AD 430:
Wind load on unclad frames

The purpose of this note is to correct errors in BRE Special Digest SD5 which lead to the prediction of significantly higher wind loads on unclad frames than were calculated using the report which SD5 superseded.

BRE published Special Digest SD5 in July 2004. The document was produced principally because at the time, the current guidance for determining wind loads on frames, lattice structures and individual members was based on the BS code of practice CP3 Chapter V: Part 2 which had been withdrawn in October 2001. SD5 is based on BS 6399-2 and includes guidance on determining loads on individual members and lattice structures. It also includes a section on unclad building frames which is based on and intended to supersede BRE report BR173, Design guide for wind loads on unclad framed building structures during construction.

BR173 considers a series of identical parallel frames of overall width W at spacing S. The parameter S is used to select the appropriate normal force coefficient C_D according to the ratio W/S and the total solidity ratio denoted φ. In a given direction, φ is presented in BR173 as the sum of the horizontal and vertical solidity ratios: $\varphi = \varphi_v + \varphi_h$. In the direction perpendicular to the secondary beams, the horizontal solidity ratio used is the equivalent solidity ratio which allows for all the secondary beams in a bay denoted $\varphi = \varphi_v + \varphi_h{}^*$ (see item iii in the design example in BR173 para. 4.2.2). In SD5, the total solidity ratio is erroneously given as $\varphi = \varphi_v + \varphi_h + \varphi_{h,s}$ ie the equivalent horizontal solidity ratio $\varphi_{h,s}$ is added to, instead of substituted for the horizontal solidity ratio φ_h. The total solidity ratio in this direction should be given in SD5 as $\varphi = \varphi_v + \varphi_{h,s}$.

The spacing of the secondary beams is used in the determination of the equivalent solidity ratio for secondary beams. In BR173, this parameter is also denoted S and is likely to be different from the frame spacing but unfortunately, SD5 does not differentiate between the two parameters. In SD5, the relevant equation is no. 11: $\varphi_{h,s} = (\varphi_1 + \varphi_2)\varphi_h$ where $\varphi_2 = (n-1)(S/d - 7.5)/25$. According to BR173, in the expression for φ_2 the parameter S is the secondary beam spacing not the frame spacing. The equivalent expression in BR173 is equation (4): $f_2 = (N_{bb} - 1)(S/b - 7.5)/25$. The secondary beam spacing should be used in the determination of φ_2.

The approach to determining the wind load on unclad structures (lattice structures, frames and individual members) in SD5 (corrected as indicated) can also be used with BS EN 1991-1-4 and its UK National annex as the design pressures have identical target reliability to BS 6399-2.

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New and revised codes & standards

NEW WORK STARTED

EN 1990
Eurocode. Basis of structural and geotechnical design
Will supersede BS EN 1990:2002+A1:2005

ISO PUBLICATIONS

ISO 17607-1
Steel structures. Execution of structural steelwork. General requirements and vocabulary
Will supersede None

ISO 17607-2
Steel structures. Execution of structural steelwork. Steels
Will supersede None

ISO 17607-3
Steel structures. Execution of structural steelwork. Fabrication
Will supersede None

ISO 17607-4
Steel structures. Execution of structural steelwork. Erection
Will supersede None

ISO 17607-5
Steel structures. Execution of structural steelwork. Welding
Will supersede None

ISO 17607-6
Steel structures. Execution of structural steelwork. Bolting
Will supersede None