

Guidance on the use of BS EN 40-3-1 and BS EN 40-3-3

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Committees responsible for this Published Document

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- Aluminium Federation
- County Surveyors' Society
- Galvanizers Association
- Highways Agency, Department for Transport
- Institution of Highways and Transportation
- Lighting Column Manufacturers Association
- UK Steel Association
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Foreword

This Published Document was prepared by Technical Committee B/509/50, Street lighting columns. It gives guidance on the use of BS EN 40-3-1 and BS EN 40-3-3, which were prepared by CEN/TC 50, Lighting columns and spigots.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**.

This Published Document is not to be regarded as a British Standard.

PD 6547:2004+A1:2009, supersedes PD 6547:2004, which is withdrawn.

BS EN 40 is a more complicated design standard than BS 5649, the British Standard which specifies the design of lighting columns, so this Published Document gives guidance on the additional information that is required to allow a suitable lighting column to be designed.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

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1 Scope

This Published Document gives guidance and background information to specifiers and manufacturers of lighting columns on the use of BS EN 40-3-1 and BS EN 40-3-3, which specify the design of lighting columns. In particular, it gives guidance on the information which the specifier is required to give to the manufacturer to allow a suitable lighting column to be designed, such as the topography factor, site wind speed, site altitude and terrain category, which are used to determine the design wind pressure.

2 Background information on the design wind loadings in EN 40-3-1

The current standard for deriving the wind loads on a lighting column is BS EN 40-3-1:2000, which superseded BS 5649-6:1982 and requires that the wind speed information be derived from DD ENV 1991-2-4. The reference in BS EN 40-3-1 to DD ENV 1991-2-4 is **[A1] text deleted [A1]** out of date and is to be revised at the earliest opportunity **[A1]** to BS EN 1991-1-4 **[A1]**.

[A1] Wind speed data for the design of lighting columns should be taken from the National Annex of BS EN 1991-1-4:2005, Figure NA.1. **[A1]**

[A1] Note deleted **[A1]**

3 Wind pressures

3.1 General

BS EN 40-3-1:2000, **3.2.1**, specifies an equation for calculating the characteristic wind pressure, $q(z)$, in N/m^2 for any particular height above ground, z :

$$q(z) = \delta \times \beta \times f \times C_{e(z)} \times q_{(10)}$$

where:

- $q_{(10)}$ is the reference wind pressure;
- δ is a factor depending on the column size;
- β is a factor depending on the dynamic behaviour;
- f is a topography factor, which is taken as 1 unless otherwise specified or where a lighting column is installed on a slope with a height of less than 5 m;
- $C_{e(z)}$ is a factor depending on the terrain of the site and the height above ground z .

3.2 Reference wind pressure $q_{(10)}$

[A1] The reference wind pressure should be determined using the fundamental basic wind velocity, $V_{b,0}$ (see BS EN 1991-1-4:2005 Clause 4.2(1)P Note (2) – The Fundamental value of the basic wind velocity $V_{b,0}$).

Expression NA1
$$V_{b,0} = V_{b,\text{map}} \times C_{\text{alt}}$$

where: $V_{b,\text{map}}$ is the value of the fundamental basic wind velocity before the altitude correction is applied, and should be taken from Figure NA1 of BS EN 1991-1-4:2005

C_{alt} is the altitude factor

$$C_{\text{alt}} = 1 + 0.001A$$

where:

A is the altitude of the site in meters above mean sea level. **[A1]**

NOTE 1 Many administrative authorities are able to select one value of **[A1]** $V_{b,\text{map}}$ **[A1]** which covers most situations within their boundaries. In the interests of standardization, administrative authorities may select a maximum altitude to be used in specifications that cover the majority of lighting column locations within their boundaries. A table of such altitudes by administrative authority is given in Annex A.

[A1] NOTE 2 In BS EN 40-3-1:2000, $V_{b,0}$ is equivalent to V_{ref} and $V_{b,\text{map}}$ is equivalent to $V_{\text{ref},0}$. **[A1]**

3.3 Exposure coefficient $Ce_{(z)}$

3.3.1 Terrain categories

The exposure coefficient $Ce_{(z)}$ is a factor varying with height above ground and is dependent on the terrain category of the site where a lighting column is to be installed, as determined by reference to BS EN 40-3-1:2000, Table 1.

Where specific information about terrain is available for the site where a lighting column is to be installed, this should be specified to the manufacturer.

[A1] Text deleted **[A1]**

Lighting columns of nominal height below 8 m are generally installed in less exposed locations more suitable to the terrain category III classification. Therefore, if the terrain category is not specified it is recommended that the terrain categories given in Table 1 should be used, **[A1]** however, it should be noted that BS EN 40-3-1:2000, 3.2.6, recommends that the calculation should be carried out using category II. **[A1]**

Table 1 — Terrain categories by lighting column height

Lighting column height	Terrain category
Below 8 m	III
8 m and above	II

[A1] NOTE Examples of the different terrain categories are given in BS EN 1991-1-4:2005, Annex A.

It should be noted that terrain category 0 is not used in BS EN 40. **[A1]**

3.3.2 Columns mounted on structures

Where lighting columns are mounted in an elevated location, such as on a bridge or multi level building, the increased height above ground level should be taken into account in calculating the exposure coefficient $Ce_{(z)}$.

Special allowance might be necessary for a lighting column positioned at the edge of a tall structure, and specialist advice should be obtained.

3.3.3 Exposed locations

Where a lighting column is to be installed in an exposed site, for example a coastal location, a site subject to local wind funnelling or a site 250 m above sea level, specialist advice should be sought in determining the terrain category to be used in the calculation of the exposure coefficient $Ce_{(z)}$.

[A1] When a lighting column is to be used in coastal applications, it is necessary to consider the higher wind loadings as a result of an increase in Terrain Category. It is recommended that the Terrain Category be moved up by one level from the recommendations in Table 1. A coastal application is defined as being within 5 km of the mean high water spring tide height. Care should be taken where the column is installed in a location where topography is significant, see BS EN 40-3-1:2000, 3.2.5. The wind speed and altitude defined in Table A.1 should be used when the site altitude is not defined. **[A1]**

4 Rationalized wind loading factors (R_{wf})

As an alternative to specifying the information detailed in Clause 3, the specifier may use rationalized wind loading factors (R_{wf}). These have been calculated using the 10 minute mean wind velocity specified for each administrative region of the United Kingdom and adjusted for altitude, as detailed in Annex A. In the interests of standardization **[A1]** five **[A1]** factors have been used for the UK, and the maximum altitude for each administrative area has been increased to take into account any additional loading capacity arising as a result of standardization.

The rationalized wind loading factor R_{wf} in N/m^2 is given by the following equation.

$$R_{wf} = (V_{ref \text{ altitude adjusted}})^2 \times 0.564$$

where:

0.564 is a factor which takes into account C_s for a mean return period of 25 years and is equal to $\sqrt{0.92}$ and ρ the air density taken as 1.226 kg/m^3 , **[A1]** from BS EN 1991-1-4. **[A1]**