Hazard Prevention – Personal Protective Equipment

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Hazard Prevention - PPE

- Respiratory Protection
- Assigned Protection Factors and Maximum Use Concentrations for Respirators Used for protection against diacetyl / 2,3-pentanedione
- Dermal, Eye and Face Protection

Respiratory Protection

- Hierarchy of Controls – Engineering, administrative controls are always used first, before respirators
- Exposure assessment is required for proper respirator selection
- Respirators can be used:
- During implementation of engineering controls
- During short duration maintenance procedures
- During emergencies
- When engineering controls cannot reduce exposures below REL

Respiratory Protection

- Respiratory protection should be provided when exposures may exceed the NIOSH REL of 5 ppb TWA or 25 ppb STEL for diacetyl;
- When exposures may exceed the NIOSH REL of 9.3 ppb TWA or 31 ppb STEL for 2,3-pentanedione;
- When occupational exposure limits of other chemicals may be exceeded;
- Or when exposures of concern to diacetyl substitutes without OELs occur.

Respiratory Protection Program

If respirators are to be used:

- The employer shall develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use.
- The program shall be administered by a suitably trained program administrator.
- There is no formal certification requirement for a respiratory protection program manager.

Respiratory Protection Program

A respiratory protection program shall include the following elements:

- Procedures for selecting respirators for use in the workplace
- Medical evaluations of employees required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- [Continued]

Respiratory Protection Program

A respiratory protection program shall include the following elements:

- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Training for employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Training for employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance
- Procedures for regularly evaluating the effectiveness of the program

Cartridge / Canister Change Schedule

- The employer shall implement a **cartridge/canister change schedule** based on objective information that will ensure the cartridges/canisters w/o ESLI are changed before the end of their service life.
- Include data and information used to establish the schedule in the respirator program.
- Warning properties such as odor and irritation cannot be used as the sole basis for determining change schedules.

Cartridge / Canister Change Schedule

- Respirator users should leave the area if abnormal odor or irritation is experienced.
- The respirator should be checked to see cartridges need to be replaced or the respirator facepiece needs adjustment

Assigned Protection Factors and Maximum Use Concentrations – Table 8.2

Type of Respirator	OSHA Assigned Protection Factor	Maximum Use Concentration – Diacetyl*	Maximum Use Concentration – 2,3-pentanedione*
Full Facepiece air purifying, w/OV-P100 cartridge(s) or canister(s)	50	0.25 ppm (250 ppb)	0.46 ppm (460 ppb)
PAPR, full facepiece w/OV-HE cartridge(s) or canister(s)	1000	5 ppm (5000 ppb)	9.3 ppm (9300 ppb)
PAPR, hood or helmet w/OV-HE cartridge(s) or canister(s)	25/1000†	0.12 / 5 ppm (120 / 5000 ppb)	0.23 / 9.3 ppm (230 / 9300 ppb)

Assigned Protection Factors and Maximum Use Concentrations – Table 8.2

Type of Respirator	OSHA Assigned Protection Factor	Maximum Use Concentration – Diacetyl*	Maximum Use Concentration – 2,3-pentanedione*
PAPR, loose fitting facepiece w/OV-HE cartridge(s) or canister(s)	25	0.12 ppm (120 ppb)	0.23 ppm (230 ppb)
SAR, positive pressure mode, full facepiece	1000	5 ppm (5000 ppb)	9.3 ppm (9300 ppb)
SAR, hood or helmet	25/1000†	0.12 / 5 ppm (120 / 5000 ppb)	0.23 / 9.3 ppm (230 / 9300 ppb)
SAR, loose fitting facepiece	25	0.12 ppm (120 ppb)	0.23 ppm (230 ppb)

Assigned Protection Factors and Maximum Use Concentrations – Table 8.2

- PAPR = Powered air-purifying respirator
- SAR = Supplied air respirator
- OV – P100 = Organic vapor – P100 series particulate
- OV – HE = Organic vapor – high efficiency particulate
- *Maximum use concentrations will be lower than shown when those concentrations are equal to or exceed immediately dangerous to life and health levels.
- †The employer shall have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. Absent such evidence, these respirators receive an APF of 25.

Assigned Protection Factors and Maximum Use Concentrations – Table 8.2

- For escape, use a gas mask with a full facepiece and OV-P100 canisters, or
- Use self-contained breathing apparatus

Respiratory Protection

- OSHA Requires: All respirators selected for use shall be approved by NIOSH under the provisions of 42 CFR Part 84
- Current listing of NIOSH certified respirators can be found in the *NIOSH Certified Equipment List*

Respiratory Protection Program Elements

- Selection of a specific respirator depends on the particular situation
- Shall consider: Worker activity and worker location;
- Time period of use;
- Routine, nonroutine, emergency or rescue use

Dermal Protection

- Chemical resistant gloves or sleeves or other appropriate protection for exposed skin should be used when handling liquid, paste, or powdered flavoring ingredients containing diacetyl and 2,3-pentanedione

Hand Protection

- Diacetyl and 2,3-pentanedione are diketones Glove suppliers should be contacted to ensure that appropriate glove materials are selected
- Gloves and protective clothing made from butyl rubber, Teflon™, or Tychem™ are effective in reducing skin contact with ketones to prevent skin irritation

Eye and Face Protection

- Eye and face protection shall be provided when there is a hazard from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. OSHA regulations at 29 CFR 1910.133 contain the specific requirements

Eye and Face Protection

- Goggles for chemical splash shall be used for eye protection for workers with potential exposures to diacetyl and 2,3-pentanedione
- Not required if wearing a respirator with a full facepiece, hood, or helmet.
- Face shields can also be used in conjunction with goggles
- Face shields shall be worn only in conjunction with spectacles and goggles, as required by ANSI Z87.1-2003.
- A face shield with a polyethylene terephthalate visor should provide good chemical resistance against diacetyl and 2,3-pentanedione

Dermal, Eye and Face Protection

- Perform analysis including exposure assessment of each operation involving diacetyl, 2,3-pentanedione, or other food flavoring compounds for establishing when to use skin, eye and face protection.

Summary

- Respirators should not be used as the primary method of controlling inhalation exposures
- Respiratory protection should be provided when exposures may exceed the NIOSH REL
- Maximum use concentrations are given for each type of respirator
- Diacetyl and 2,3-pentanedione can cause skin and eye irritation
- Chemical resistant gloves should be used when handling liquid, paste or powdered materials containing diacetyl and 2,3-pentanedione
- Eye and face protection such as goggles and faceshields should be provided for liquid splash protection