

LIGHTNING PROTECTION AND GROUNDING FOR DATA CENTERS



LIGHTNING PROTECTION

TOTAL FACILITY PROTECTION

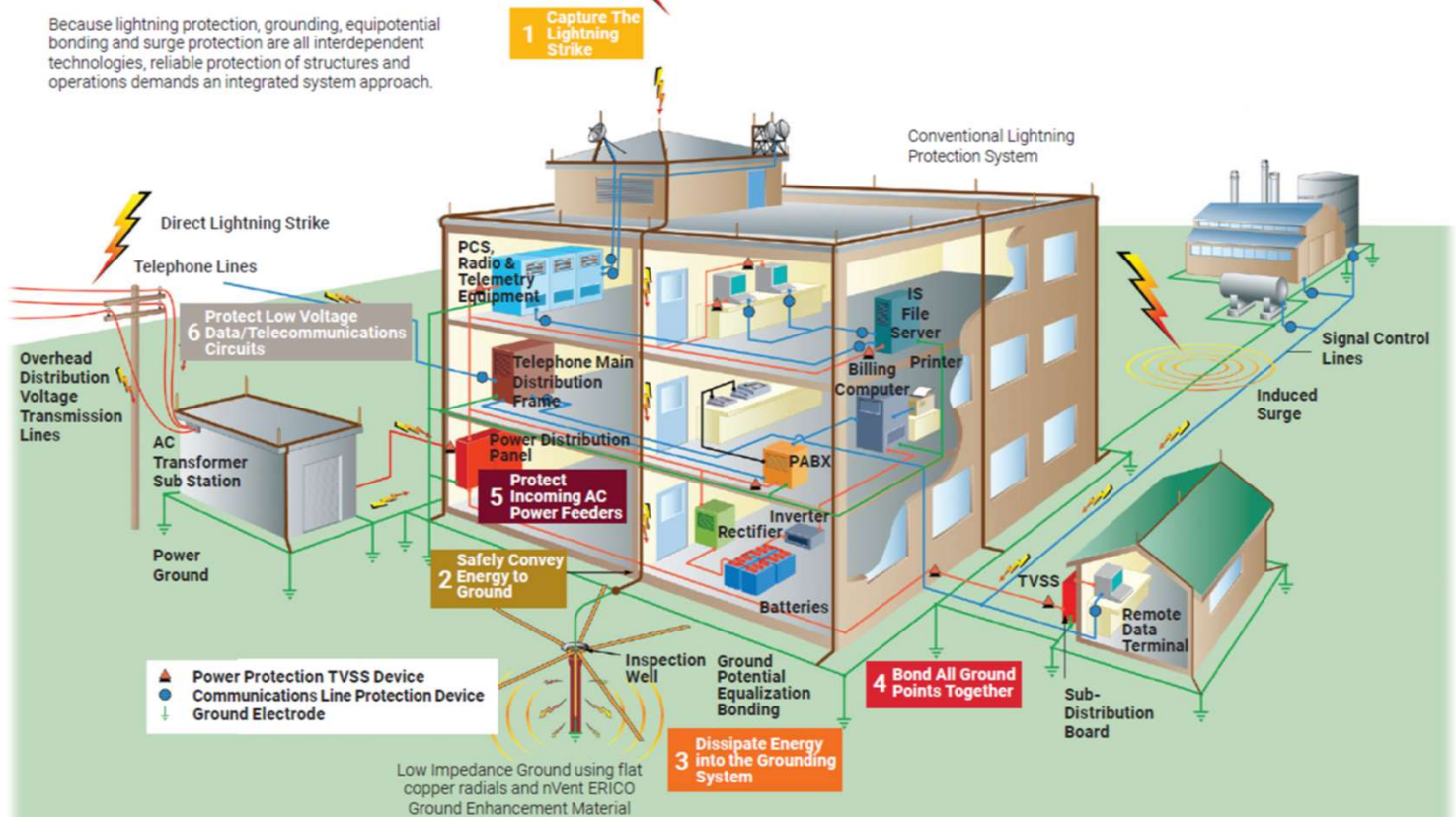
The consequences of an unexpected lightning strike or power surge can be catastrophic for a facility:

- Personnel are at risk.
 - Critical equipment may be damaged or destroyed.
 - Data can be corrupted.
 - The costs of operational downtime and lost revenue can be very substantial. As industries become more dependent on increasingly sensitive equipment, proper protection from lightning and dangerous over-voltage transients is necessary. The Six Point Plan of Protection is designed to provide total facility protection by integrating several concepts. The Six Point Plan will minimize the risk of damage to facilities through:
- Direct Strike Protection
 - Grounding and Bonding
 - Surge and Over-voltage Transient Protection

The Six Interdependent Points that form a Facility Electrical Protection Plan are:

1. Capture the lightning strike.
2. Convey the energy to ground.
3. Dissipate the energy into the grounding system.
4. Bond all ground points together to create a single point ground plane.
5. Protect incoming AC feeders.
6. Protect low-voltage data/telecommunication circuits.

Because lightning protection, grounding, equipotential bonding and surge protection are all interdependent technologies, reliable protection of structures and operations demands an integrated system approach.



LIGHTNING PROTECTION

THE EFFECTS FROM LIGHTNING

Outages in a data center can wreck havoc amongst the IT staff and it's customers. Weather related causes is ranked #4, just behind human error, in an article written by Lifeline Data Centers located in Indianapolis, Indiana. Only 27% of companies received a passing grade according to a survey done by the Disaster Recovery Preparedness Council. According to a new study, the average cost of a data center outage has steadily increased from \$505,502 in 2010 to \$740,357 today. Having a NFPA 780 compliant lightning protection system installed is just a part of an overall facility electrical protection program. Installing a lightning protection system will reduce damage to the structure and mitigate any stray currents which could have an impact on electrical and electronic systems. The need for a lightning protection system should be assessed in the early stages of the structures design. A risk assessment in the Annex of NFPA 780 can provide additional guidance. The risk assessment will assist in determining if a lightning protection system should be installed or if a lightning protection system is optional. It takes into consideration, where geographically, the structure is located, what it's made from, and it's contents. For more information on obtaining a copy of the lightning protection risk assessment, please contact Hicks Lightning Protection.

SYSTEM BENEFITS

- ⚡ **Affordability:** Costs for LPS typically run less than 1% of the value of a structure.
- ⚡ **Insurance Requirements:** Since lightning is a preventable loss, insurers understand cost-benefits of LPS, with many providers offering policy credits, and incentives.
- ⚡ **Risk Management Mandates:** LPS is increasingly specified to meet OSHA safety measures for personnel and public venues.
- ⚡ **NFPA Risk Assessment:** LPS is increasingly required in situations where vulnerability to lightning is greater than the tolerable risk.
- ⚡ **Improves Sustainability:** LPS is often included on Green and LEED structures as a building resilience measure.
- ⚡ **Fortifies Technology:** Automated building systems and smart structures rely on LPS grounding to prevent system interruptions and downtime.
- ⚡ **Value-added Amenity:** LPS safeguards properties against the weather peril that affects most people, most of the time in the U.S.



LIGHTNING PROTECTION



TYPICAL LIGHTNING PROTECTION INSTALLATION

Lightning is risk for business. Manufacturing facilities, financial service institutions, hospitals, schools, and critical facilities are especially susceptible to lightning. The need for protection is more profound when lives and life-providing systems are at risk. Without proper grounding and bonding provided by a safety standard compliant lightning protection system, uncoordinated installations (telecommunications, antennas, electronics, generators, and inter connected systems) can be especially vulnerable to lightning. For structures with costly state-of-the-art hardware, internal circuitry and critical systems, the cost-benefits of lightning protection can't be overstated.

Hicks estimating department can provide complete turnkey estimates on any type or size grounding or lightning protection system. Our estimates are detailed to list out all inclusions and exclusions. Each estimate adheres to all required specifications.

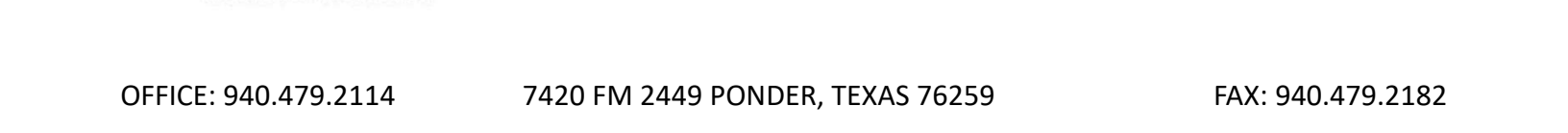


A photograph of a server room with rows of server racks. A white text box is overlaid on the left side of the image, containing text about grounding and bonding. The background shows the server racks and a ceiling with lights.

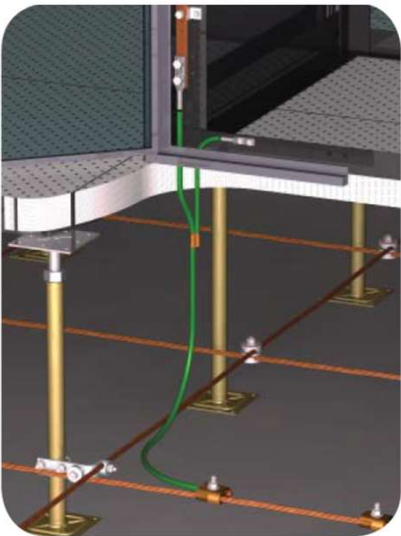
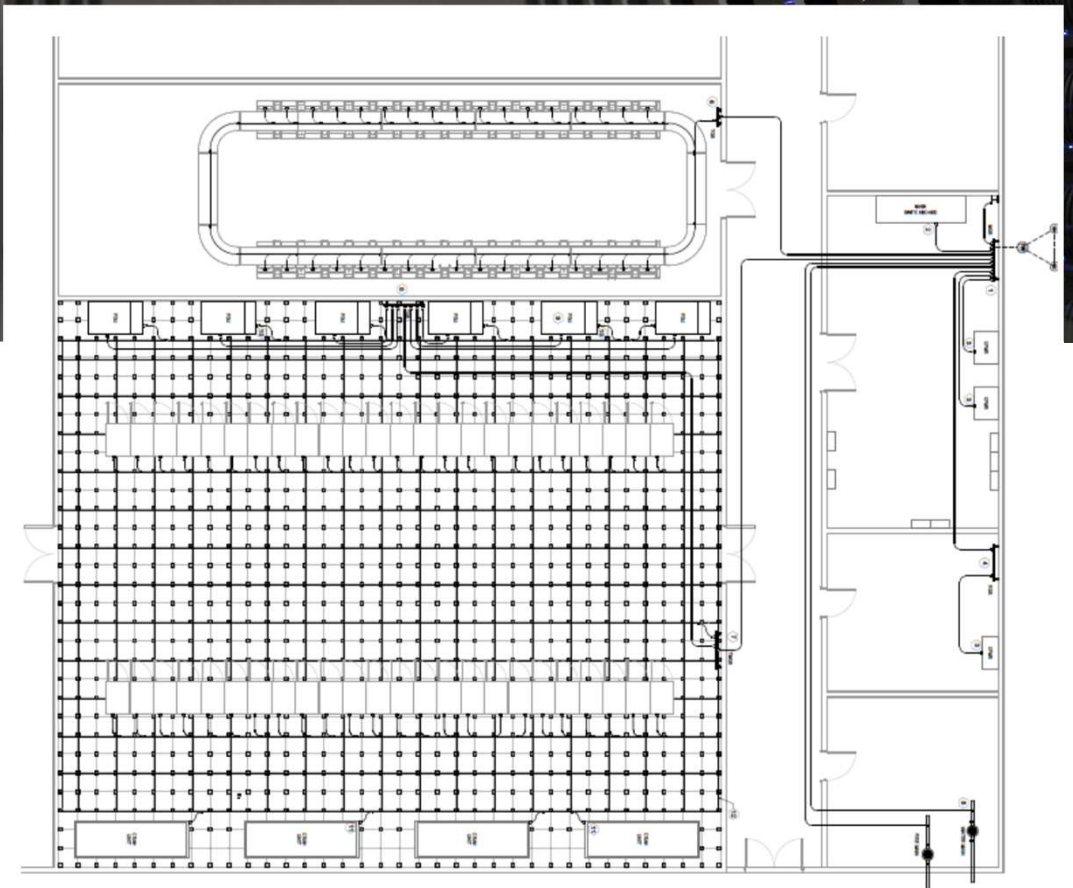
GROUNDING AND BONDING

The performance of a data center is affected on whether or not the equipment is properly bonded or grounded. Electrical services and/or telecommunications equipment, are required to be bonded to ground per the national and local electric codes for safety reasons. Each data center computer or equipment room will have a MESH or Signal Reference Grid (SRG) that covers the entire room floor. Spacing for

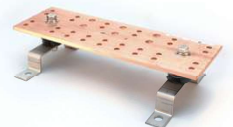
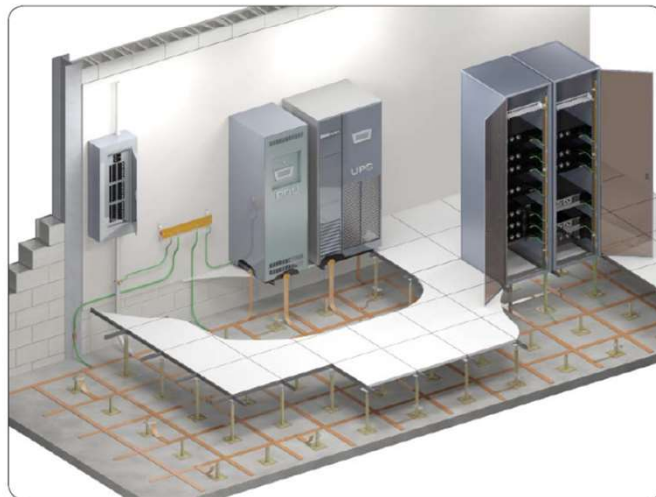
these configurations is 2 to 10 feet, depending on the design requirements. The SRG is a high-frequency, low-impedance network of flat copper strips welded at the crossovers. The computer or equipment room will also have a TGB or TMGB for the MESH/SRG to bond to. On the exterior portion of the building will be an array of ground rods all interconnected by a perimeter cable or ground loop. These multiple grounding systems will all be bonded together to form one equipotential grounding plane.



GROUNDING AND BONDING



Hicks offers complete engineering services that include product specification, product selection, technical support, site testing and system design. The Hicks design and engineering team can produce a complete lightning protection and grounding layout for any type of structure utilizing the latest CAD software.



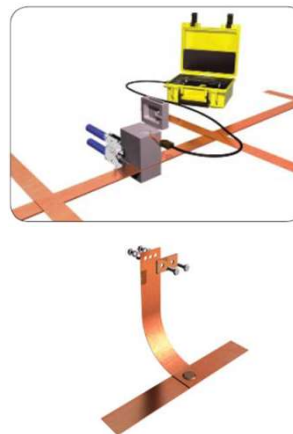
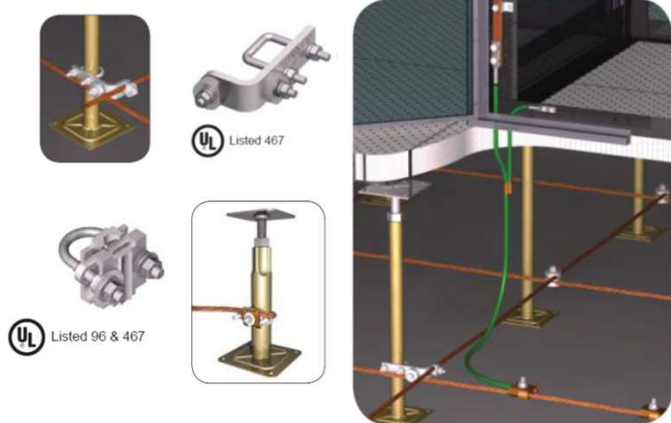
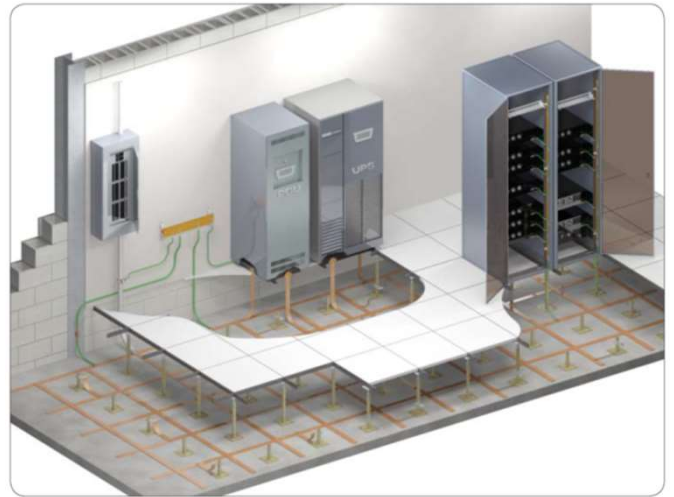
GROUNDING AND BONDING



ROUND CONDUCTOR APPLICATIONS



FLAT STRIP APPLICATIONS



TRANSIENT MONITORING



Lightning can infiltrate your power infrastructure and sensitive electromechanical systems in many ways. Direct lightning strikes to your facility or assets pose an obvious hazard, but nearby strikes can be equally damaging, particularly if lightning signals are strongly coupled into power and other utilities that enter your facilities. It pays to know when these lightning transients occur, and how damaging they are likely to be to your infrastructure.

SLS designed Jupiter TMS to reliably monitor, accurately measure, and quickly report lightning related transient signals that may compromise the integrity of your sensitive assets.

TECHNICAL SPECIFICATIONS

Power	24 VDC
Communication	Cell or Fiber LAN
Channels	4 Analog Channels
Input	Balanced Differential or Single-Ended
Sampling Frequency	80 MS/s (up to 125 MS/s)
Analog Bandwidth	> 40 MHZ
Bit Depth	14-bit



TRANSIENT MONITORING



FEATURES:

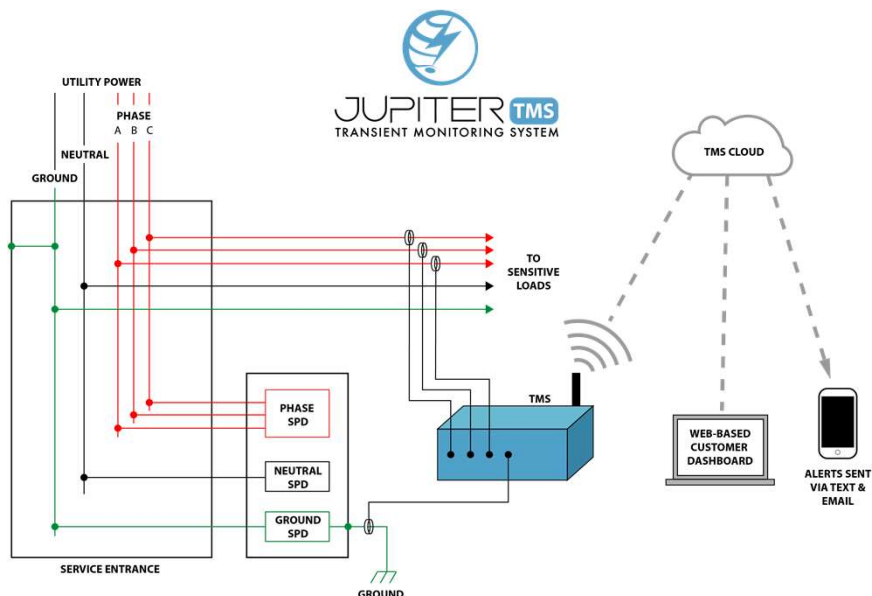
- Zero dead time recording with 100% transient detection efficiency
- Small, low-power, rugged, easily deployable
- Tested, proven immunity to real lightning electromagnetic effects

CAPABILITIES:

- Accurate measurement of direct or coupled transients in a hostile lightning environment
- High bandwidth, high-fidelity current, voltage, and electromagnetic field measurements
- Near real-time alerts, reporting and characterization of recorded transient events

APPLICATIONS

- Critical Facility Power Mains Monitoring
- Power Monitoring for Critical Loads
- Electrical Substation Power Monitoring
- Electromagnetic Field Measurements
- High-Voltage Laboratory Current/Voltage Measurements
- Non-Intrusive Transient Monitoring for Any Critical Power, Communication, Data, and Control Lines



In today's electronic environment, you cannot afford to have downtime or blackouts. Hick's Lightning Protection can provide the needed design and installation requirements in order to keep your facility safe from stray transient voltages from both, above and below your facility.



Visit www.hickslp.com for more information concerning lightning protection and grounding.

Members of:



NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards