IEEE Product Safety Engineering Society
Telecommunications Technical Activities Committee Roster
IEEE PSES TSTC
Meeting Minutes: July 27, 2011

Members present: Don Gies (Alcatel-Lucent), Al Martin (TE Connectivity), Paul Ng (GE Energy), Joe Randolph (Randolph Telecom), Dan Roman (Dialogic), Jim Wiese (Adtran) Steve Zugay (Alcatel-Lucent)

Members absent: Philip Havens (Littelfuse), Peter Lim (Alpha Technology), Mick Maytum, Gary Schrempp (Dell), Tom Smith (TJS Technical Services Inc), Peter Tarver (Enphase Energy),

Discussion topics

1. Attendance/Introductions

The minutes from the last meeting were approved as submitted

Meeting attendance was recorded. Introductions weren't needed, as there were no new members

2. New business

Papers and presentations for 2011 IEEE International Symposium on Product Compliance Engineering (ISPCE 2011)

- Joe Randolph will give paper on lightning
- Don Gies will give paper on safety of wireless base equipment

New Telcordia GR-3171-CORE, Issue , Generic Requirements for Network Elements Used in Wireless Networks Physical Layer Criteria

- GR-3171-CORE could be the wireless equivalent of GR-1089-CORE for wireline (Don).
- Wireless may be subjected to NEBS (Don).

3. Grounding requirements for tracer wire in outdoor optical fiber cable (see attached)

It was requested that discussion of tracer wires on optical fibers be added to the agenda for the July 2011 meeting.

In the RUS document, the tracer wire running in a fiber cable was originally required to be grounded at the ONT, but now can be optionally disconnected. Installers would like to have the option of locating the ONT anywhere on the building, and not have to drive a ground rod. NEC Article 840 says that grounding shall be as required by the listing. Otherwise article NEC 770 indicates that the grounding of fiber optic tracer wires is similar to that for coax.

The issue is whether to ground the tracer wire. There is no definitive guidance at this point. If the wire is grounded at the house, then a lightning surge can be injected into the house ground, which could cause problems. If the wire is left floating there may be a flash-over problem. We need input from committee members who are involved with optical systems.

Telcordia had given a response to Al Martin.

From: Gallo, Ernest J [mailto:egallo@telcordia.com]
Sent: Thursday, May 26, 2011 12:44 PM
To: Martin, Al
Subject: Question from the IEEE PSES TAC

Hello Al

I reviewed this with Trevor Bowmer and Randy McCarver of Telcordia who are also on the NEC. They indicated that the tracer wire is a "non-current carrying metallic element" and **therefore should be bonded to maintain continuity and grounded**.

The grounding and bonding aspects of optical fiber cable are really written around shielded cables and armored cables not around jackets with thin tracer wires that would probably fuse open if substantial current is placed down them.

1. NEC (Article 770 and 840) – applicable at premises subject to vagaries of local AHJ judgments

- Tracer wire in sheath -> meets definition of a conductive optical fiber cable (770.2) having a "non-current-carrying conductive member".
- Article 770.93 – covers case where optical cable is exposed to supply cables – if one isolates the optical cable from being in the vicinity of any power cables this may not apply but that would seem problematic to achieve routinely,
    - Article 770.93 - on entering or terminating at the building needs to be grounded or interrupted by insulating joint or equivalent device
- Article 770.100 does begin with "Where required…" but following logic of 250.94 and the other chapter 8 sections (800.100, 820.100, 830.100 and 840.100) it would seem that a tracer wire as a "non-current-carrying conductive member" would likely qualify as a component that needs grounding or isolation.

2. **SR-TAP-001718 "Guide to Electrical protection of the Outside Plant"**

Sec. 5.01 (General)

- Establish and maintain continuity of all metallic components in the cable.
- Bond all metallic components to the metallic components of repeater housings, cases, closures and pedestals.
- …..

(Buried optical cable exposed to power)

- Sec. 5.02 - These M&Ps all point to bonding metallic components of the facilities to the MGN
- Sec. 5.03 - metallic components subject to 60Hz induced voltages and need continuity maintained.

- Sec. 5.04 – to address 5.03 – ground metallic components at regular intervals
- Sec. 5.05 – it is implied (not stated) that separation of power and optical cables by more than 3 feet is sufficient to greatly reduce the induced voltage concern .

(Buried optical cable exposed to lightning)

- Sec. 5.06 - maintain sufficient separation from tower footings and grounding elements (rods0 to preclude arcing
- Sec. 5.06 - Add shield wires (separate wires) to reduce damage potential to optical cables
- (joint Buried optical cable with metallic cable)
  - Sec. 5.07 - maintain at least 1 foot separation between optical cable and metallic cable
  - Sec. 5.08 - avoid random separation practices between optical cable and metallic cable
  - Ground metallic wire shield to pedestal/grounded enclosure where exposed

3. <u>Chapter 24 of Blue Book</u>

Follows the SR-1718 in general.

The question that need to be considered and assessed for these tracer wires is what is the exposure of this tracer wire to

(a) lightning,

(b) power supply cables/equipment or

(c) coaxial or metallic twisted pair communications wires

If the answer is no exposure – then it does not need to be grounded

If the answer is yes to any of these then it needs to be grounded and continuity needs to to maintained along its length – ground at both ends

4. <u>Bonding and grounding from TR-949 (Service terminal closures fro optical cable - old- out of date)</u>

4.1.9 Bonding and Grounding

A. Metallic Element Bonding

R4-10	**[23]** The service closure shall provide the necessary hardware and a method of bonding the metallic elements of the cable in order to provide a current carrying capacity equal to or greater than a #6 AWG copper wire.
R4-11	**[24]** Once established, the continuity shall not be affected by subsequent re-entries into the closure.

B. Metallic Element Grounding

R4-12	**[25]** The service closure shall provide appropriate hardware and installation procedures for extending the electrical continuity of all metallic elements to an effective electrical ground. This shall be accomplished by means of an external grounding mechanism protruding from the service terminal closure.

5. Separate Tracer wire placed with all-dielectric fiber cable. A question was raised in 2010 about a separate tracer/locator wire of 12 - 24 gage wire).
My 2010 responses -

1. The NEC could be used by a AHJ and they may incorrectly point to Article 770.93(A) and (B) claiming these tracer wires are considered to meet the descriptions of "non-current carrying metallic member of optical fiber". I do not think that is right - It is really a joint burial situation of a tracer wire (normally non-current-carrying metallic wire) with an all-dielectric fiber cable.
2. Apart from that 770.93 issue, I do not think the NEC would cover that tracer wire since it is not designed to carry current under any circumstances. It would only have induced currents and only if it was sufficiently long enough to have a sizable potential between the ends (>100 feet).
3. Our general practice is to bond metallic elements together whenever possible. If the tracer wire is bonded at the terminal then it would probably need to be bonded at the NID. There are exemptions around dairy farms with long shielded drop runs can experience stray current issues arise and can cause problems with cows. But that is a special case.
4. If the tracer wire run is long, there may be a possible increase the lightning hazard but a separate wire act as a sacrificial item and may actually help limit damage the nearby all-dielectric cable.

6. Another option is to use a **non-continuous metallic or magnetic marker** that are placed along and above the cable to enable location.

Regards,
Ernie

Discussed Ernie's response. How is ground connection made? In some equipment, the tracer wire is brought into the ONT, and connected there to the ground terminal. In some installations the trace wire (or the ground wire) is clipped before entering the ONT, to improve lightning survivability. Al discussed the NTT paper. Cutting the tracer wire doesn't make the problem go away (Jim). Even is ground if floating, could have surge that goes in one communication port and out the other (Joe). The damage path probably doesn't go through the AC power, because damage to the AC power circuits hasn't generally been observed (Jim). Implementing the Verizon 5 kV test generally fixes the problem (Jim, Joe). Ethernet circuits generally don't fail until voltage exceeds 2.8 kV (Jim). POTS damage is generally more common than damage to the Ethernet ports [4:1 to 5:1](Jim, Joe). TVS protector on POTS line needs to be rated at 100 A or more, to survive (Joe, Jim). Article 840.90 of NEC requires primary protection (Don). NEC concerned with safety, not the reliability of equipment. Some communications companies say that that the NEC 90-2 doesn't apply to how cable is terminated, because the cable is under their exclusive control (Jim). But if NEC doesn't apply, then some other standard covers it (Don).

Additional input from Jim Wiese
RUS 515d:

6. LOCATE WIRE

6.1 Locate wire conductors may be installed and shall be determined by the engineer **to be left "floating" or grounded** on the ends in accordance with RUS Service Installation Standard Bulletin 1753F-801(PC-5A), and the Construction Sheets. They

shall also be installed in such a manner as to coordinate with acceptable, available grounding electrodes, such as to meet the existing applicable requirements of the NEC or local laws or ordinances whichever are more stringent. The locate wire shall never be left exposed to any contact on either end.

From a telecom engineer we are working with:
There are some big issues here and there appears to be some confusion. To respond to your email directly, I have two points:

1) The metallic sheath of a fiber cable must be bonded to the electric service ground if available per the National Electrical Code (NEC). If the electric service ground is not accessible (as defined in the NEC) then there are other options for bonding with the final alternative being to ground to a ground rod to meet NEC. This is an oversimplification of this issue but the details can be found in 770.93 and 770.100 of the NEC.

2) RUS was considering requiring all inside wiring to be protected in their latest version of the 515d. They have backed off of this requirement due to discussions with us and other engineering firms. This does not remove the requirement for bonding the metallic sheath of the fiber cable. RUS still requires this.

This issue is further complicated by the use of network power and this is the discussion we were having with xxx Telephone. Network powered communications circuits fall under Article 830 of the NEC. Our discussion with xxx Telephone centered on the protection of the incoming powering circuits. We were recommending a protective device be placed on the incoming powering circuit as we were unsure if the Generonix device had adequate protection to meet the NEC requirements of NEC 830.90.

We recommend that all clients follow the NEC requirements and notes that to not do so may leave the telco open to unnecessary liability.

4. Revisions to 60950-22 standards – Enclosure ratings

Review Section 8.3, what is meant by “corrosion”.

Not discussed

5. Low-Voltage DC Powering (380 V dc)

No discussion

7. SmartGrid issues

No discussion

8. Additional agenda items

None

9. Old Business

No discussion

Next meeting – Wednesday, 24 August 2011.

Respectfully submitted,

Al Martin
Secretary

Participant	Employer	Telephone	E-mail	IEEE Member?	PSES Member?	Linkedin Subgroup	Other Committee
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Guest: Jack Burns, Dell, IEEE PSES, VP Technical Activities

Chair: Peter Tarver
Vice Chair: Don Gies
Secretary: Al Martin

1) UL Standards Technical Panel for Subjects 60950-1, -21, -22, -23
2) TIA TR 41.7, TR41.7.1
3) IEEE Surge Protective Devices Committee
4) ATIS Protection Engineers Group
5) ITU-T, SG5, WP1
6) Canadian National Subcommittee for IEC TC108
7) TIA TR 41.7.10 (Smart Grid)

Other LinkedIn members:

hifi cha, China (Independent Consumer Electronics Professional)