

**Working Group D5 – IEEE 998 Meeting Notes
Nashville, Tennessee
Fall 2015**

Meeting notes WG D5 for Monday October 5, 2015

- Introductions. Steve Greenfield updated his affiliation to Safeearth
- Reviewed the pre-PAR patent slide
- No comments on Notes from Minneapolis
- Reviewed Appendix A from CEATI. Bryan Beske gave background on the development of Appendix A including the funding utilities and how the entire report was prepared.
- Brian Cain reviewed the CEATI document
- No quorum is present (18 of 48). 3 guests requested membership (Josh Berkow, Bill Tocher, and Teri Hopkins). Membership was granted. The WG chair will be reviewing membership status in accordance with the P&P manual.
- Several members raised questions and had various comments regarding the CEATI document. Due to IEEE P&P rules, no formal written response to the CEATI letter will be made by WGD5.
- Brian Cain reviewed the existing guide for discussion on future scope. Lengthy discussion on scope and purpose for a future PAR to be voted on in Atlanta. Bob Nowell volunteered to draft scope and purpose for the PAR. Draft scope and purpose statements are attached for review, annex I.
- Brian C reviewed current action item list of possible guide modifications discussed over the previous 4 meetings. The summarized discussions are attached for review, annex II.
- Bill Carman, Aaron Wilson, and Bill Tocher volunteered to review risk items and how they could be incorporated into next version of the Guide.
- Brian Cain will begin to review new research papers dealing with BIL vs CFO for lightning shielding calculations as previously discussed with Lane Garrett and Gary Engmann.
- Meeting adjourned

ANNEX I

Draft scope and purpose statements for IEEE 998.

2016 998 Revised Scope and Purpose Submissions:

1.1 Scope: This guide describes the general nature of lightning and discusses design methods for placement of masts and shield wires to provide direct stroke shielding of outdoor substations. Tables, formulas, and examples are provided to calculate whether substation equipment is effectively shielded from direct lightning strokes.

This guide specifically does not include:

- 1) all shielding design methods that may have been developed
- 2) protection from surges entering a substation over power or communication lines
- 3) personnel safety issues

1.2 Purpose: Direct strokes from lightning can damage substation equipment and bus work. To protect equipment, substation engineers can install direct stroke lightning shielding. This guide is intended to provide engineers with information pertaining to the interception of damaging direct lightning strokes to outdoor substations. Users of this guide should consider the factors that relate to the design of a particular installation and use engineering judgment in the application of these methods, particularly with respect to the importance and value of the equipment being protected.

Because of the unpredictability of lightning and the costs associated with damage from direct lightning strokes, research into lightning phenomenon is ongoing. A bibliography for further study is included to provide the substation engineer with additional lightning research.

ANNEX II

Draft list of possible modifications for IEEE 998.

Guide Modifications??

Data from the last five meeting discussions. PAR Revision Outline for IEEE 998: Working Group D5 “Direct Lightning Stroke Shielding of Substations” for 2023 completion.

1. Update introduction
2. Review and edit Scope as needed
3. Review and edit Purpose as needed
4. Reference an Application guide (998.1) of examples if two PARS are created
5. Revise Clause 3 by Franco and Sakis
6. Edit lines 9-16 on Page 8, no recommendations
7. Edit lines 5-9 on both page 17 and 18
8. Edit lines 1-13 page 24 with Risk Analysis
9. Review subclause 6.2.2 for BIL and edit as needed
10. Edit lines 23-25 page 29 for return strokes and multiple strokes as needed
11. Edit lines 6 and 10 Page 32 to include all equations 1-9 as possibilities. (No recommendations)
12. Edit lines 9-14 page 37, 3kA minimum???
13. Edit subclause 6.5.2.2 Page 43 with Risk Analysis
14. Edit lines 12 – 28, subclause 6.6 page 48 with Risk Analysis
15. Edit figure 46 LPM page 57 with the mast and shield wire formulas
16. Method 7.1.4 SLIM, get formulas to model mast estimated placements
17. Edit lines 1-5 page 94 for Zs and Eq used with RSM???
18. Edit figure B.37 Page 138 with Risk Analysis
19. Update tables B22 and B23 for completed examples
20. Add two examples for CVM/FIFM, LPM, and LIT (SLIM if possible) for masts and shield wires
21. Edit Annex C page 167 with BIL
22. Edit Annex D Risk Analysis
23. Edit for new survey?? or Remove Annex E page 173 to make room for examples???
24. Remove Annex F page 175, make a reference with body of text
25. Remove Annex J page 176 to make room for examples
26. Update Annex I page 201 comparisons relative to IEEE 998.
27. Update references in Annex J page 208.
28. Re-Organize the guide?????? Move clause 7 to Annex?????
29. 2017 tutorial with a new example such as a 345kV to 115kV or 69kV?????