

SAFETY BULLETIN #10

**GUIDELINES REGARDING THE USE OF ARTIFICIALLY CREATED ATMOSPHERIC
FOG & HAZE**

Artificial fog and haze are commonly generated using a machine or generator, which releases a chemical solution as an airborne aerosol to create various atmospheric effects during filming/performing. This bulletin does not address combustion-based smoke effects, such as free burning wood products, diesel fuels, etc.

There are no known long-term effects from exposure to artificial fog or haze. However, it is important to realize that every individual is different and temporary reactions to artificial fog or haze may range from having no effects to:

- Irritation to the eyes
- Dry throat
- Minor respiratory irritation

Control Measures

The Production should implement one or more of the following:

- Limit cast and crew exposure, in both amount and duration, to artificial fog or haze.
 - Keep the area clear of non-essential personnel.
 - Use additional control measures at worksites where workers are exposed to extended durations of artificial fog or haze.
- Ventilate or exhaust interior sets or stages at appropriate intervals.
- Provide breaks to all personnel and animals at appropriate intervals.
- Protection from the cold and asphyxiation risks in low-lying areas when cryogenic liquids or gases are used.
- The Production may monitor airborne levels to ensure they do not exceed Permissible Exposure Limits (PELs).
- Utilize qualified technicians to generate artificial fog or haze.
- Technicians will follow the manufacturer's guidelines in the use and cleaning of equipment and use only fluids and gasses specified by the manufacturer.

Communications

When fog or haze effects are scheduled to be used, the Production should notify all personnel in advance. Regular communications with cast and crew, including background, should also occur to discuss operations and precautions associated with the use of artificial fog or haze.

The following methods may be used to notify the cast and crew when artificial fog or haze will be used:

- Notification on the Call Sheet
- Safety Data Sheets (SDSs)
 - Should be available at the worksite
 - A supervisor or another member of department leadership will help to locate a copy of the SDS.
- Safety Meetings

A safety meeting should be held by the First Assistant Director, and may include the Special Effects Coordinator or qualified technicians, and should address, but not be limited to, the following topics:

- When and where atmospheric effects will be used.
- Ways to limit one's exposure to artificial fog or haze, and options to obtain adequate fresh air.
- Availability and use of respiratory protection if airborne levels are expected to exceed PELs.
- How to seek medical care
- Where to find the SDS

Individuals with Sensitivities

The elderly, children, and people with respiratory conditions or other ailments may have a higher sensitivity to artificial fog or haze. These persons should inform the Production of their sensitivity.

When there is an infant present at a Production using artificial fog or haze, steps should be taken to prevent the infant from being exposed. Please consult Safety Bulletin #33, "Special Safety Considerations When Employing Infant Actors (Fifteen Days to Six Months Old)".

For further information on how to protect workers from overexposure to airborne chemicals generated when using artificial fog or haze, please refer to "**Addendum A**" the "**Atmospheric Fog & Haze – Technical Awareness Sheet**".

INDUSTRY WIDE LABOR-MANAGEMENT SAFETY COMMITTEE

SAFETY BULLETIN #10

GUIDELINES REGARDING THE USE OF ARTIFICIALLY CREATED ATMOSPHERIC FOG & HAZE

"ADDENDUM A"

ATMOSPHERIC FOG & HAZE – TECHNICAL AWARENESS SHEET

INTRODUCTION

This document is intended to give recommendations to protect workers from overexposure to artificial fog and haze (e.g. theatrical haze, fogs, mists, etc.). Artificial fog and haze are commonly generated using a machine or generator, which releases a chemical solution as an airborne aerosol to create various atmospheric effects during filming/performing.

DEFINITIONS

- Permissible Exposure Limit (PEL) – The maximum amount or concentration of a chemical that a worker may be exposed to under OSHA regulations.
- Time-Weighted Average (TWA) – The average exposure to a contaminant over a given period of time, typically 8-hours.
- Short Term Exposure Limit (STEL) – The maximum exposure level averaged over a short-term, generally 15 minutes.
- Peak – The maximum amount of safe exposure to a substance.

CHEMICAL PRODUCT GUIDELINES AND REGULATIONS

Various chemical solutions and mixtures are used to generate artificial fog and haze. Some artificial fog or haze components have PELs regulated by Fed/OSHA and/or Cal/OSHA, while others are regulated as simple asphyxiants.

Products containing the following chemicals/substances should **not** be used for atmospheric effects due to their possible health effects:

- Known human carcinogens, including tobacco smoke (except when required to film a scene where such smoke results from an actor smoking tobacco);
- Fumed and hydrolyzed chlorides;
- Ethylene glycol and diethylene glycol;
- Aliphatic and aromatic hydrocarbons including petroleum distillates;
- Hexachloroethane and cyclohexylamine; and
- Butylene glycol 1,4.

The following substances **may** be used:

- Propylene glycol, butylene glycol (1,2 & 1,3), polyethylene glycol, triethylene glycol, and dipropylene glycol;
- Glycerin products;
 - **Caution:** Glycerin and the listed glycol products should not be heated beyond the minimum temperature necessary to aerosolize the fluid. In no event should glycerin or glycol be heated above 700 degrees Fahrenheit.
- Mineral oils (highly refined only); and
- Cryogenic liquids and gases (e.g., carbon dioxide [dry-ice], liquid nitrogen) may be used, but care must be exercised to avoid depleting oxygen levels, especially in confined or low-lying areas. When used, adequate fresh air should be supplied to avoid creating a hazardous atmosphere that may result in asphyxiation. Careless handling of liquid nitrogen may result in cold burns. Use caution to avoid the adverse effects of cryogenic materials on exposed persons.
 - When using asphyxiants, including cryogenic liquids and steam, in confined spaces, monitor the oxygen level. Oxygen levels should stay between **19.5% and 22%.***

*Occupational Safety and Health Administration – 19.12(a)(3)

Airborne Permissible Exposure Limits, as specified in the table below, should not be exceeded unless control measures are in place.

Ingredient	Fed OSHA 8-hour Time Weighted Average (mg/m³)	Short Term Exposure Limit (STEL) (mg/m³)	Peak (mg/m³)‡
Glycerin Mist (total dust)	15*	-	50
Glycerin Mist (respirable fraction)	5	-	50
Glycol	10**	40	40
Mineral Oil	5	10†	25

*Cal OSHA PEL at 10 mg/m³

**Glycol PEL as set by OSHA Standards for particulates not otherwise regulated

† Mineral Oil STEL set by The National Institute for Occupational Safety and Health

‡ Peak Exposure Limits set by ANSI Standard E1.5

Refer to Fed/OSHA and Cal/OSHA Regulations for further information and/or requirements.

CONTROL MEASURES

The following control measures should be performed or implemented when using artificial fog or haze:

- Eliminate the need for artificial fog or haze whenever possible.
- Limit the cast and crew exposure to artificial fog or haze. Keep the area clear of non-essential personnel.
- Use the minimum concentration necessary to achieve the desired effect.
- Ventilate or exhaust interior sets or stages at appropriate intervals.
- Provide breaks away from the set or stage to personnel and animals at appropriate intervals.

- Attach Industry Wide Labor-Management Safety Committee Safety Bulletin #10 “Guidelines Regarding the Use of Artificially Created Atmospheric Fog & Haze” to the call sheet whenever artificial fog or haze is scheduled to be used that day.
- The Production may monitor airborne levels to ensure that they do not exceed Permissible Exposure Limits.
- If airborne levels are anticipated to exceed PELs, appropriate respiratory protection must be provided. Contact your studio safety representative for guidance.
- Ensure that Safety Data Sheets (SDSs) are made readily available.
- If an infant is present on a Production, take the appropriate steps to prevent that infant from being exposed to artificial fog or haze.
 - Consult Safety Bulletin #33, “Special Safety Considerations When Employing Infant Actors (Fifteen Days to Six Months Old)”.
- Ensure that qualified technicians are utilized to generate artificial fog or haze.
- Technicians should follow manufacturer’s guidelines for the use and cleaning of equipment and only use fluids and gasses specified by the manufacturer.

MEASURING AIRBORNE CONCENTRATIONS

Airborne concentrations can be measured using a variety of instruments and by following recognized monitoring methods:

- Various direct-reading instruments that measure airborne aerosol are available for rent or purchase.
- Qualitative and quantitative testing should be conducted by or under the direction of an individual who is knowledgeable about the testing process. A correction factor, which varies with the reading instrument used, the type of fluid used, and the type of machine, must be applied. An industrial hygienist or qualified person can be contacted to discuss measuring airborne concentrations including correction factors and testing.
- If airborne monitoring has not been conducted, then ensure that exposure estimates (based on previous monitoring reports, available literature, or professional health and safety advice) are available.

EXTENDED EXPOSURE

Consider extended work shifts and the consequences of working more than 8 hours per shift, as it relates to time-weighted average (TWA). As exposure time increases, the Permissible Exposure Limit decreases.

Adjust exposure limits for extended work shifts (longer than 8-hours), as follows. Decrease the noted 8-hour TWA PEL by a factor of (8/extended shift length):

- 10 hour adjusted TWA = $(8/10) * 10 \text{ mg/m}^3 = 8.0 \text{ mg/m}^3$
- 12 hour adjusted TWA = $(8/12) * 10 \text{ mg/m}^3 = 6.7 \text{ mg/m}^3$
- 14 hour adjusted TWA = $(8/14) * 10 \text{ mg/m}^3 = 5.7 \text{ mg/m}^3$

For questions on artificial fog or haze, please contact your studio safety representative. Please refer to the Studio Safety Hotlines document for guidance on how to contact the appropriate safety representative.