

# 2014

23rd International Lightning Detection Conference  
18 - 19 March • Tucson, Arizona, USA  
5th International Lightning Meteorology Conference  
20 - 21 March • Tucson, Arizona, USA

## DYNASPHERE ESE AIR TERMINALS : ISSUES DESERVING CONSIDERATION

by Richard Kithil, Pres. and Orlando Alzamora, Vice-Pres.

National Lightning Safety Institute (NLSI)

[www.lightningsafety.com](http://www.lightningsafety.com)

1.0 Summary. Many commercial and Industrial structures have been assessed by NLSI for lightning protection compliance with accepted Codes & Standards (C&S). The DYNASPHERE Enhanced Air Terminal (ESE) design does not comply with C&S requirements.



ESE, at right background, competes with other metal objects for air terminal behavior.



Two ESEs on tall masts. Unnecessary on this all metal structure.

2.0 Air Terminals (AT) are intended to intercept lightning and to convey it to earth, thus preventing fires and physical damage to structures. They do not “attract” lightning. Lightning has its own unpredictable behavior. It may ignore some or all of various protection systems. Further, on some steel or concrete structures no type air terminals are needed since negligible damage would result from direct lightning strikes. Examples would include radio towers, water tanks and other robust facilities.

2.1 Conventional AT designs, as cited by *NFPA-780, Standard for the Installation of Lightning Protection Systems*, are described in Section 4.6.1.1. They are:

- 2.1.1 Franklin Rod systems, mounted directly on the structures to be protected.
- 2.1.2 Indirect adjacent vertical conductive masts serving as sacrificial attachments for lightning.
- 2.1.3 Indirect masts with horizontal overhead shield or static wires similar to methods used on high voltage power lines. The intent is to intercept incoming lightning.
- 2.1.4 Designs, locations, heights and general placements all are described in NFPA-780.

2.2 Unconventional DYNASPERE ESE Design. There are several important issues related to this ESE approach to AT lightning protection and to its installation.

- 2.2.1 DYNASPERE ESE is excluded by NFPA-780, Section 1.1.3.
- 2.2.2 DYNASPERE ESE design is based upon unsubstantiated claims without technical merit according to the global scientific lightning community. See Google: “*ESE air terminal controversy*”.
- 2.2.3 DYNASPERE ESE is not approved by Underwriters Laboratory. UL regards the sphere as a decorative embellishment to the inner Franklin rod. (Ref. 4.8)
- 2.2.4 There are many examples of DYNASPERE ESE failures. For some photos Google: “*ESE Failures Hartono Photos*” and open the file: “*Response to ESE Advertorial – Scribd*”.
- 2.2.5 Laboratory testing for comparative performance of ESE and Franklin air terminals does not weigh in favor of ESEs. The *Report on the Results of ESE and Franklin Terminals* concludes:

*During the entire evaluation program in a lab a total of 420 electrical discharges were generated with 200 of these discharges striking the Franklin rod for 47.6%, 165 discharges striking the ESE for 39.3% and 55 discharges did not strike either for 13.1% of the discharges. (Ref. 4.1)*<http://www.lightning-risk.org/>

- 2.2.6 NFPA-780 describes requirements for bonding all metal rooftop objects to the AT design. The DYNASPHERE ESE installations are not in compliance. See NFPA-780, Section 4.8.10.3, 19, 20 and 21.
- 2.2.7 NFPA-780 requires air terminal designs to be connected to the common grounding system. DYNASPHERE ESE installations are not in compliance. See NFPA-780, Section 4.14.1, Annex B.4.3 and NEC 250.50 and 250.58.
- 2.2.8 Where lightning is the proximate cause for an insurance claim, compensation may not be approved since the DYNASPHERE ESE design is not accepted by NFPA-780.
- 2.2.9 A ruling by the Supreme Court of Arizona held that an ESE supplier could not promote advertisements in conflict with mainstream science. See below at: [forums.mikeholt.com/showthread.php?t=105354](http://forums.mikeholt.com/showthread.php?t=105354)
- 2.2.10 Surge protection devices (SPDs) react at high speed to divert electrical transients to ground and/or to absorb them in heat sinks. NFPA-780 requires the adoption of SPDs as an integral component of a lightning protection system. DYNASPHERE ESE installations visited by the authors were not equipped with SPDs on electrical or electronic circuits.

3.0 Conclusion. Commercial vendors seek to gain marketplace advantage with exclusive claims of perfection and techno-babble. By example: DYNASPHERE ESE “...causes a sudden “snap” increase in the electric field immediately above the air terminal which provides the additional energy to initiate a strong propagating streamer.” (Ref. 7) The boundary separating exaggerated advertising and outright fraudulent misrepresentation is obscure. *Caveat Emptor*.

#### 4.0 References.

- 4.1 Test Report 43427, Department of Electrical Engineering and Electronics, Univ. Manchester Institute of Science & Technology, Dec. 1997.
- 4.2 NFPA-780, v. 2011, Installation of Lightning Protection Systems, NFPA Quincy MA.
- 4.3 NFPA-70, v. 2011, National Electric Code, NFPA, Quincy MA
- 4.4 IEEE STD 142, Grounding of Industrial and Commercial Power Systems, IEEE NY NY
- 4.5 IEEE STD 1100, Powering & Grounding Electronic Equipment, IEEE NY NY
- 4.6 NLSI, 2013, Lightning Protection for Critical Facilities, NLSI, Louisville CO
- 4.7 [www.erico.com/products/s3000\\_1.asp](http://www.erico.com/products/s3000_1.asp)
- 4.8 Author conversation with UL Field Evaluations Engineer, 10/23/13

---

Corresponding Author: [rkithil@lightningsafety.com](mailto:rkithil@lightningsafety.com)