Glass constructions for infrastructure – new subway stations in Munich

Geralt SIEBERT
Univ.-Prof. Dr.-Ing. Chair for structural design and building physics
Universität der Bundeswehr München
85577 Neubiberg, Germany

geralt.siebert@unibw.de

Geralt Siebert, born 1966, received his civil engineering degree from TU München. The doctor's thesis about the application of architectural glass as load carrying structural element was accepted 1999. He owns a consulting engineers office. Since 2003 he is professor at Universität der Bundeswehr München

Summary

This paper gives an overview about the application of architectural glass as load carrying element in structural engineering and its possible applications for infrastructure buildings like anti drop devices (railings), glazing of elevators and overhead glazing (eg. for bicycle-stations). The required actions to get a safe construction (static analysis, remaining load carrying capacity, necessary testing in laboratory) are shown, especially related to the demands of infrastructure buildings. For new subway connections in Munich many stations were built using glass for several applications. Examples the author worked on are presented, e.g. an accessible glazing with requirements for fire resistance, a large point fixed overhead glazing with access for service work and anti drop device.

Keywords: glass elements, residual strength, testing, railing, overhead glazing.

1. Introduction

1.1 General

Architectural glass is used for windows since a long time; the main loads were own dead load and the short-term wind. As an exception buildings like the famous crystal palace (built in 1851 for the international world exhibition in London) used the glass panes as stabilising element; at that time design for these rare special applications was done by "trial and error" instead of the nowadays usual calculation and safety regulations.

More and more architectural glass became new functions during the last decades: it is no longer used just as window but for vertical or overhead glazing, eventually with additional tasks like anti-drop-device (railing) or accessible walking surface. And moreover it is also used as stabilising element, as beam or girder to support e.g. (glass) roofs or even acting as flat or curved 2-d-structural element (plate and shell).

Together with these new applications of course new ways of supporting glass elements were developed: instead of linear bearings in window-frames e.g. several types of alternative linear or point-fixings were developed This means a widened field of static systems and by this different behaviour for glass has to be taken into account. And in addition, the new application of glass as structural elements also means that new loads have to be considered: e.g. climatic loads for insulation glass elements or impact loads for railings.

This opens a new, wide field for interesting research work: it has to be checked whether the well known methods for calculation and design of the conventional building materials like concrete, metals and timber can be applied to the new applications of the "old" material *glass*; and in case the "old methods" can not be used, new methods and rules have to developed.

1.2 Overview of different applications

The different applications of architectural glass can be divided according to their way of installation (geometrically) and – depending on the situation – eventually with respect to additional tasks the

https://doi.org/10.2749/222137807796157896