Annex I 104.03

Isocyanates

Definition of causal agent

Isocyanates constitute a group of highly reactive chemicals used on a large scale for the production of flexible polyurethane foam. They are generally synthesized by the reaction of amines or their hydrochlorides with phosgene. Toluene diisocyanate (TDI), diphenyl-methane isocyanate (MDI) and hexamethylene diisocyanate (HDI) are most often used in the production of polyurethane articles.

Main occupational uses and sources of exposure:
Aliphatic isocyanates such as HDI polymers are used primarily in external coatings and paints. Aromatic isocyanates such as MDI and TDI are used to produce a number of products such as flexible and rigid foams, adhesives, and sealants. MDI is also used to manufacture truck bed liners, synthetic leather, and laminated wood products

Toxic effects

1. Irritant and corrosive effects

The crucial mechanism of toxicity is connected with the direct influence of isocyanates on oxidative stress in cells. These chemicals can create quite persistent connections with gluthatione and they are the cause of increased production of reactive free radicals.

Isocyanates irritate the skin and the ocular and respiratory mucous membranes.

Direct contact (or exposure to high concentrations) can lead to palpebral and corneal disorders with eye burns, photophobia, blepharospasm, conjunctival hyperhaemia and superficial corneal ulcerations.

Irritation of the airways may lead to an acute pulmonary oedema with bronchoconstriction and possible development of severe bronchiolitis, death from acute respiratory distress syndrome or fibrosis-type sequelae.

Guide values: (methyl isocyanate)

irritation of ocular mucous membrane: exposure > (470µg/m3); 0.2 ppm

palpebral and corneal disorders: exposure > (117.5 mg/m3); 50 ppm

acute pulmonary oedema: exposure > (117.5 mg/m3); 50 ppm

See section on ***Occupationally caused irritation of the skin and mucous membranes*** in Annex I entry nr. 202.