenna onto a structure does not require the structure to transition from a class II to a class III structure.

2:50 – New Business – No motion was received from the floor.

3:00 – Next meeting – Looking at Mid Atlantic Later in the summer or early fall.

5:00 – Adjournment – Motion to adjourn John Wahba, Second by Dave Davidson. Approved by voice vote.

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## Adjournment


The meeting was conducted in accordance with the TIA Legal Guides and the Engineering Manual.

End of Report

By: John R. Erichsen, P.E., S.E. – TR14.7 Vice Chairman & Secretary

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