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Wrexham Football Museum

Lightning Protection System
Technical Submittal

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55319	00	15/01/2025	G. Self		**Zhor Boukerrou**

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1 - The Function of a Lightning Protection System:

The function of an external lightning protection system is to intercept, conduct and disperse a lightning strike safely to earth. Without such a system the structure's electronic systems and the people working around or within it are all at risk.

There are many ways in which lightning strikes can cause damage or injury. Lightning strikes (or even electrical discharges due to nearby lightning) can cause fires, explosions, chemical release or mechanical disruption within or around a building. Step and touch voltages generated from a lightning strike can cause injury, or even loss of life, to humans (and animals) in the close vicinity

Lightning discharges contain awesome amounts of electrical energy and have been measured from several thousand amps to over 200,000 amps - enough to light half a million 100 watt bulbs! Even though a lightning discharge is of a very short duration (typically 200 microseconds) it is a very real cause of damage and destruction.

The effects of a direct strike are obvious and immediately apparent - structures damaged, trees blown apart, personal injuries and even death. However, the secondary effects of lightning - the short duration, high voltage spikes called transient over voltages can, and do, cause equally catastrophic, if less visually obvious, damage to the electronic systems inside a building or structure.

The Lightning Protection System shall achieve the following performance objectives:

- ~ intercept a lightning flash to the structure (using an air-termination network)
- ~ conduct the lightning current safely towards earth (using a down-conductor network)
- ~ disperse the lightning current to the earth (using an earth-termination network)

To reduce the risk of the following types of damage to property caused by lightning:

- ~ injury of persons due to step and touch voltages
- ~ physical damage including fire, explosion, mechanical destruction, chemical release
- ~ failure of internal systems due to lightning electromagnetic impulse (LEMP)

To reduce the risk of disruption to service caused by lightning

To minimise the following types of loss resulting from damage due to lightning:

- ~ loss of human life
- ~ loss of service to the public

To ensure that the LPS complies with this specification (including all appropriate design parameters set out herein) by arranging that the design, installation, testing and commissioning is completed by a lightning protection system specialist.

2 –Codes of Practice:

Comply fully with the current edition (including amendments) of each of the following at the time of tender.

BS EN 62305-1 Protection against lightning – Part 1: General principles
BS EN 62305-2 Protection against lightning – Part 2: Risk Management
BS EN 62305-3 Protection against lightning – Part 3: Physical damage to structures and life
BS 951 Electrical earthing, Clamps for earthing and bonding Specification.
BS 7430 Code of practice for earthing
BS 7671 Requirements for electrical installations: IEE Wiring Regulations
BS EN 50164 lightning protection components (LPC)
BS EN 61643 Low voltage surge protection devices
BS EN 62305 Protection against Lightning
BS EN ISO 9001 Quality Management Systems

3 - Primary risk totals
Risk to loss of human life (R1): 9.989E-06
Risk of loss of service (R2): Not determined
Risk of loss of cultural heritage (R3): Not determined
Risk of loss of economic value (R4): Not determined

4 – Lightning Protection System Designation
Lightning protection level IV LPS (LPL4):
Building 60 UEA - Class IV LPS (LPL4)
Risk Assessment No. 55319

5 - Design Parameters
Maximum peak current (Imax): 50kA
Probability that lightning current values are smaller than the maximum value defined: 97%
Minimum peak current (Imin): 10kA
Probability that lightning current values are greater than the maximum value defined: 91%
Max peak current of equipotential bonding SPDs for each incoming line defined (ISPD): 25kA

5 - Design Parameters Continued

Part 1: General Principals
BS EN 62305-1 (part 1) is an introduction to the other parts of the standard and essentially describes how to design a Lighting Protection System (LPS) in accordance with the accompanying parts of the standard.

Part 2: Risk Management
BS EN 62305-2 (part 2) risk management approach, does not concentrate so much on the purely physical damage to a structure caused by a lightning discharge, but more on the risk of loss of human life, loss of service to the public, loss of cultural heritage and economic loss.

Part 3: Physical damage to structures and life hazard
BS EN 62305-3 (part 3) relates directly to the major part of BS 6651. It differs from BS 6651 in as much that this new part has four Classes or protection levels of Lightning Protection System (LPS), as opposed to the basic two (ordinary and high-risk) levels in BS 6651.

Part 4: Electrical and electronic systems within structures
BS EN 62305-4 (part 4) covers the protection of electrical and electronic systems housed within structures.
Coordinated surge protection to all cables entering or leaving the structure will be provided by others.

6 – Surge Protection Requirements

Incoming Power - 1No x 3 Phase (Type1/2) 415 Class IV (complete with enclosure)
Telephone Supply – 10no. x Telecom (Type 1/2) for 10 line Exchange Telecom

Upon completion PTSG will check that all SPD's have been installed and are working prior to issuing certification for the lightning protection system.

7 - Lightning Protection System Outline Description:

Air Termination Network:

25mm x 3mm PVC aluminium conductor tape secured with non-metallic/WSO holdfast/self adhesive type clips at 1 mtr centres to form an effective grid network over the entire roof area in accordance with BSEN62305:2012 Part 3 for a Class 4 LPS.

Down Conductors:

The down conductor paths will be formed by 25 x 3mm pvc sheathed aluminium tapes these shall be fixed at 1 mtr centres via NMDC clips as the down conductor paths in 12no. positions around the perimeter of the structure.

Earth Termination Network:

2 No 1.2 Mtr copper bond earth electrodes in each down conductor position coupled together with a gunmetal coupler

Te**st Points:**

12 No earth electrodes complete with inspection housings.
12 No bimetallic tests points installed at 300mm above ffl
Testing will be carried out by way of the disconnection points within the inspection housings.

Equipotential bonding:

All exposed metalwork at roof level will be bonded into the LPS to form an equipotential plane over the entire roof area to prevent flashover in the event of a lightning strike to the structure.

System Testing:

All earth electrodes will be individually tested and the overall resistance calculated to ensure full compliance with BSEN62305:2012

The test result certification will be forwarded to JRS Mechanical Services Ltd along with O&M information for the system.

8 – Specifications, Drawing Register & LP Risk Assessments:

Drawings:

JH_GS_55319_0_SP_LP

Risk Assessments:

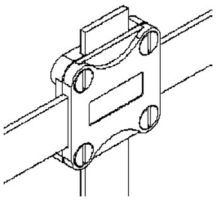
Wrexham Football Museum– Risk Assessment no. 55319 (LPL4)

Upon completion and final witnessed testing certification for lightning protection system, as installed drawings and the operation & maintenance manual will be issued along with a guide to future testing requirements.

3. STRUCTURAL LIGHTNING PROTECTION (LPS)

Materials/Consumables used on LPS

Description	ABB Part Number	Photograph
25x3mm PVC sheathed copper tape	TC130	
25x3mm PVC sheathed aluminium tape	TA120 / TA130	
50mm² pvc covered aluminium tape	CD084	
50mm² pvc covered copper tape	CD039	
Non-metallic DC clip - PVC	CP040	
Non-metallic push-in clips	CP876	

Adhesive DC tape clip	CA020	
Glue down DC clip	GD020	
Slate holdfasts	HF030	
Slate Holdfasts	HF176	
Aluminium / Gunmetal Square Clamps	CT106 / CT007	
Gunmetal U-Bolt Clamp	CR320	
Bimetal connector	CN915	
Copperbond steel rods with couplers and driving studs	RA205+CG270+ST200	

Polymer Inspection Housing	PT205	
10mm SS nuts, bolts & washers		
Oxide inhibiting compound	CM005	
Gunmetal Square Clamp	CT106	
Gunmetal Oblong Clamp	CN105-H	

8 - Component Parts Continued:

For lightning conductor applications where aesthetic impact is an important consideration, choose one of our PVC coverings from the colour swatches below.

