

**Guidance  
Note**



**Fire Industry Association**

Leading Excellence in Fire Since 1916

**Lightning Protection  
Existing Arrangements Evaluation Tool**

For the primary purpose of informing fire risk assessments, which are carried out in compliance with the Fire Safety Order 2005

## Contents

1. Background.....	3
2. Purpose and objective.....	3
3. The Risk Appraisal.....	4
4. Appraisal tool.....	6

## 1. Background.

- 1.1 The guidance set out in PAS 79 recommends that fire risk assessors take account of the fire safety risks arising from lightning strikes to buildings. However, the provision of lightning protection is not a building regulation requirement, and at the time of writing, there is little, if any guidance for fire risk assessors on how to appraise the risks.
- 1.2 To confirm the presence of lightning protection in the absence of documented evidence, Fire Risk Assessors will usually look for lightning protection components on a building, such as air terminals, down conductors, and external earth terminal points. But the presence of these indicators may not be obvious, particularly where the structural steel is utilised as the down conductor, and air terminals cannot be seen from the ground.
- 1.3 This tends to result in Risk Assessors setting recommendations for routine servicing and testing of lightning protection systems where they are obviously present, but maintenance records are not available, and where protection systems are not obviously present, in recommendations for a lightning protection risk assessment to be carried out.
- 1.4 The latter recommendation has the potential to impose significant, and in most cases, unnecessary costs on the Responsible Person, because for most buildings, the necessity for lightning protection would have been considered as part of the design considerations at the time of construction, and providing that there have been no significant changes to the prevailing arrangements that were initially considered, then the risk will not have changed.

## 2. Purpose and objective.

- 2.1 This document sets out an approach to appraising the need for lightning protection in buildings where; no obvious lightning protection is provided, the original design intention relating to the lightning protection is not available, or where salient factors that would have influenced the design intention appear to have changed, thereby bringing the existing arrangements into question.
- 2.2 The primary purpose of the document is to facilitate a reduction in the number of recommendations, in fire risk assessment reports buildings, to undertake lightning strike risk assessments, without incurring any significant increase in the risks to building occupants from lightning strikes.
- 2.3 The document describes a basic, relatively unsophisticated, risk appraisal process that can be applied by lay persons to determine whether the provision of lightning protection for individual residential buildings is clearly not a requirement or needs to be the subject of a more detailed risk assessment, carried out by specialist lightning protection contractors.
- 2.4 The objective of the document is to provide a means by which fire risk assessors can easily identify those buildings which do not require lightning protection and avoid making erroneous and potentially costly recommendation in their reports. Thereby enabling the redirection of resources and funds to higher risk issues.

### 3. The Risk Appraisal.

**3.1** It must be remembered that this document is not attempting to set out a full lightning strike risk assessment process. That is a task for qualified, experienced, and competent specialists following the guidance set out in BS-EN 62305-2. Protection against lightning. Risk Management.

It should also be noted that this tool has been specifically produced for residential premises.

**3.2** In order to provide a comprehensive lightning strike risk assessment, the criteria considered in a BS- EN 62305-2 risk assessment includes the following:

- a. The lightning strike density of the region in which the building is located. The number of lightning strikes per square kilometre per year. <sup>1</sup>
- b. The danger to people. The number of people present and the likelihood of panic. <sup>1</sup>
- c. The occupancy coefficient. Whether the structure under assessment is occupied or vacant. <sup>2</sup>
- d. The dimensions of the building. <sup>1</sup>
- e. The location and height of the building. In relation to other structures. <sup>1</sup>
- f. The fire risk. Presented by the building structure or the processes or materials within the building. <sup>1</sup>
- g. Associated services. Services to other premises/installations that could be disrupted by a lightning strike to the subject building/installation. <sup>2</sup>
- h. The arrangements for incoming services to the building. Overhead services are more likely to attract lightning strikes than below ground services. <sup>2</sup>
- i. The lightning protection level. The kilo-ampere capacity of existing lightning protection arrangements. <sup>2</sup>
- j. Surge arrestors. <sup>2</sup> Existing protective devices that prevent surge currents entering the building and damaging the electrical installation. Normally only provided where overhead incoming services are present. <sup>2</sup>

These factors should have been considered as part of the buildings original design at the time of construction or significant alteration.

A reassessment of the risk of lightning strike should be prompted by; observations made during routine service and inspection visits of the existing lightning protection system, significant changes to the occupancy or use of the building, changes in the buildings surroundings, or changes in weather patterns driven by climate change.

**3.3** For the purposes of the appraisal described in this document, the outputs of which are less refined than a full lightning strike risk assessment, only those factors listed above, and indicated by the superscript 1, will be considered. The remaining factors, indicated by the superscript 2 will be considered in a more comprehensive risk assessment, should that be required by the findings of this appraisal.

**3.4** This appraisal tool, [Lightning Protection Appraisal Tool UK](https://electrical-engineering-portal.com/) which is based on the principles set out in a lightning protection risk assessment calculator that was developed by Shafqat Ali and made available for free download on <https://electrical-engineering-portal.com/>, produces a binary

conclusion which will either confirm that lightning protection is not necessary, or that a more detailed lightning protection risk assessment is required.

### 3.5 5 Appraisal tool inputs.

The following guidance should be considered and adopted when entering data into the lightning strike appraisal tool.

#### a) Lightning strike density (Ng)

For the purpose of this appraisal tool, Ng, is taken as being 0.5, which is the average lightning strike density for the UK based on statistics produced by Viasala<sup>i</sup> for the years 2016 to 2021. More accurate Ng values, on a county-by-county basis, can be obtained at <https://interactive-lightning-map.vaisala.com/?ga=2.34776354.2063317197.1656508397-1151693532.1656508397> and can be used in the appraisal tool.

Additional lightning data and maps can be found on the UK Met Office website<sup>ii</sup>.

#### b) Danger to people (h)

Danger to people is loosely based on the likelihood of panic amongst occupants and the ability of occupants to self-evacuate. The appraisal tool assumes that the means of giving warning of fire and the means of escape are code compliant while at the same time recognising that the fire safety arrangements in some residential buildings are currently operating on a less than optimal regime. Occupancy figures have been based on an average of 2.5 person/dwelling.

Value	Descriptor	Examples
1	No particular danger	HMO <= 5 occupants. Converted house <sup>see note 2</sup> , <= 4 dwellings <=10 occupants. Purpose built block of flats <=8 dwellings < 20 occupants.
2	Low risk of inappropriate response or confusion during evacuation.	HMO <= 8 occupants. Converted house <sup>see note 2</sup> , <= 6 dwellings <=15 occupants. Purpose built block of flats <=16 dwellings < 40 occupants
5	Medium risk of inappropriate response or confusion during evacuation.	HMO 9 – 20 occupants. Converted house <sup>see note 2</sup> , 7 - 12 dwellings >=30 occupants. Purpose built block of flats >=17 dwellings > 43 occupants. Plus 1 or more from the following list. Common parts fire alarm. Simultaneous evacuation. CP3 design buildings. Single stair egress. Single door protection to stairs.
5	Protracted evacuation procedures / arrangements.	Care homes. Substantial number of occupants with known significant disabilities / substance dependencies. Presence of evacuation lifts.
10	High risk of inappropriate response or confusion during evacuation.	<1,000 people. Occupants unfamiliar with escape routes. Presence of waking watch. High rise residential premises operating on simultaneous evacuation.

<sup>a</sup> = House converted to flats but not in accordance with building regulations 1991 or later editions. i.e. suitably subdivided into fire compartments.

**d) L, W, H, Projections.**

The dimensions of the building should include the width, length, and height of the building in metres. In addition, the height of any projections that extend above the roof line, such as chimneys, spires, telecoms towers and the like, should also be entered.

**e) Relative location of building (Cd)**

Generally, the higher a structure, in relation to surrounding structures and trees, the more likely it is to be struck by lightning. So, if adjacent tall structures or buildings that were in place at the time of construction, have been removed, then the likelihood of a lightning strike on the building under assessment is increased. Conversely, if taller structures have been erected since the building being appraised was erected, then the risk of lightning strike may have diminished.

<b>Cd value</b>	<b>Building situation</b>
0.25	Building surrounded by higher structures or trees.
0.5	Building surrounded by buildings or trees of similar height
1	Building isolated with no other structures or trees in the vicinity
2	Building isolated on top of a hill or raised ground.

**f) Fire risk (rF)**

Is a value that represents the likely risk of fire spread and growth in the building, considering the fuel load, automatic suppression, and fire compartmentation.

Generally, residential buildings will present a 'Normal' fire risk, with no unusual fuel load and compartmentation and suppression provided in accordance with building regulation requirements. However, buildings with hazardous external wall systems present a greater fire risk, due to the potential speed of fire spread across the exterior of the building and therefore present a 'High' fire risk.

<b>rF value</b>	<b>Fire risk</b>
0.01	Normal fire risk
0.1	High fire risk

## **4. Appraisal tool**

[Lightning Protection Appraisal Tool UK](#)

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<sup>i</sup> Vaisala is a global leader in weather, environmental, and industrial measurements headquartered in Vantaa, Finland.

<sup>ii</sup> <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-actual-and-anomaly-maps>

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