WIND PRESSURE DISTRIBUTION ON LOW-RISE BUILDINGS WITH PROJECTIONS

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ABSTRACT

Wind load is one of the important loads to be considered while designing low-rise buildings constructed in the area of high velocity wind such as cyclones and tornadoes. Low-rise buildings generally have simple shape in plan with flat or pitched roof. Information regarding wind pressure coefficients, both internal and external, on such building forms are available in code of practices of various countries dealing with wind loads.

External surfaces of low-rise buildings may or may not be smooth. Such buildings have projections such as parapets (in case of flat roofs), overhangs (in case of sloping roofs) sunshades on window openings, and canopies on the main entrance to the building at ground floor level (Fig. 1). A canopy may be simple cantilever slab projecting from the external wall or having column supports at free edge (Fig. 2). The canopy may be placed at first floor level or at roof level in case of buildings with more than one storey (Fig. 2).

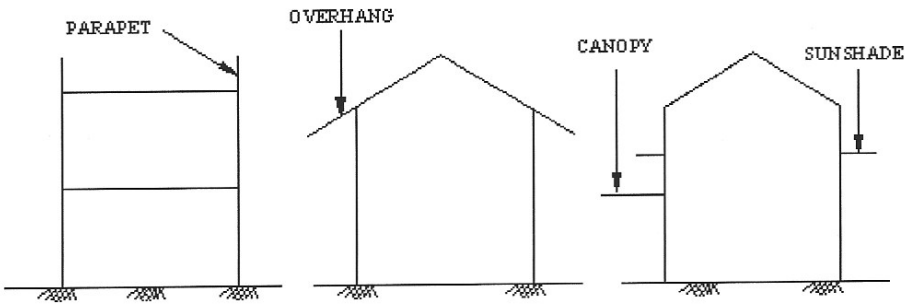
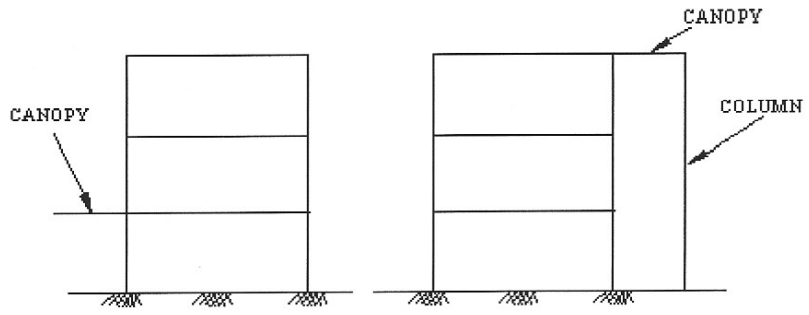


Fig. 1 Low-rise buildings with projections

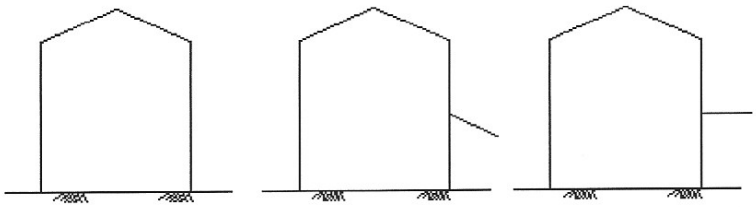
Presence of such projections influences wind pressure distribution and thus wind pressure coefficients on external surfaces of buildings, including roof and walls. However, this fact has not been studied in detail so far and as such, only very limited information in this area is available in codes of practices. Indian Standard code of practice on wind loads IS : 875 (Part-3)-1987 gives values of wind pressure coefficients on gable roof buildings with unsupported canopy for wind direction normal to ridge only. Similarly, the Australian code AS/NZS 1170.2:2002 recommends certain values of net pressure coefficients on canopies/awnings and carports. Values given in code are for wind directions parallel and perpendicular to ridge. Dimensions of canopies with respect to building dimensions are also restricted.



(a) (b)

Fig. 2 Different types of Canopies

Present paper describes the wind tunnel study carried out on models of gable roof buildings with and without canopies. Only one canopy, cantilevering from the surface of the wall is considered. Canopy is placed perpendicular to the wall in one model and inclined in the other. Figure 3 represents models used in present study. Pressure points are made on roof as well as wall surfaces to measure external wind pressures. In case of canopies, pressure points are placed on upper as well as lower surfaces.



(a) (b) (c)

Fig. 3 Models used in present study

Models are tested in closed circuit wind tunnel under uniform flow field. Wind direction is varied from 0° to 90° at an interval of 15°. Wind pressure coefficients are calculated and compared with those for building without canopy in order to observe the influence of canopy on wind pressure distribution.