Construction Metal Forming

Suggestions for internal pressure coefficients

Wind Loads – Internal Pressures

MetPurl®

Internal pressures act on all structures with any element of permeability. What engineers equate this to may be down to subjective interpretation of the building envelope, including its façade and apertures.

The following aims to give generic guidance on the use of positive internal pressures, but approval of the applied loadings should always be sought from the client and/or project engineer.

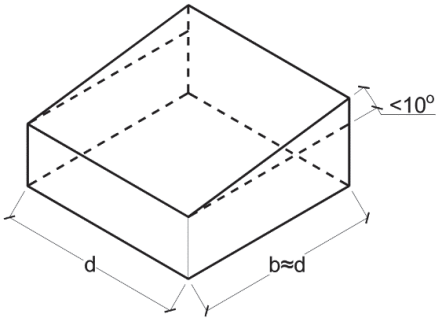
POSITIVE INTERNAL PRESSURE COEFFICIENTS (+0.2 OR 0.0)

BS EN 1991-1-4 § 7.2.9 (6) NOTE 2 states that where it is not possible or justified to estimate permeability, c_{pi} is to be taken as the more onerous of +0.2 and -0.3. BS 6399-2 concurs and provides these values in a tabulated format. However, many would argue that a positive value of +0.2 is conservative for many design cases with other design standards discussing this further.

SCI guide P394 suggests that "since the surface area exposed to negative external pressure will usually be much greater than that exposed to positive, a calculation based on EN 1991-1-4 7.2.9 (6) should be able to justify a c_{pi} well into the negative (i.e. not +0.2). SCI guide P286 goes further and advises that positive internal (e.g. +0.2) pressure can only occur in an enclosed building when two opposite sides are equally permeable, other faces impermeable and wind acting normal to the permeable face. Appendix C agrees but says +0.2 should be considered as an upper bound.

The nearest thing to prescriptive guidance is the BRE Digest 436 document which states that the internal pressure coefficient for completely clad enclosed warehouse-type buildings, without opening windows, may be taken as c_{pi} = -0.3; and says that generally for buildings +0.2 is now the exception instead of the rule.

c_{pi} should ideally be calculated for each project based on building permeability. However as this may not be practical for many purlin or rail schemes and given the historic use of +0.0 as the positive coefficient value within the industry, suggestions are provided based on limiting the ratio of positive to negative external pressures to around **1:3**.



Positive c_{pi} = +0.0 might be considered where:

i. building plan is relatively square
ii. cladding is consistent all round
iii. there are no dominant openings
iv. roof slopes < 10° to limit positive Cpe

or where the project engineer advises as such

NOTE: A negative c_{pi} = -0.3 should be maintained unless a project specific c_{pi} value is calculated

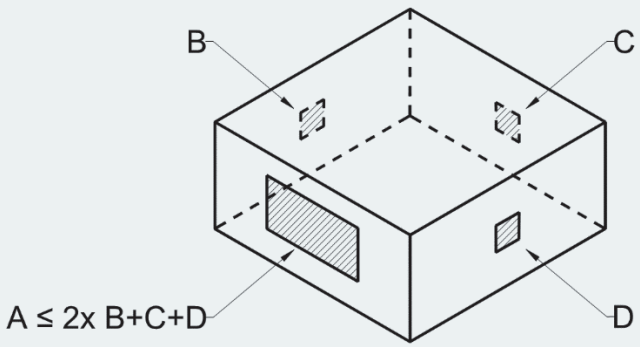
DOMINANT OPENINGS

BS 6399-2 § 2.6.2 and BS EN 1991-1-4 § 7.2.9 (4) both state that the face of a building is considered dominant when the area of openings within that face is at least 2x the area of openings of the remaining faces.

Note also that BS EN 1991-1-4 § 7.2.9 (3) states where a dominant opening would be shut during a storm, the design should also be checked as an accidental situation (available within the MetPurl software).

Further information is available from PD 6688-1-4 (BSI, 2009).

Further information on the design of portal frame buildings is available from SCI publication P399.



Face treated as dominant where area of openings at that face is at least 2x area of openings in remaining faces

For further information please contact CMF:

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