

Use of Contact Lenses in an Industrial Environment

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Industrial workers can come into contact with harmful agents that are transmitted via the eye in the form of an aerosol droplet or splash. Contact lenses do not provide ocular protection from hazards. This guidance from the American College of Occupational and Environmental Medicine addresses the use of contact lenses and personal protective equipment by the industrial worker and provides recommendations for contact lens use in an eye-hazardous environment.

An estimated 45 million Americans wear contact lenses and many of these individuals are employed as part of the industrial workforce.¹ As the health professional most familiar with workplace hazards, the occupational and environmental medicine (OEM) provider must be able to address employee and employer concerns regarding the proper use of contact lenses in the industrial setting. This guidance from the American College of Occupational and Environmental Medicine (ACOEM) addresses the use of contact lenses and personal protective equipment (PPE) by the industrial worker and identifies specific standards regarding the use of contact lenses as authorized by the Occupational Safety and Health Administration (OSHA).²⁻⁴

BACKGROUND

Many harmful agents are transmitted by contact with the eye in the form of an aerosol droplet or splash. Contact lenses do not provide ocular protection from hazards such as particles, chemicals, and radiant energy, and do not fulfill PPE requirements

for ocular safety when worn by individuals performing eye hazardous tasks.

Prior to 1988, federal regulations and voluntary standards of the American National Standards Institute (ANSI) also disallowed the use of contact lenses with a respirator.^{5,6} The National Institute for Occupational Safety and Health (NIOSH) also recommended that employees not wear contact lenses when they worked with chemicals that present an eye irritation or injury hazard.⁷ Challenges to these regulations, standards, and recommendations resulted in a 1985 OSHA-funded research project conducted by Lawrence Livermore National Laboratories (LLNL). The research concluded that the “prohibition against wearing contact lenses while using a full-facepiece respirator should be revoked or withdrawn in spite of the limitations stated. Wearers of corrective lenses should have the option of wearing either contacts or eyeglasses with their full-facepiece respirators.”⁸

In consideration of LLNL’s recommendation and review of other articles supporting contact lens use, OSHA considered the prohibition unwarranted. In 1988, the Agency published an enforcement procedure allowing the use of rigid gas-permeable and soft contact lenses in all workplaces and with all types of respirators.⁹ Subsequent studies and review articles have confirmed the safety and efficacy of appropriate use of both soft contact lens and/or rigid gas permeable contact lens in the workplace,¹⁰⁻¹³ and in fact the use of contact lenses for vision correction may be advantageous in the workplace.

Zelnick et al, showed that when a respirator was worn without glasses, there was a loss of visual field, which varied depending on the type of full-face respirator.¹⁴ Since the frames of glasses have been shown to be an obstruction of the full field of vision, the combined use of a respirator plus glasses compounds the loss of visual field. The use of “intra mask corrections” (lenses suspended inside mask) and lenses built into a facepiece as a substitute for spectacles, also leads to poor visual ergonomics. Contact lenses provide the best visual ergonomics for users of full-face respirator masks, although users of soft contact lenses may present with symptoms of dry eyes which may be ameliorated by using artificial tears and increasing the blink rate.

OSHA REGULATIONS

Although OSHA allows the use of contact lenses in all workplaces and with all types of respirators, the Code of Federal Regulations,¹⁵ requires they be combined with appropriate industrial safety eyewear. With regard to eye protection, OSHA has codified the voluntary ANSI Z87.1 consensus standard. Compliance is mandatory.¹⁶ For example, personnel must wear eye and face safety equipment to protect themselves from chemical vapors/eye irritants, optical radiation-glare, optical injurious radiation, and biologic hazards. The rule states, “The required industrial-safety eyewear for the specific hazard identified in ANSI Z87.1 must be worn over the contact lenses.”

In paragraph (g)1(iii) of its preamble to Respiratory Protection rule, OSHA states that “Because the final standard allows contact lenses to be worn, full facepiece respirators can be worn by persons needing corrective lenses; contact lenses obviously do not interfere with facepiece seal.”¹⁷ Further, the preamble of the PPE for General Industry rule states, “Based on the rulemaking record, OSHA believes that contact lenses do not pose additional hazards to the wearer, and has determined that additional regulation addressing the use of contact lenses is unnecessary. The Agency wants to make it clear, however, that contact lenses are not eye protective devices. If eye hazards are present, appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.”¹⁸

Currently, OSHA rules state that contact lenses should not be worn when working with acrylonitrile, 1,3-butadiene, ethylene oxide, methylene chloride, and 4,4’-methylene methylene dianiline chemicals.¹⁹⁻²³ These recommendations are presumably based on best professional judgment of 1978, as no specific bases are provided in the preamble to these standards. However, these rules must be adhered to until the standard is changed.

NIOSH RECOMMENDATIONS

In addition, NIOSH in its 2005 Current Intelligence Bulletin (CIB) 59, *Contact Lens Use in a Chemical Environment*, NIOSH noted that guidance from several professional groups including ACOEM and the American Academy of Ophthalmology, removed restrictions regarding contact lens use in the industrial environment.²⁴ Therefore, NIOSH currently recommends that

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contact lenses be permitted, provided the safety guidelines in CIB 59 are followed.

ACOEM RECOMMENDATIONS

In order to confirm with OSHA rules and provide a safe environment for industrial workers, the following recommendations for contact lens use in an eye-hazardous environment will guide employers and occupational safety and health professionals in implementing a policy for the safe use of contact lenses:

Establish a Written Policy

This policy should document general safety requirements for wearing contact lenses, including the required eye and face protection, and contact lens wear restrictions, if any, by work location or task. Restrictions on contact lens wear should be evaluated on a case-by-case basis, taking into account the visual requirements of the individual worker wearing contact lenses, as recommended by a qualified occupational medicine physician, ophthalmologist or optometrist, in order to be able to perform the essential visual functions, in accordance with this policy statement.

Conduct an Eye Hazard Evaluation

This evaluation should include an assessment of eye hazardous environments per OSHA Personnel Protection Standards (29CFR 1910.132), and appropriate eye and face protection for contact lens wearers (OSHA 29CFR 1910.133 and ANSI Z87.1A 2003). This information should be provided to the examining OEM health professional.

Provide Safety and Medical Training

In addition to providing the general training required by the OSHA personal protective equipment standard (29 CFR 1910.132), provide training on employer policies on contact lens use and first aid for contact lens wearers with a chemical exposure:

- Routinely train medical and first-aid personnel in the removal of contact lenses, management of pain, blepharospasm, and the appropriate equipment available. In the event of a chemical exposure, begin eye irrigation immediately and remove contact lenses as soon as practical. Do not delay irrigation while waiting for contact lens removal as the lens may come out with the irrigation or can be removed when irrigation is complete.
- Instruct workers who wear contact lenses regarding proper hand hygiene

when putting in or removing contact lenses. Removal of contact lenses should only be done in a clean environment and after the worker has washed his or her hands. Workers should remove lenses at the first signs of eye redness or irritation. Continued lens wear should be evaluated with the worker. Consider the assistance of an ophthalmologist if needed.

- Encourage workers to routinely inspect their contact lenses for damage and/or replace them regularly.

Provide Personal Protective Equipment (PPE)

Comply with current OSHA regulations on contact lens wear and eye and face protection. The *Code of Federal Regulations Preamble on Respiratory Protectors* (29 CFR 1910.134) and *Personal Protective Equipment* (CFR 1910.132) allows contact lenses to be worn under full-face respirators and other PPE for the eyes. Provide suitable eye and face protection for all workers exposed to eye injury hazards, regardless of contact lens wear. The wearing of contact lenses does not appear to require enhanced eye and face protection. For chemical liquid or caustic hazards, the minimum protection consists of well-fitting indirectly vented goggles or full-facepiece respirators. Close-fitting safety glasses with side shields provide limited chemical protection, but do not prevent chemicals from bypassing the protection. Face shields should be worn over other eye protection when deemed necessary for additional face protection, but workers should not wear face shields instead of goggles or safety glasses regardless of contact lens wear.

Notification to Visitors

Notify employees and visitors of any areas where contact lenses are restricted without appropriate eye and face protection.

CONCLUSION

ACOEM agrees with OSHA rules and other recommendations that workers be permitted to wear contact lenses when handling hazardous chemicals and in other eye hazardous environments provided the safety guidelines listed above are followed and that contact lenses are neither banned by regulation,^{20–24} nor contraindicated by medical or industrial hygiene recommendations. ACOEM concurs that contact lenses are not eye-protective devices and their use does not eliminate or reduce the requirement for eye and face protection. Consequently, as with glasses, contact lenses cannot serve as protective eye wear and appropriate eye protection is required to be worn in conjunction with the contact lenses.

REFERENCES

1. Konne NM, Collier SA, Spangler J, Cope JR. Healthy contact lens behaviors communicated by eye care providers and recalled by patients—United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2019;68:693–697.
2. Code of Federal Regulations—Parts 1900 to 1910 Personal Protective Equipment. 29 CFR 1910.132. Revised 1994.
3. Blais BR. Does wearing of contact lenses in the workplace pose a direct threat? *Occup Environ Med Rep.* 1998;12:17–31.
4. Blais BR. Discrimination against contact lens wearers. *J Occup Environ Med.* 1998;40:876–880.
5. Code of Federal Regulations—Parts 1900 to 1910 Respiratory Protection, 29 CFR 1910.134(e)(5)(ii). Revised July 1, 1990.
6. American National Standards Institute. ANSI Z88.6: Physical Qualifications for Respirator Use; 1984.
7. National Institute for Occupational Safety and Health. *Pocket Guide to Chemical Hazards.* Pittsburgh, PA: U.S. Government Printing Office; 1978.
8. DaRoza RA, Weaver C. *Is It Safe to Wear Contact Lenses with A Full-Facepiece Respirator?* Berkeley, CA: Lawrence Livermore National Laboratory (UCRL-53653); 1985.
9. US DOL. Memorandum to Regional Administrators Regarding Contact Lenses Used with Respirators, 29 CFR 1910.34(5)(ii). February 1988.
10. Owen CG, Margrain TH, Woodward EG. Use of contact lenses by firefighters. Part 2: clinical evaluation. *Ophthalmic Physiol Opt.* 1997;17:205–215.
11. Owen CG, Margrain TH, Woodward EG. Use of contact lenses by firefighters. Part 1: questionnaire data. *Ophthalmic Physiol Opt.* 1997;17:102–111.
12. Margrain TH, Owen CG, Woodward EG. Prevalence of spectacle and contact lens wear in the UK fire service. *Ophthalmic Physiol Opt.* 1996;16:11–18.
13. Tyhurst K, McNett R, Bennett E. The safety and efficacy of contact lens wear in the industrial and chemical workplace. *Optometry.* 2007;78: 596–604.
14. Zelnick SD, McKay RT, Lockey JE. Visual field loss while wearing full-face respirator protection. *Am Ind Hyg Assoc J.* 1994;55:315–321.
15. Code of Federal Regulations—Parts 1900 to 1910 Personal Protective Equipment. 29 CFR 1910.133. Revised 1994.
16. American National Standards Institute. ANSI Z87.1 1979 and Subsequent Revision.
17. Code of Federal Regulations—Parts 1910 and 1926 Respiratory protection final rule. Federal Register. January 5, 1998;1162.
18. Code of Federal Regulations—Parts 1910 Personal Protection Equipment for General Industry. Final Rule, CFR 29, 1910.132. *Federal Register.* 1994;59:16343.
19. Occupational Safety and Health Administration. Substance safety data sheet for acrylonitrile. 29 CFR 1910.1045—Appendix A. Available at: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1045AppA>. Accessed June 3, 2020.
20. Occupational Safety and Health Administration. Substance safety data sheet for ethylene oxide (non-mandatory). 29 CFR 1910.1047—Appendix A. Available at: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1047AppA>. Accessed June 3, 2020.

21. Occupational Safety and Health Administration. Substance safety data sheet and technical guidelines for methylene chloride. 29 CFR 1910.1052—Appendix A. Available at: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1052AppA>. Accessed June 3, 2020.
22. Occupational Safety and Health Administration. Substance safety data sheet for 1,3-Butadiene (non-mandatory). 29 CFR 1910.1051—Appendix A. Available at: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1051AppA>. Accessed June 3, 2020.
23. Occupational Safety and Health Administration. Substance Data Sheet, for 4,4'-Methylenedianiline 29 CFR 1910.1050—Appendix A. Available at: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1050AppA>. Accessed June 3, 2020.
24. Shulte PA, Ahlers HW, Jackson LL, et al. NIOSH CIB 59. *Contact Lens Use in a Chemical Environment*. DHHS (NIOSH) June 2005. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2005-139, (CIB 59), 2005. Jun:1–5.