

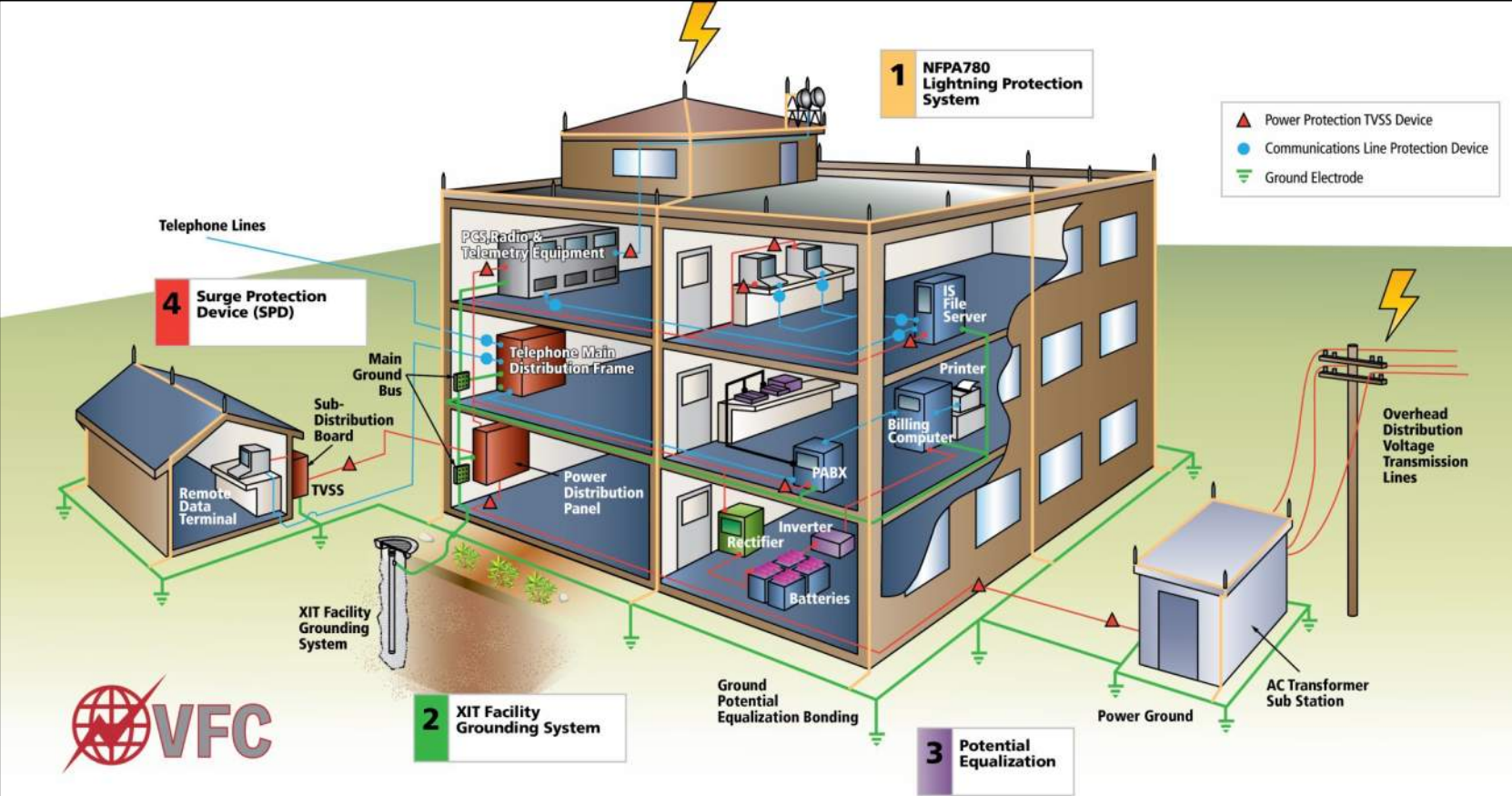


***"How to create
Lightning Resilient
Facilities"***



***We Are
Lightning Protection***

Facility Lightning Protection





"We Are Lightning Protection"

VFC Lightning Protection

• Structural Lightning Protection Systems

- Conventional Passive and Active Systems
- NFPA 780, UL 96A, IEC 62305, NFC 17-102, ABB Standard and Guideline ESEAT Systems – Lightning Protection Standards

• Complete Product Line Manufacturer



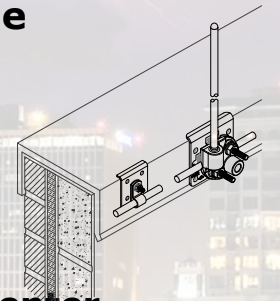
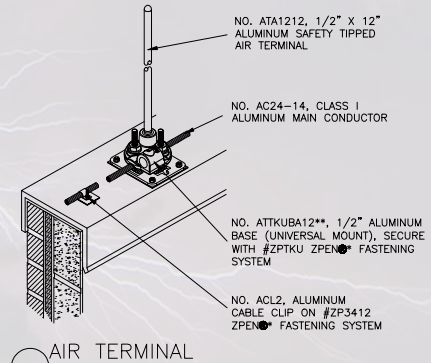
• Grounding and Bonding Systems

- Ground Loops, Enhanced Grounding, Grounding Risers, Raised Floor and Data Center Bonding

• Consulting & Design Services

• Turn-Key Installation Services

- Available Nationally
- Installation Services available internationally



Nationwide

- Oahu, HI
- Seattle, WA
- Livermore, CA
- Torrance, CA
- Phoenix, AZ
- Salt Lake, UT
- Denver, CO
- Chicago, IL
- New York, NY
- Dallas, TX
- Houston, TX
- Oklahoma City, OK
- Atlanta, GA
- Raleigh, NC
- Orlando, FL
- Miami, FL
- Hamilton, NJ
- Ontario, CAN

- **1200+ Installed Projects 2021**
- **Over 13,000 systems since 2000**



Lyncole



- **Lightning Resilient Facilities and Operations**

- Consulting Engineers
- Lightning Resilient Facilities Programs
- Systems Certifications and Testing

- **XIT Grounding Product Solutions**

- XIT Electrolytic Grounding Systems and Accessories
- Ground Enhancement Materials
- Grounding System Design and Testing



Lyncole Experience

- Over 150,000 XIT Systems Installed
- Over 1,500 Site Evaluations
- Repeat Customers



AT&T	ALCOA	BP	FAA
Alcatel-Lucent	Bechtel	Chevron	US Air Force
Motorola	General Dynamics	Exxon	US Coast Guard
Pacific Bell	GE	NSA	Dept. Agriculture
CenturyLink	IBM	Northrop	Dept. Defense
Raytheon	Intel	Westinghouse	Dept. Energy
Sprint	L3 Harris	Lockheed	U.S. Marines
Rockwell	Micron	Navy	Verizon

VFC International Coverage

- **Support for US Military Installations Worldwide**
- **Hong Kong Office**
- **Distributors**
- Japan
- South Korea
- Taiwan
- China
- Europe
- South / Central America



Need for Protection

“How much Downtime can you afford?”

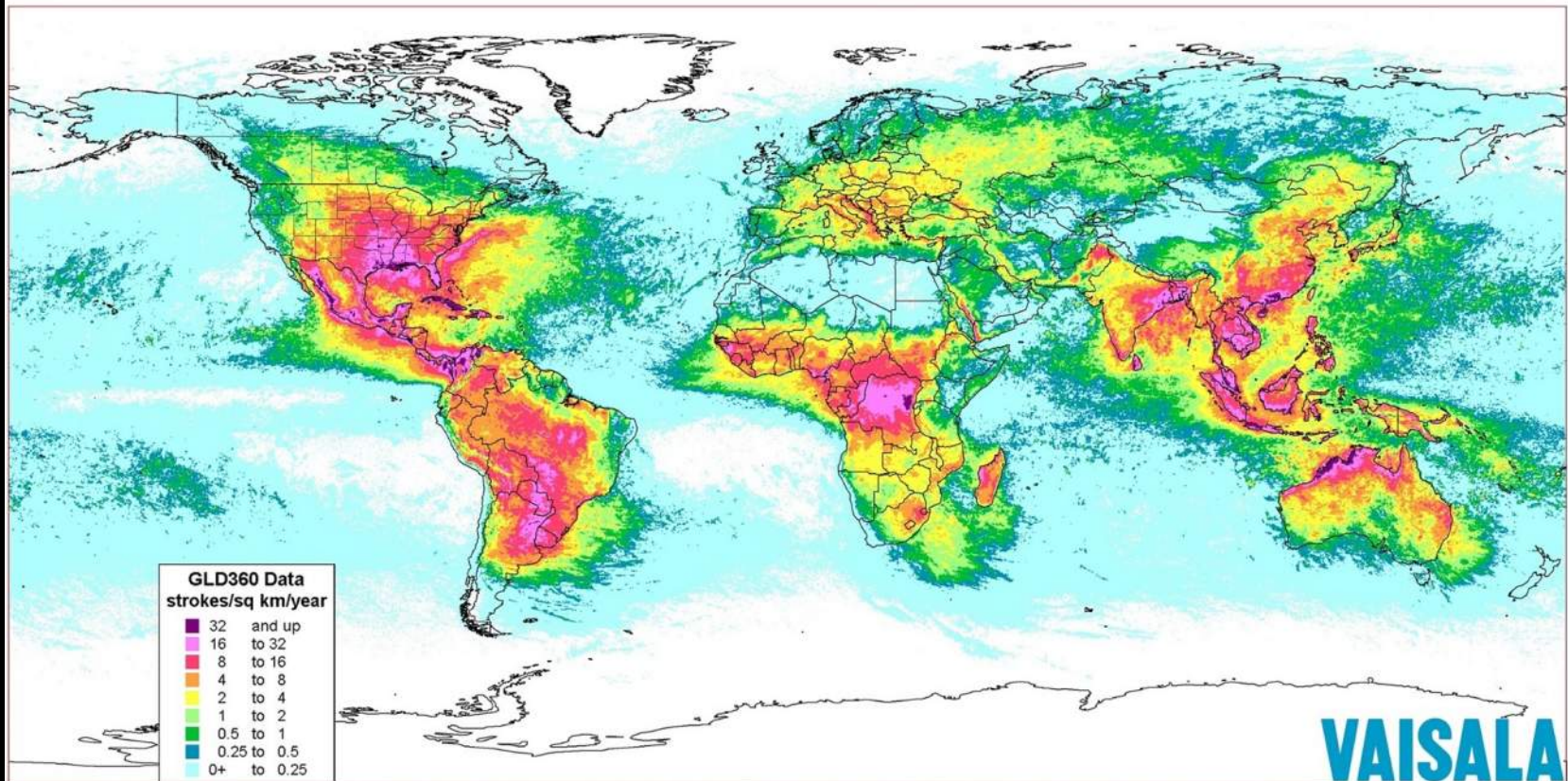
- The Fortune 1000 spends **\$2.5 Billion annually** on unplanned outages. IDC Study
- Infrastructure failure costs **\$100,000 p/hr**, Critical systems \$500,000 p/hr. IDC Study
- Total Lightning related damage and disruption currently **\$8 to \$10 Billion annually**, with costs going up at nearly 20% p/yr.
- **Evidence points to a concentration of lightning strikes around major urban areas compared to their rural surroundings. Population density and urbanization is intensifying human and industry exposure to lightning hazards.** (Physics World, Feb 2019)
- More than **32%** of damages to solar panels are caused by lightning, placing atmospheric discharges as the first cause of deterioration (South African Institute of Electrical Engineers)
- Lightning Protection has become a key component in the **Resilient Facilities Initiative**.
- **Damage and disruption from Lightning is largely preventable.**

Risk Assessment



- **Facility Lightning Protection Systems are not required in most of the US.**
 - Only 10% of new commercial buildings
- **Two different types of Assessment**
 - Simple Need Based – **NFPA 780**
 - Detailed, Protection Level Based – **IEC 62-305**
- **Risk Factors**
 - Lightning Frequency
 - Building Environment
 - Building Construction
 - Structures Occupancy
 - Structures Contents
 - Consequences of Lightning Strike



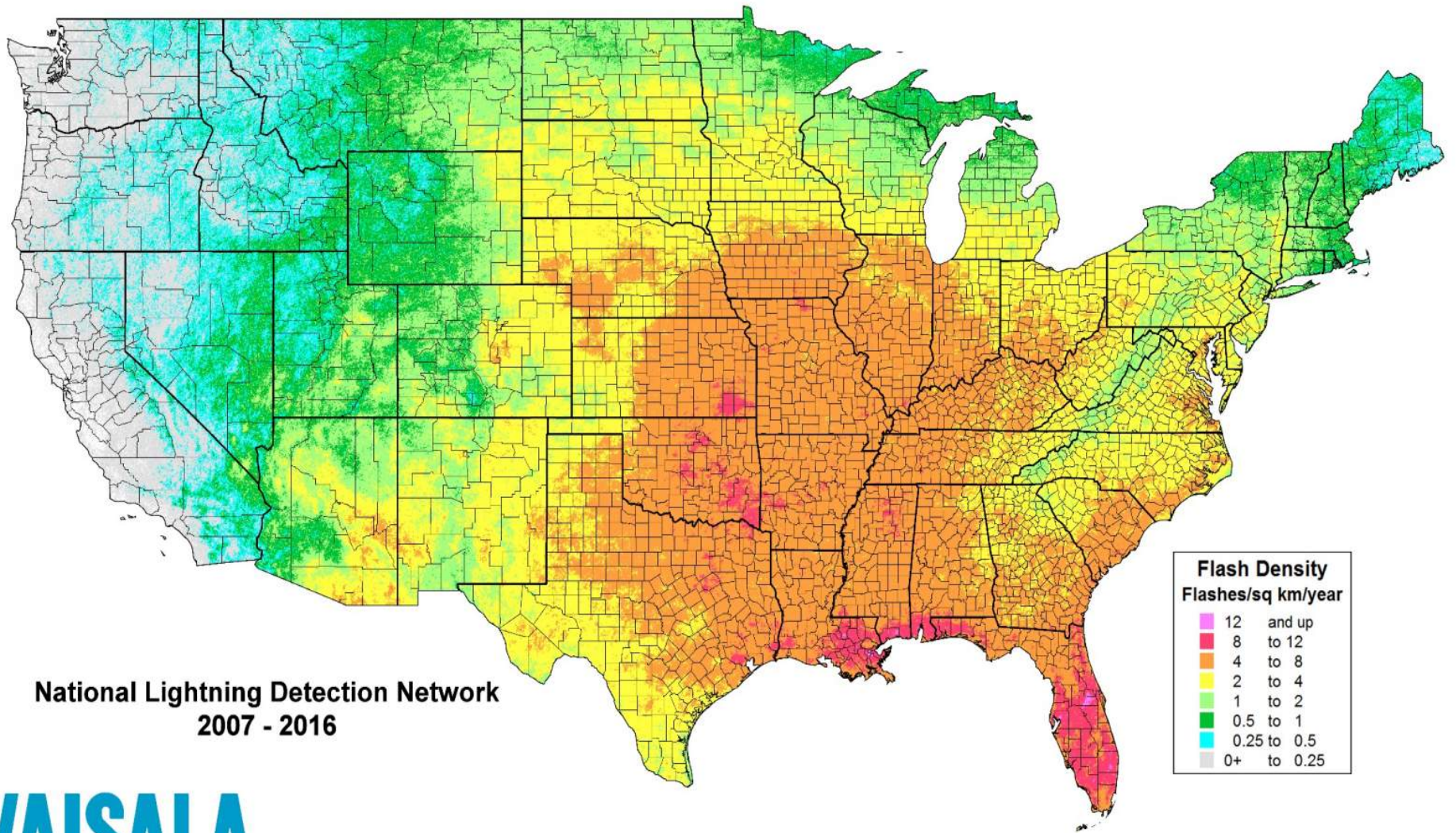


Stroke Density Map - 20 km grid

January 1, 2012 - December 31, 2014

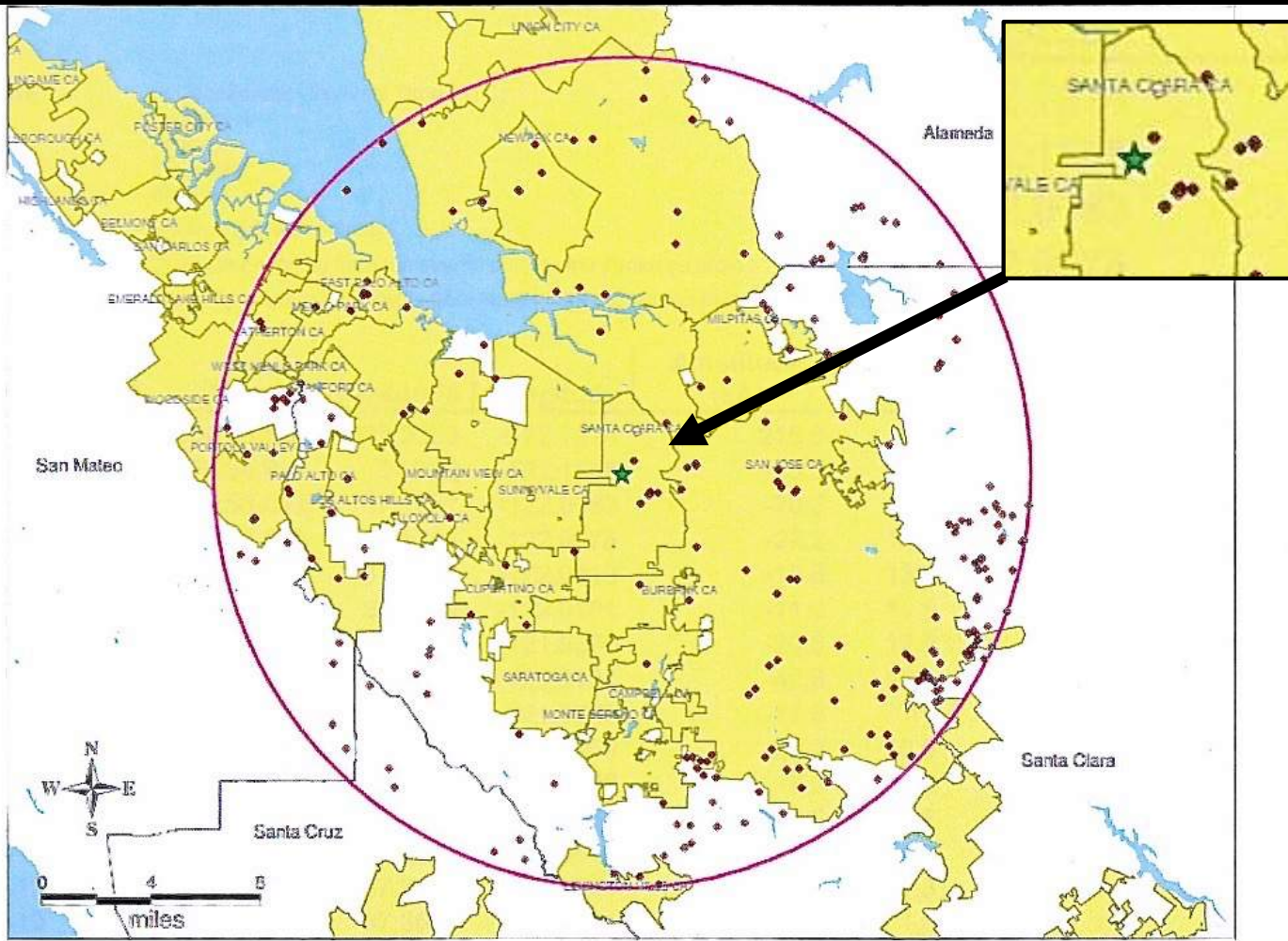
GLD360 data

VAISALA



National Lightning Detection Network
2007 - 2016

VAISALA

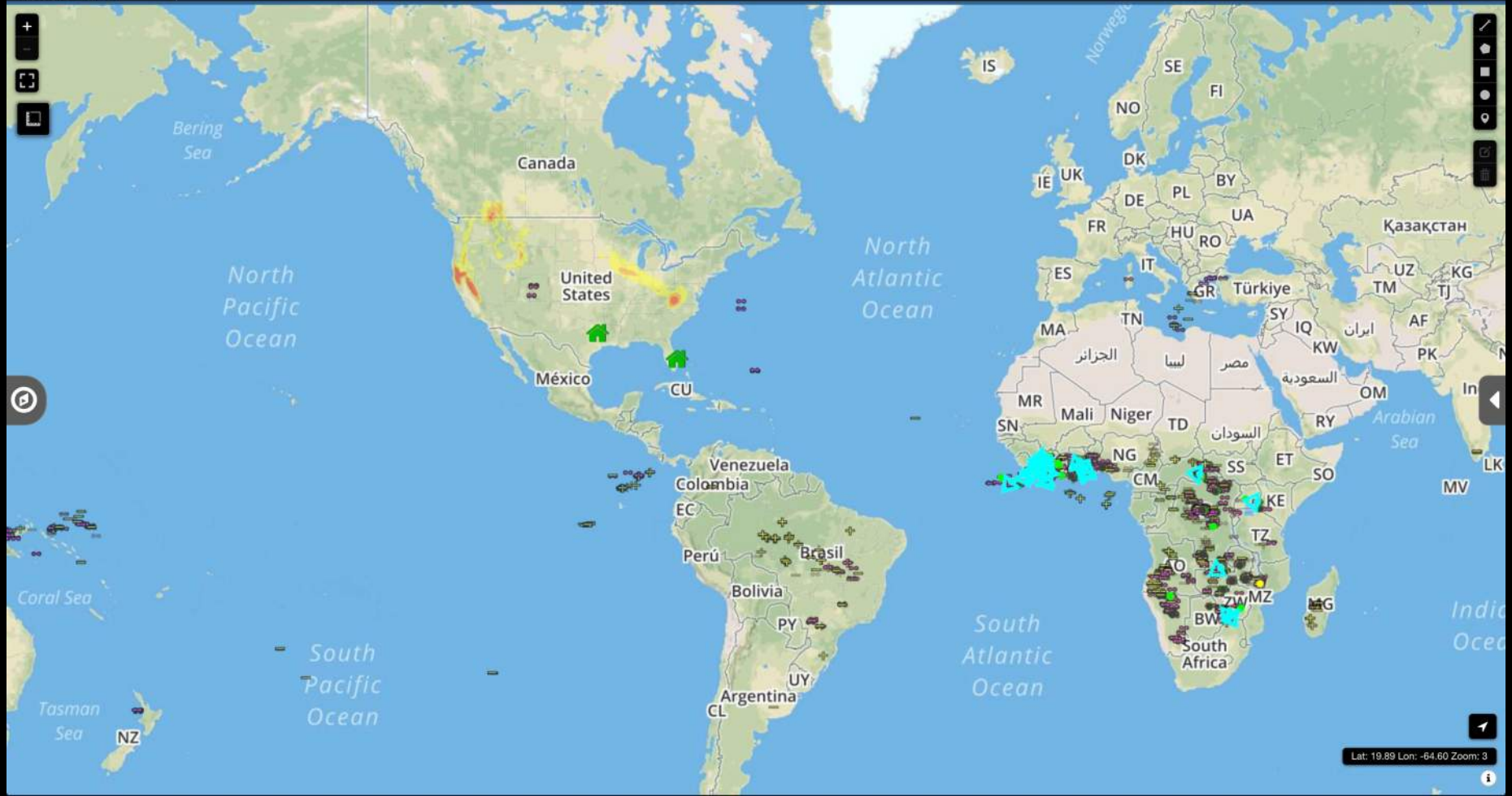


VAISALA

VFC Lightning Protection

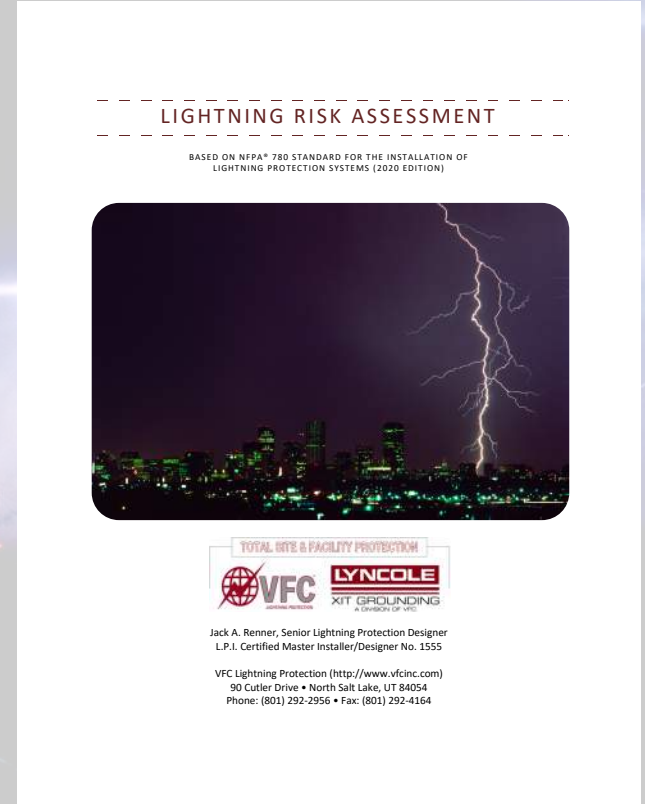
15 mile radius search
 Lat: 37.376525, Lon: _____

Dec 1, 2009 12:00:00 UTC
 To
 Dec 1, 2015 12:00:00 UTC



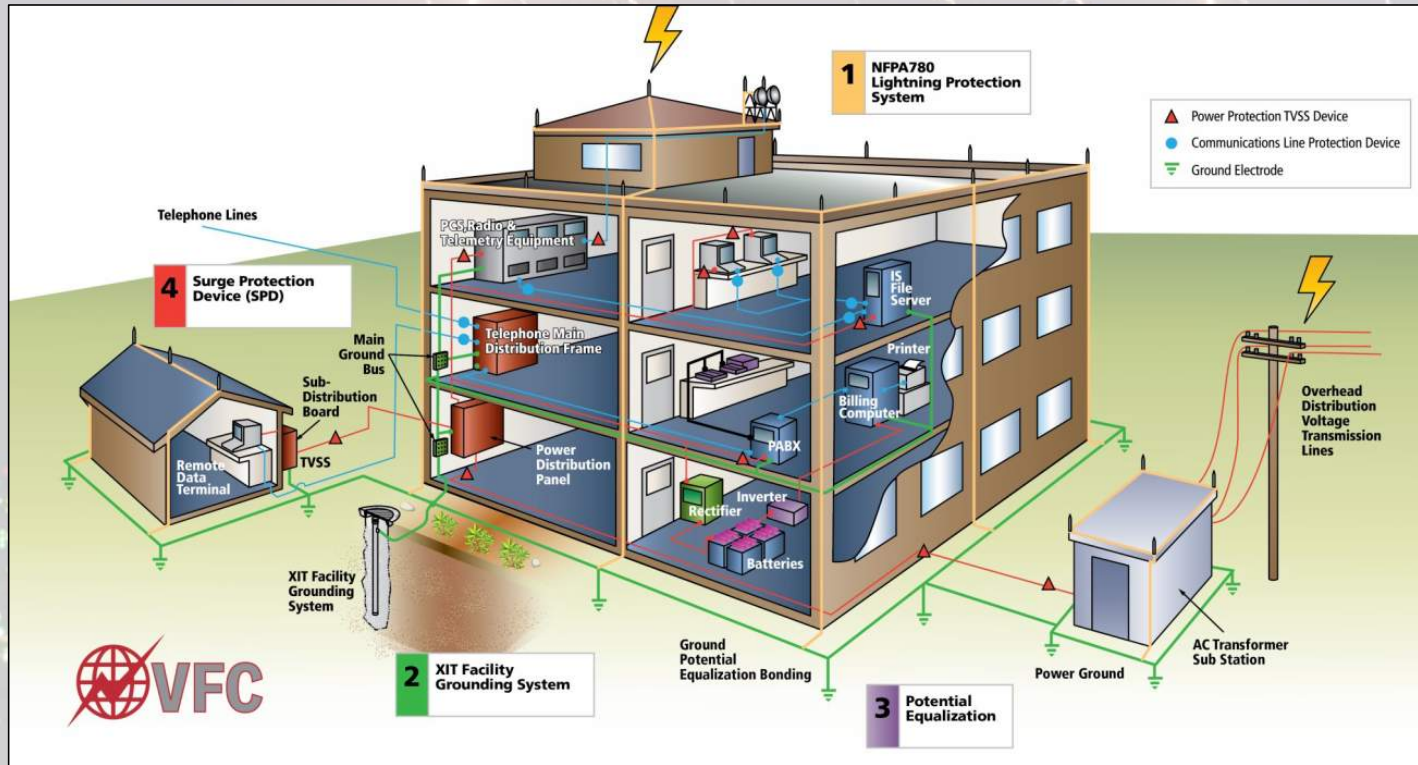
Risk Assessment

- **NFPA Annex L**
- **Risk Factors**
 - **Lightning Frequency**
 - **Building Environment**
 - **Building Construction**
 - **Structures Occupancy**
 - **Structures Contents**
 - **Consequences of Lightning Strike**



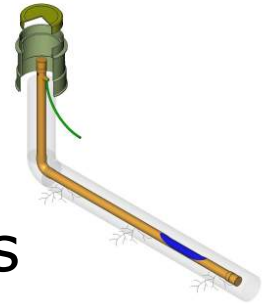
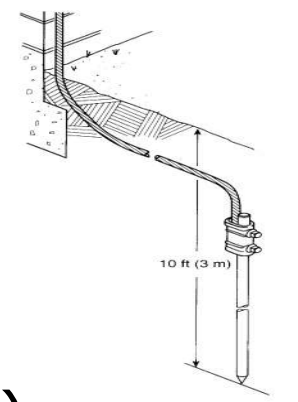
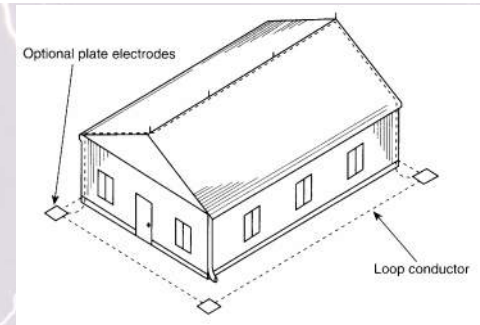
Facility Lightning Protection

- NFPA
- NEC
- IEEE
- IEC / EN
- UL
- LPI
- BICSI
- FAA
- DOD



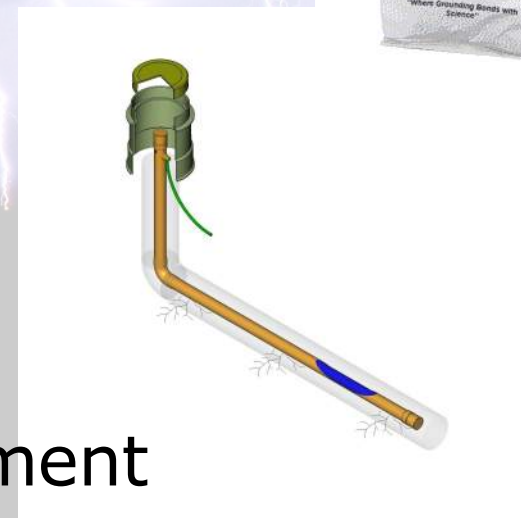
Grounding

- **A quality Grounding System appropriate to the application.**
- National Electrical Code (NEC) - < 25 Ohms
- IEEE Standard 142 – Equipment Dependent
- IEEE Standard 1100 - < 5 Ohms (Equipment Dep.)
- Motorola R-56 - < 10 Ohms
- Verizon Wireless 8501 - < 5 Ohms
- Typical Telecom Switch / Data Center – < 3 Ohms



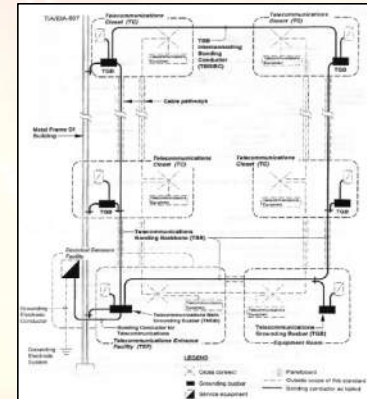
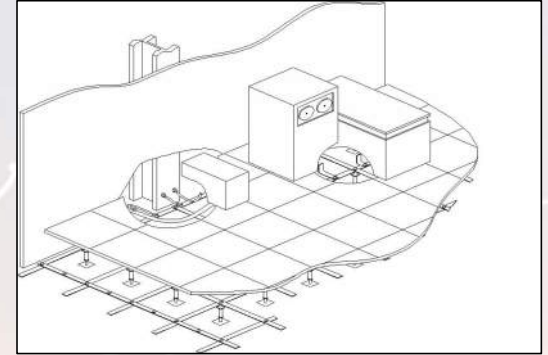
Grounding

- **Low Systems to Ground Resistance <25 OHMS**
- **Stable over Time**
- **Long Life**
- **Electrolytic Grounding Systems**
 - The most cost-effective solution
 - 50 Year Life – Low Resistance
 - Less cost vs Ground Ring
- **Grounding Gravel - Ground Enhancement**



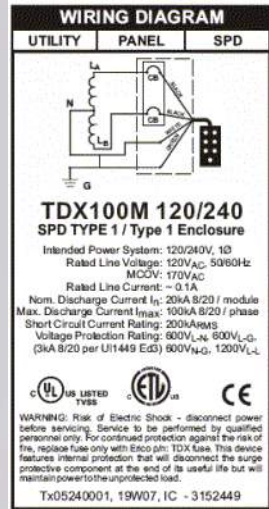
Bonding – Potential Equalization

- **NEC Bonding**
 - NEC – NFPA 70
- **Lightning Protection Bonding**
 - NFPA 780
- **Telecommunications Bonding Backbones**
 - ANSI/TIA/EIA 607
- **Process Control System Bonding**
- **Raised Floor, High Frequency Bonding (SRG's)**
 - IEEE Standard 1100



Surge Suppression – SPD's

- **UL 1449 5th Edition**
 - NEC, NFPA, ANSI, NEMA & IEEE have made revisions, working with UL 1449 Edition 4.
 - This is UL's fourth major revision within the past 10 years.
- **SPD's must be deployed beyond just the Electrical Service.**
- **Communications and Process Control Conductors must have SPD's applied as well.**



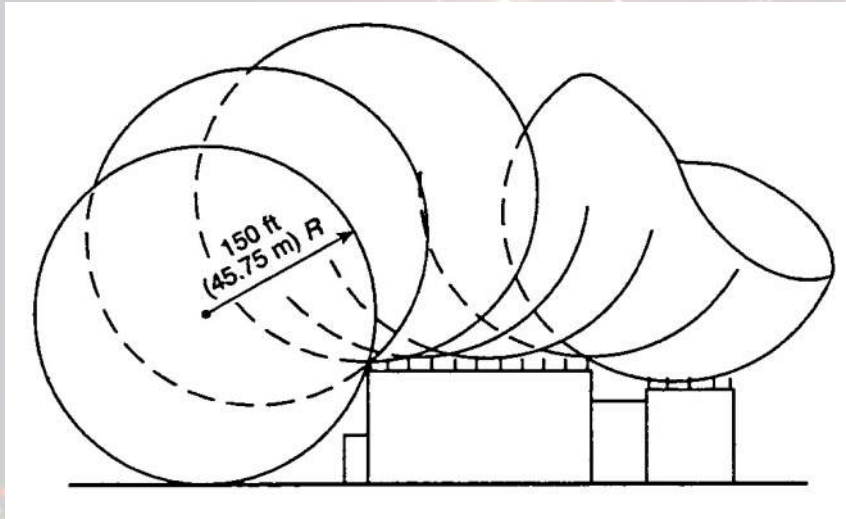
Structural Lightning Protection



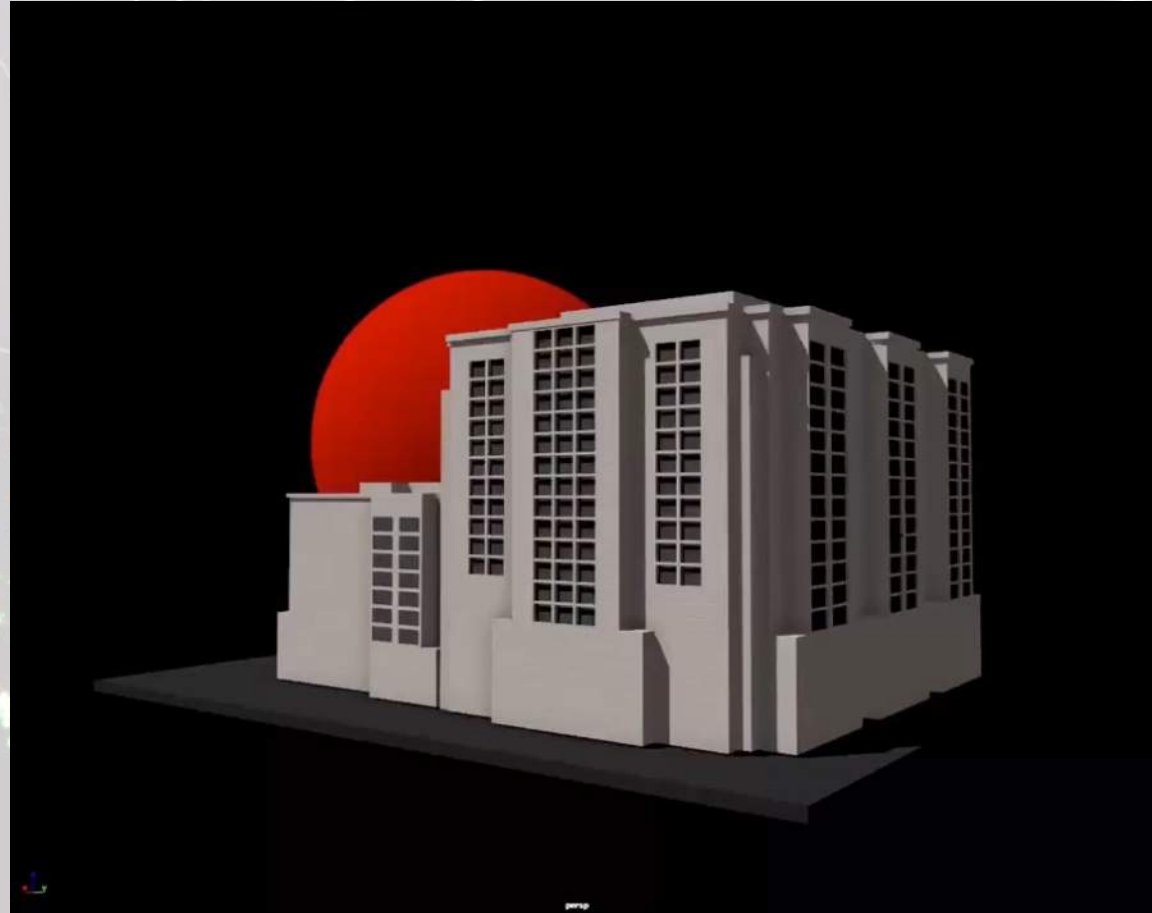
- **US Conventional Systems**

- **NFPA 780 (2020)**, UL 96, UL 96A 13th Ed. 2018, L.P.I. 175, IEC 62305
- FAA, DOD, Air Force, Navy, etc. Most are based on NFPA 780
- **New DOD Specification and Certification requirements. Strict compliance to NFPA 780.**
- **Early Streamer Emission Systems (ESEAT)**
 - NFC 17-102 (UL), ABB Standards and Guidelines

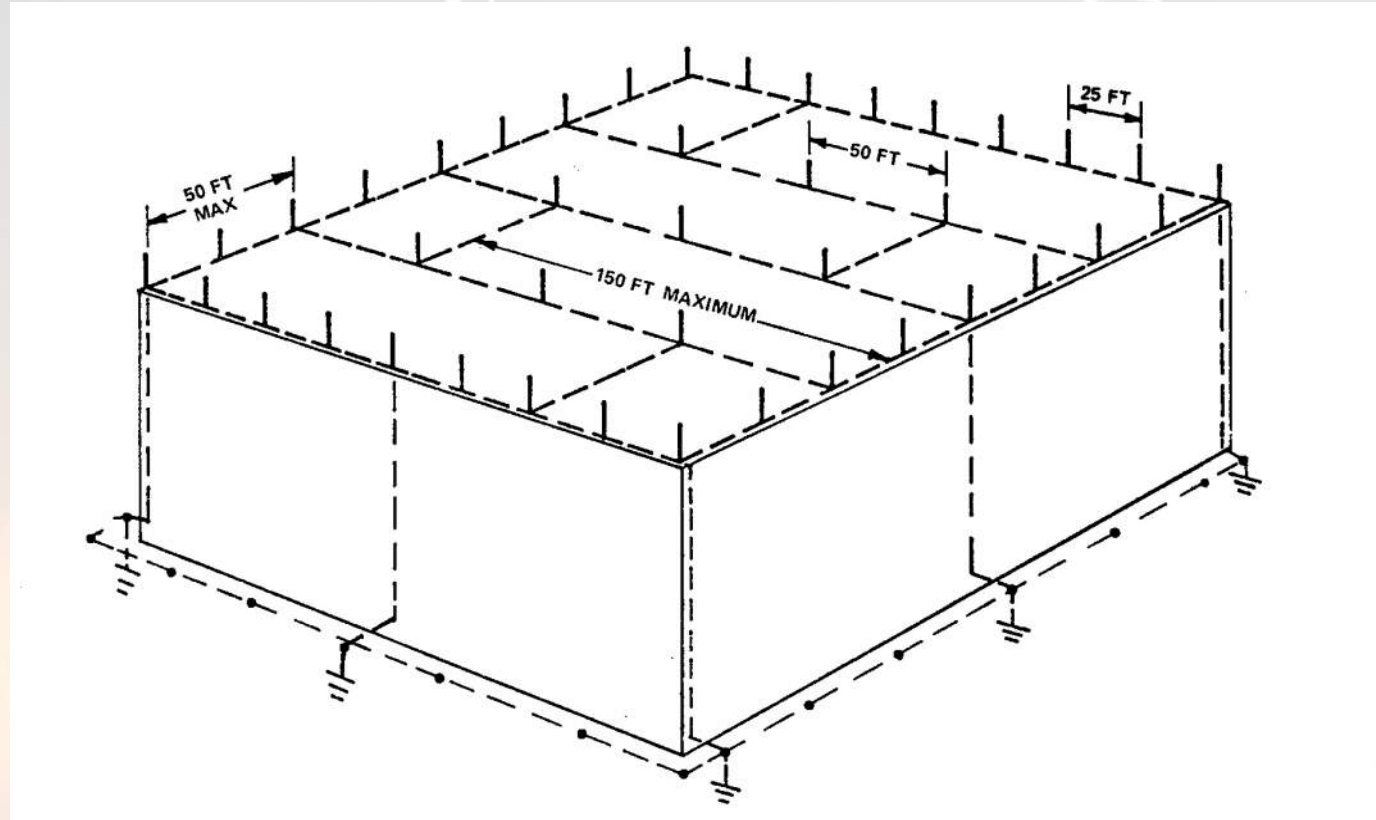
Structural Lightning Protection Basics – Zone of Protection Analysis



- **Same theory across all US and International standards.**
- **The application and size of the sphere varies.**

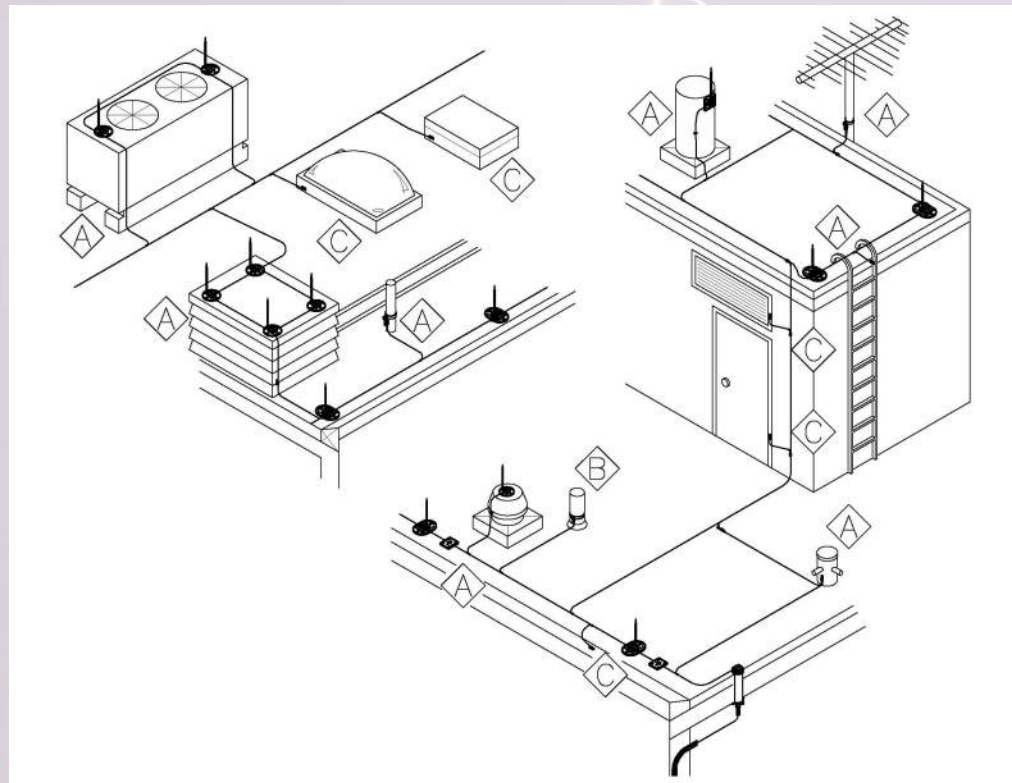


Structural Lightning Protection Basics



Structural Lightning Protection Basics

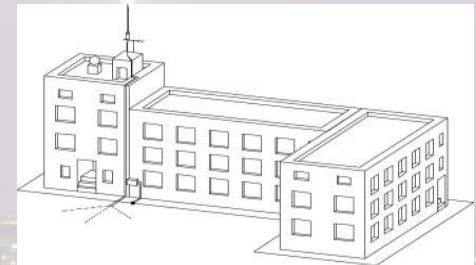
- **Grounded Metal Bodies Subject to Direct Strikes**
 - Potentially Grounded Metal Bodies subject to a direct strike. Typically taller than surrounding Air-Terminals.
- **Grounded Metal Bodies**
 - Potentially Grounded Metal Bodies not subject to a direct strike. Typically shorter than surrounding Air-Terminals. Also includes building systems such as Electrical Service Ground, Main Water and or Natural Gas services, and Building Structural Steel.
- **6 Foot Rule – UL96A**
 - Potentially Grounded metallic objects within 6' of the Lightning Protection System must be bonded.



- **NFPA 780** $D=h/6n*Km$

More than one way to provide Protection - ESEAT Systems

- **NFPA 780 is the superior application.**
- **NFPA 780 isn't always applicable!**
- There are multiple systems available to us to provide quality protection for any facility.
- VFC, teamed with ABB, the leader in ESEAT systems applications worldwide.
- Not every facility fits in the NFPA 780 box.
- All as per **International Standards.**
- **UL Inspection Report available now.**



More than one way to provide Protection - ESEAT Systems

- **Typical Application: Open areas such as Stadiums, Amusement Parks, Industrial Facilities.**
 - These Facilities can be protected while this cannot be done with conventional protection systems.
- **Can be used in combination with NFPA 780.**
- **Must be deployed as part of a Total Site and Facility Protection System**
- Must be designed and installed to one of the ESEAT International Standards, **UL listed, and an Inspection Report provided.**



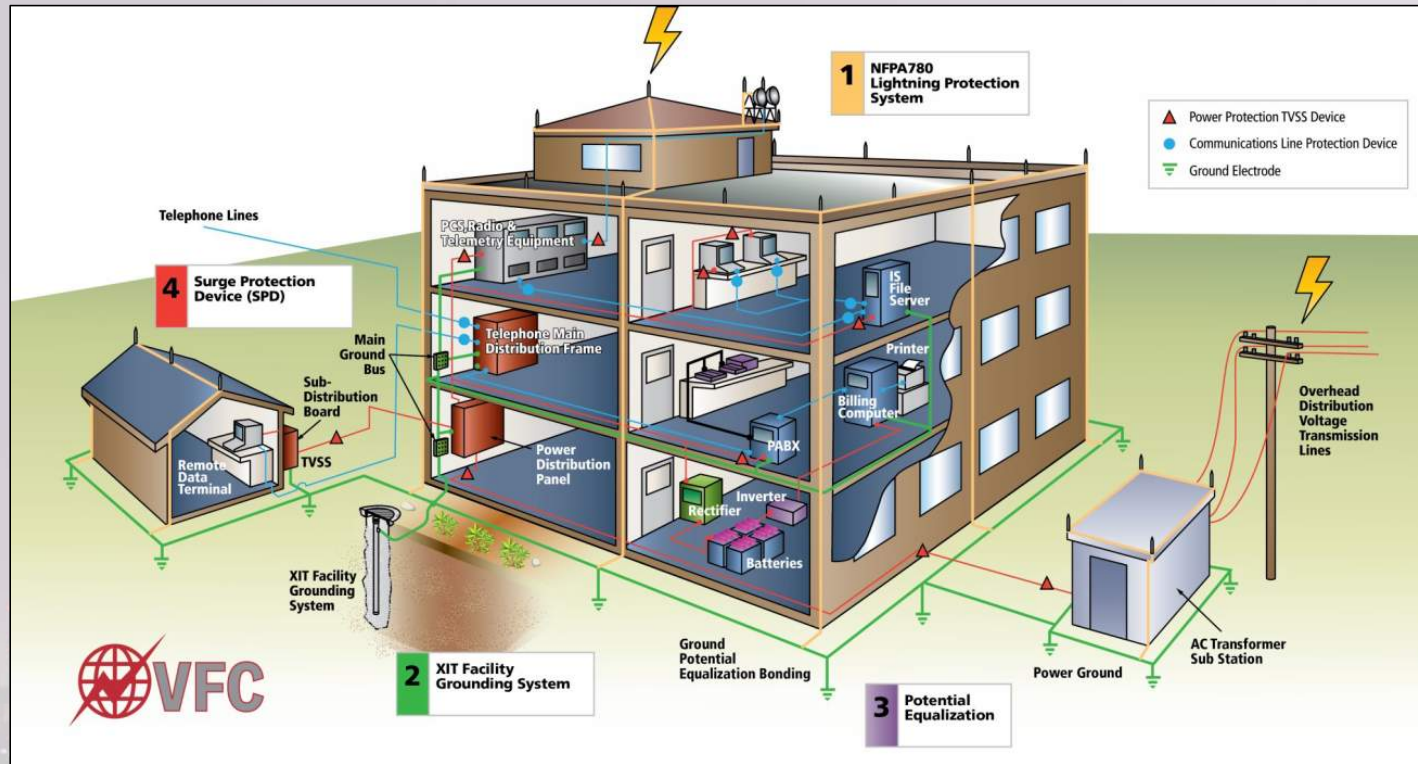
Every Facility is Unique

**“How much
Downtime can you
afford?”**

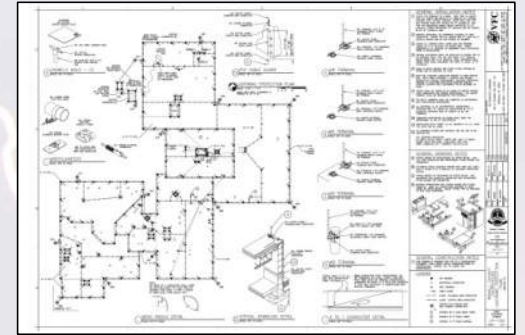


Key's To Successful Facility Protection

• Comprehensive Design

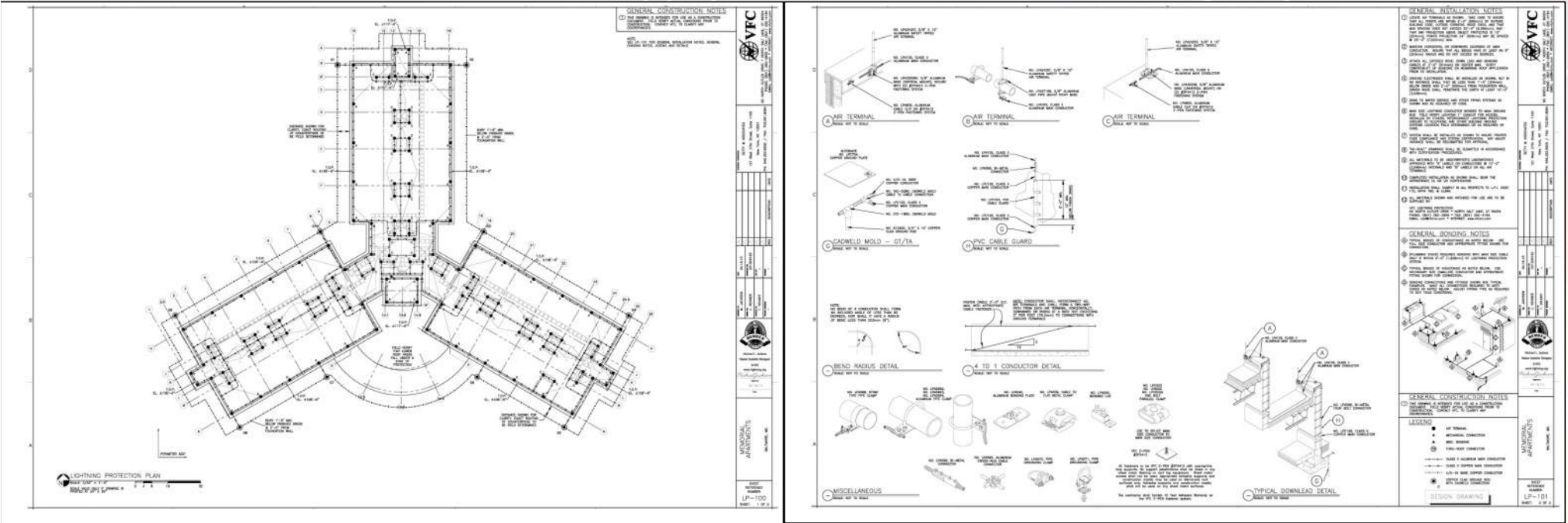


The VFC Solution



- **Available to the Engineer**
- **New Construction**
- **Risk Assessments**
- **Structural Lightning Protection Design Build Specification**
- **VFC System Design Drawings**
- **Specification and Design Review**
- **All at no cost the EE Firm**
- **Existing Structures & Systems**
- **Site Evaluations & Analysis**
- **Grounding System Design**
- **Lightning Resilience Program**
- **Grounding and Soils Resistivity Testing**
- **Cost Proposals available upon request**

The VFC Solution



VFC Innovations

- **Engineering / Implementation**

- We are by far the leader in the engineering and implementation of these systems.

- **XIT** Electrolytic Grounding Systems – 30 Year Warranty

- XIT, Enhancement Products, Engineering

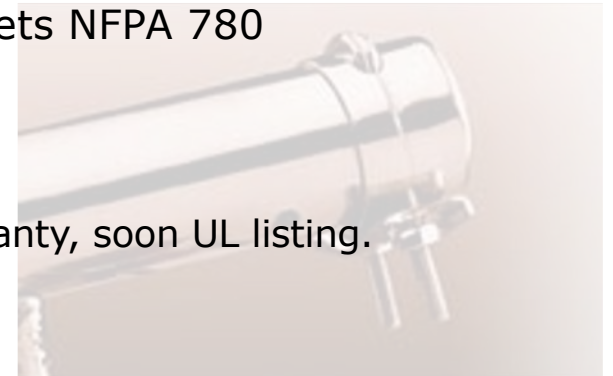
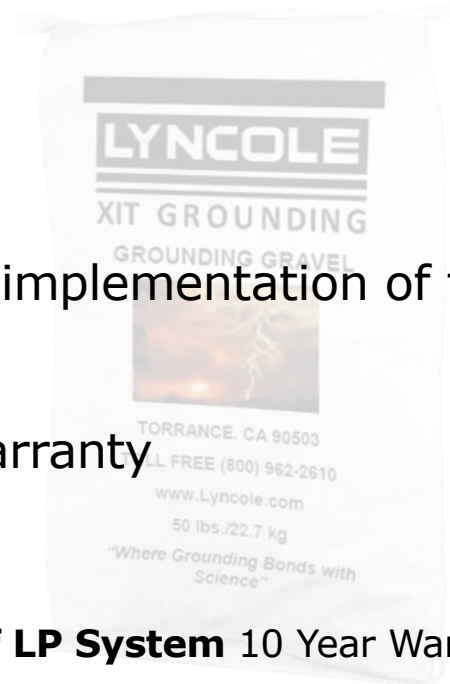
- **VertStick** the Zero Penetration Fastener and **Leak-Proof LP System** 10 Year Warranty

- **VFC Mast Systems** – Reduce cost, maintenance, meets NFPA 780

- **AT STORMv3** Lightning Warning Systems – New Products

- **ABB OPR ESEAT Systems** – Certification and \$10 mil Warranty, soon UL listing.

- **New Process Control LP Products and Services!**



Questions, How can we help?



TM

A VFC Group Company

