

The logo for the Entertainment Services & Technology Association (ESTA) features the word "ESTA" in a large, bold, sans-serif font. Above the text is a thick black horizontal bar. Below the text is a stylized graphic consisting of several thick, black, horizontal brushstrokes that appear to be layered and slightly offset, creating a sense of motion or depth.

ENTERTAINMENT SERVICES &
TECHNOLOGY ASSOCIATION

Technical Standards Office

Request for Quotations for an Analysis of Glycol Inhalation Exposure Literature

July 25, 1996

1 Scope

This request for quotations (RFQ) requests responses for work proposed by the Entertainment Services and Technology Association (ESTA) on behalf of its members. Details of the proposed work are provided below.

ESTA is beginning a two to five year program of research concerning the health safety of glycol-based theatrical fog making methodologies commonly utilized at entertainment venues throughout the world. Stated in the simplest terms, this methodology creates an atmospheric haze (or fog) by producing an aerosol from a mixture of glycols and water. Several processes are used to produce the aerosol including; controlled heating, exposure to ultrasonic vibrations, and mixture with pressurized air.

Regardless of the method used, the result is an aerosol of one or more glycols that hangs in the air and looks like fog. Performers and technicians working in this environment breathe the glycol aerosol. Scientifically establishing safe exposure concentrations for inhalation of the aerosolized glycols as commonly used in the entertainment industry is the overall goal of the ESTA research.

This RFQ covers only the first step in the complete research program. Additional quotations will be sought for additional work, after that work has been sufficiently well characterized. Some of the needed characterization will be included in the results of the work described in this RFQ.

In general terms, the two tasks covered by this RFQ are:

- 1) A search of scientific and other applicable literature for papers that help define safe inhalation exposure concentrations, and
- 2) Definition of additional research needed to define safe inhalation exposure concentrations.

Future work that is beyond the scope of this RFQ includes defining safe inhalation exposure concentrations and proposing convenient methods for measuring exposure concentrations.

2 Background

2.1 Glycols used in theatrical fog making

The exact composition of the glycol mixtures used in theatrical fog making are closely guarded trade secrets. We believe the following glycols are used in theatrical fog production:

- triethylene glycol
- diethylene glycol
- monopropylene glycol, methyl ethylene glycol (1,2 propanediol)
- dipropylene glycol
- glycerin (glycerol, 1,2,3-propanetriol)
- butylene glycol

The research being requested by ESTA will be limited to these glycols.

2.2 Fog making methods

2.2.1 Heating

The water and glycol mixture is moved from a reservoir to a heat exchanger. The heat exchanger has been heated to the point at which the fluid will vaporize. Usually, this temperature is over 500F, but less than 700F. The fluid's own expansion as a vapor forces the heated material out of the front of the fog machine. As the vapor exits the machine, it mixes with the cooler air and forms an opaque aerosol.

2.2.2 Ultrasonic

The water and glycol mixture is placed in a tray having an array of ultrasonic transducers at the bottom. When the transducers are activated a mist of glycols and water forms above the surface.

The mist then is mechanically blown out of the fog machine. The process is similar to that used by ultrasonic humidifiers.

2.2.3 Pressurized air

The water and glycol mixture is placed in a vat and a hose having an air dispersion system at the end is submerged in the liquid. Pressurized air is pumped through the hose and disperser. As the bubbles break the liquid's surface, they carry with them small droplets of glycol and water, which exit the machine as fog.

3 Work to be covered by the quotation

3.1 Literature search

The CIH (Certified Industrial Hygienist) firm contracted as a result of this RFQ shall review all scientific and other applicable literature that helps define safe inhalation exposure concentrations for the glycols listed in section 2.1. Participating ESTA member firms will provide their literature bibliographies to the CIH for reference. However, this is meant only to reduce the learning curve for the CIH firm. The CIH firm shall conduct an independent review of the applicable literature.

The CIH firm shall prepare a summary of the literature search results. For each glycol listed in section 2.1, the summary report shall identify existing known safe exposure concentrations with supporting literature references.

The CIH firm also shall provide ESTA with the complete literature bibliography produced by the literature search. ESTA shall be granted unencumbered use of both the summary report and the bibliography.

3.2 Manufacturer Private Data

Some manufacturers of glycol fog making machines and fluids have conducted their own inhalation research on some or all of the glycols listed in section 2.1. It is possible that these manufacturers may wish to contribute the results of their research to the literature search described in section 3.1. The CIH firm shall be prepared to accept and evaluate such research, provided the manufacturer contributing it agrees to make it fully available for public distribution and reference.

3.3 Definition of additional research

The CIH firm contracted as a result of this RFQ shall provide ESTA with a written report describing additional research needed to define safe inhalation exposure concentrations for the glycols listed in section 2.1. ESTA does not guarantee to contract with the same CIH firm to perform the research or even to perform all the research that will be described in the report. Those decisions cannot be made until the report is reviewed by ESTA.

ESTA shall be granted unencumbered use of the additional research report.

3.4 Other requirements

The CIH who supervises the project shall fully review and sign all the documents delivered to ESTA. The CIH who supervises the project shall be available for telephone consultations regarding the written reports.

4 Information to be included in the quotation

Bidders on this RFQ shall provide a summary of the credentials of the certified industrial hygienist who will supervise the work. Responses to this RFQ shall specify the time required to complete all tasks described in section 3 (preparation of the bibliography, bibliography summary, and definition of additional research). The time required to complete all tasks shall not exceed six (6) months. A quotation response to this RFQ shall include a fixed price for all tasks described in section 3.

5 Delivery of quotations

All quotations must be addressed to:

Karl G. Ruling
Technical Standards Manager
ESTA
875 Sixth Avenue, Suite 2302
New York, NY 10001

In order to be considered, a quotation must be received by October 1, 1996.

Direct any questions to the ESTA Technical Standards Manager at:

212-244-1505 phone
212-244-1502 FAX