

学术论文

罩棚式低矮房屋屋面风荷载特性及气动抗风措施研究

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摘要:

采用模型的风洞试验详细研究了矩形和圆形罩棚屋面结构的平均风压和峰值风压分布特征, 分析了屋面风致破坏的主要原因, 在此基础上实施了7种不同的屋面局部修改方案的对比试验, 从中筛选出可以有效消减屋面风荷载的抗风措施。两种平顶矩形和圆形罩棚屋面结构均以负压为主, 试验测得两结构屋面的最高平均负压系数分别为-1.83和-0.97, 相应最高极值负压系数为-5.41和-3.11, 结果远高于GB 50009—2001《建筑荷载规范》推荐的平均风压乘以阵风系数的方法, 这显示规范中的阵风系数方法并不适合于计算该类屋面结构的风压值。根据分析结果给出了平顶矩形和圆形罩棚屋面结构风压体型系数取值的建议值, 采用斜切角形式的屋檐或在屋面板和侧面围板交界处开贯通透风槽方式可以使屋面风敏感区域的极值负压削减25%~35%。

关键词: 罩棚式屋面 风荷载 风洞试验 平均风压 极值风压

Study on wind loads on flat roof of canopied low-rise building and aerodynamic strategy for wind load reduction

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Abstract:

The distributions of mean wind pressure and extreme wind pressure on flat roof of rectangular and circular canopy structure models were investigated in a boundary layer wind tunnel. The mechanism of wind-induced damages of the canopy roof was analyzed. Generally, the cladding design of those canopy structures is dominated by suction wind pressures. The results show that the maximum mean negative pressure coefficients on the rectangular and circular canopy reach -1.83 and -0.97, respectively, and the maximum peak negative pressure coefficients are found to be -5.41 and -3.11 which are much more than the values proposed by the gust factor approach of GB 50009. This indicates that the gust factor approach is not suitable for the calculation of roof pressure on the envelope structures. According to the characteristics of wind loads on the canopy, several aerodynamic strategies to reduce the maximum suction wind pressure at wind sensitive locations on the canopy by venting the leading edges and chamfering the roof edge were recommended. The experimental results show that the suggested strategies can make a reduction of 25% ~35% wind load on the roof's sensitive locations. Based on the analysis results, the local shape factors for the rectangular and circular canopy structures were recommended.

Keywords: canopied low-rise building wind load wind tunnel test mean wind pressure extreme wind pressure

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