

Focus on IFA's work

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UV transmission of vehicle windows

Problem

Effective 1 January 2015, squamous-cell carcinomas of the skin and multiple actinic keratoses of the skin caused by natural UV radiation were included in the list of formally recognized occupational diseases under the number BK 5103.

The criteria required for description and evaluation of occupational exposure to natural ultraviolet (UV) radiation are summarized in a technical information document. This document is already being used for practical purposes. The calculations are based essentially upon assessment of the exposure to natural UV radiation during daily working hours. Person-specific aspects of exposure are computed from a large number of factors. These lead to additions to and deductions from a baseline radiation value.

One of these factors takes account of working conditions that reduce UV exposure. Such conditions include time spent within vehicles. Before now however, knowledge was not available of the transmission of UV radiation through vehicle windows. This knowledge gap was to be closed by an IFA project.

Activities

In conjunction with the German Social Accident Insurance Institutions, the IFA performed systematic measurements of the UV transmission of windows on vehicles of different ages.



Test arrangement on the side window of a goods vehicle

A test arrangement developed specifically for the purpose was used for reproducible measurements on vehicles in exhibitions and museums.

Analysis of the measured transmission spectra yielded coefficients from which conclusions can be drawn regarding exposure of persons within the vehicles.

Results and Application

Systematic transmission measurements were performed on a number of different vehicle window types to determine the extent to which the UV exposure of persons in vehicles is influenced by the windows. Vehicle windows can be divided into two groups:

- Solid glass windows: transmission of between 5 and 10% of the erythemal UV radiation.
- Laminated and plastic windows: transmission of between 0.1 and 2% of the erythemal UV radiation.

Besides the preventive aspects, recommendations for application of the Wittlich formula can also be formulated based upon the measured values:

- During time spent within vehicles with closed cabs, 2.5% of the exposure normally occurring outdoors can be assumed as a worst-case hypothesis based upon the transmission factors and exposure situation.
- During time spent within vehicles with semi-open cabs, 10% of the exposure normally occurring outdoors can be assumed as a worst-case hypothesis based upon the transmission factors and exposure situation.

For vehicles of open design (e.g. with protective canopy only), no reduction in the exposure is assumed.

Area of Application

Accident insurance institutions tasked with assessing exposure in relation to occupational disease No BK 5103.

Additional Information

- Wittlich, M.: Technische Information zur Ermittlung in Berufskrankheiten(BK-)fällen vor dem Hintergrund der neuen Berufskrankheit mit der BK-Nr. 5103 „Plattenepithelkarzinome oder multiple aktinische Keratosen der Haut durch natürliche UV-Strahlung“, Issue 09.2015 www.dguv.de/webcode/m352118
- Wittlich, M.: UV-Strahlung im Freien – Gefährdungen bei der Arbeit. Technische Sicherheit 5 (2015) No 7/8, pp. 51-54
- Prävention von Gesundheitsschäden durch solare Exposition. Grundsatzpapier der Deutschen Gesetzlichen Unfallversicherung (DGUV) 2015 www.dguv.de/webcode/m773383
- Hautkrebs durch arbeitsbedingte UV-Strahlung; Arbeitshilfen der Deutschen Gesetzlichen Unfallversicherung, available at: www.dguv.de/webcode/d649737

Expert Assistance

IFA, Division 4: Ergonomics – Physical Environmental Factors

Literature Requests

IFA, Central Division