DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

CDC--MOUNT ST. HELENS VOLCANO HEALTH REPORT #11 July 2, 1980

The following report on methods to limit dust exposure to volcanic ash was submitted by NIOSH/CDC, and although designed primarily for the occupational setting many of the principles are equally relevant to non-occupational settings.

Management Approaches to Control Volcanic Ashfall Dust Exposure

The Mount St. Helens volcano poses a potentially long-term dust problem because of the likelihood of future eruptions and re-entrainment of dust. The chronic effects of long-term exposure to this dust are not fully known, and since residual dust will have a large respirable component, exposure should be minimized by appropriate control measures. The most practical control methods pertain to a) chemical dust suppressants, b) work practices, and c) personal protective equipment. These control methods should be supplemented by a suitable monitoring program.

A. Chemical Dust Suppressants

Chemical dust suppressants may be effective for certain outside applications. For example, several types of dust suppressants can be used on roads, driveways, sidewalks, and even lawns and gardens. On the other hand, trying to cover farmlands and forests would probably be impractical, especially where the vegetation is relatively impenetrable. Farmlands and gardens will eventually be plowed or cultivated, thereby controlling the dust by mixing it with soil.

Two major chemical dust suppressants:

1. Calcium chloride ($CaCl_2$) is inexpensive and can be applied as a powder or in water solution. It is also hydroscopic (water absorbing) and will, therefore, act as a long-term wetting agent and dust suppressant. $CaCl_2$ would be appropriate for dust control on roads, driveways, sidewalks, and other hard surfaces. However, large amounts, especially applied to agricultural land, may cause ecological problems.

2. Nonionic surfactants when used in low concentrations are relatively inexpensive, relatively nontoxic, and good dust binders. They are biodegradable and long lasting.

Most chemical distributors stock $CaCl_2$ and a number of applicable nonionic surfactants. Also, several major U.S. chemical companies are working with volcano dust samples to provide optimal dust suppressants.

Additional information may be obtained from the Federal Emergency Management Agency (FEMA) Technical Information Bulletin (TIB No. 19 [See below for a listing of the Mount St. Helens FEMA Technical Information Bulletins issued to date.]).

B. Work Practices

Work practices include housekeeping, administrative controls, maintenance, emergency procedures, and training.

Housekeeping: A dustless method of cleaning such as washing with water and an effective detergent/wetting agent is recommended. Damp-rag techniques should be used whenever possible to remove the substance from small

surface areas or flooring. On those areas where damp-rag techniques cannot be implemented (such as carpeted areas) vacuum-cleaning methods should be applied. It is recommended that portable vacuum systems be equipped with HEPA (high efficiency particulate) filtering systems. The use of central vacuum systems with adequate dust retention devices is the preferred method of vacuum control. Care must also be taken to avoid exposure during the emptying, cleaning, and maintenance of vacuum-cleaning equipment.

Cleaning by blowing with compressed air or dry sweeping should be avoided. Floor sweepers with side brushes should not be used to clean aisles and floors because they may re-entrain dust particles into the air.

Immediate attention should be given to high traffic areas where dust accumulations may become re-entrained during the course of normal activities. A daily cleaning of these areas is recommended to minimize this exposure source.

Each employee should be responsible for clean-up of his/her own work area to minimize exposure potential during a work shift. This should be accomplished at the beginning of each workshift and inspected by appropriate personnel to provide maximum worker protection. Damp-rag or vacuum-cleaning techniques should be used during this operation.

Moving machinery or in-plant transportation equipment should not be started until this cleaning is finished.

Windows and doors should be closed during windy periods to keep dust from entering the plant.

Recirculation and air supply systems (e.g., air conditioning, heaters) should be inspected periodically to ensure that they do not blow dust particles into the work environment. The filters on these systems should be changed at periods which will effectively reduce exposure potential. (Note: Regular filters in air-supply systems may be only 50% efficient, so that most respirable dust will pass through. The installation of higher efficiency filters may, therefore, be appropriate.)

Additional housekeeping information may be obtained from FEMA TIB #7.

Administrative Controls: Where practical, dust exposure may be minimized through adminstrative action. For example, outdoor clean-up operations might occur at night when people are inside, and when weather conditions are cooler and less windy.

Equipment Maintenance: Periodic maintenance of potentially vulnerable equipment (e.g., trucks, heavy duty equipment, etc.) should be made per FEMA TIBs #2b, 22, and 24. Likewise, routine preventive maintenance of industrial equipment should be made to avoid hazardous (and expensive) equipment failures.

Emergency Procedures: Personal protective equipment (e.g., approved respirators, protective clothing, etc.) should be available and easily accessible in the event of a volcano-related emergency. In areas close to the volcano, personnel should be adequately trained in first-aid and emergency procedures for disaster victims.

Note: In the event of heavy accumulation of volcanic ash, all non-essential or non-emergency personnel should remain inside, keeping windows and doors closed. All non-filtered air supply systems should be shut off, or minimized as possible, during such emergencies.

Training: An adequate training program should be developed which would document the proper identification of hazards, potential effects of exposure, and appropriate actions required to reduce exposure. This would include instructions related to fitting and wearing personal protective equipment (PPE) and to sampling and monitoring procedures.

Hazard information and emergency procedures, as well as housekeeping and control techniques should be adequately labeled and posted.

C. Personal Protective Equipment (PPE)

Work practices should be used to help reduce potential dust exposure. When respirable dust concentrations are high, even in the absence of actual dust measurements, individuals should wear personal protective equipment. The 2 applicable types of PPE are NIOSH-approved respirators and protective eyewear.

Respirators: NIOSH-approved respirators should be worn when the respirable dust concentration is high* or, in the absence of dust measurements, when dust levels appear significantly higher than normal. Table 1 provides respirator-use guidance for individuals with normal cardiopulmonary function.

TABLE 1
RESPIRATOR RECOMMENDATIONS

VOLCANIC DUST CONCENTRATIONS	RESPIRATOR TYPE
High (e.g., persons close to the volcano)	Any high-efficiency particulate-filter respirator with a full facepiece.
Medium (e.g., loggers, highway maintenance workers)	Any particulate-filter respirator, except single-use or quarter-mask respirator.
Low (e.g., general population)	Any particulate-filter respirator, including single-use and quarter-mask respirator.

*Occupational exposure limits cannot be applied directly to the general population and were not designed specifically for volcanic ash exposure situations. If, however, one were to calculate a permissible exposure limit (PEL) according to OSHA regulations where the PEL $\approx \frac{10}{\%SiO_2+2}(mg/m^3)$ and $\%SiO_2$ is the percentage of free crystalline silica of the volcanic dust sample as determined by appropriate analytical techniques (7% in preliminary NIOSH analyses of volcanic ash at Mount St. Helens) then the PEL would be approximately 1.1 mg/m^3.

Note: In the general population, elderly people, small children, and individuals with cardiopulmonary problems should avoid or minimize activity in high dust-concentration areas. Also, these individuals should be aware that the use of any respirator other than a single-use (disposable) respirator may cause additional cardiopulmonary stress.

A partial list of NIOSH approved respirators is found in FEMA TIB #3.

Protective Eyewear: Goggles, for use in fine-dust environments, are recommended for those persons suffering eye irritation. (Note: Individuals wearing contact lenses and suffering eye irritation should remove the lenses and wear corrective eyeglasses while dust levels remain high.)

D. Monitoring

Where practical (i.e., in occupational settings involving clean-up crews, loggers, farmers, etc.), dust concentrations should be periodically monitored to determine actual exposure concentrations. Individuals with high exposures should be instructed of the hazards involved and the proper fit and wearing of personal protective equipment (PPE). Those occupations continually showing higher than normal exposures should be singularly investigated to determine specific work practices and control measures that will facilitate a healthy work environment.

All sampling and analytical techniques should be accomplished using good industrial hygiene practices, in accordance with recommended and established procedures.

Additional information may be obtained by contacting

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FEMA Mount St. Helens Technical Information Network Bulletins

The Mount St. Helens Technical Information Network established through the Federal Coordinating Office, FEMA (Federal Emergency Management Agency) has, to date, issued 32 Technical Information Bulletins. The health bulletins in this series have been based primarily on the CDC Mount St. Helens Volcano Health Reports. Technical bulletins on other aspects of the Mount St. Helens volcanic eruptions (e.g., geology, agriculture, economics, ecology, environment, and others) were prepared with the assistance of other agencies. For the interested reader a listing of these 32 bulletins and dates of issue are provided. Copies should be requested directly from FEMA, Mount St. Helens Technical Information Network, 1220 Main St., Vancouver, Washington 98660.

#1 - The Nature of Mount St. Helens Ash - May 27, 1980.

#2b- Driving and Vehicle Maintenance in Heavy Ash Areas - May 30, 1980 (revised version, reissue date).

#3 - Precautions in Handling Volcanic Ash - May 27, 1980.

#4 - Current Volcanic Hazards at Mount St. Helens, Washington - May 29, 1980.

#5 - Volcanic Ash Could Reduce Insect Populations...Temporarily - May 30, 1980.

#6 - Advice for Farmers from Washington State University--Tractors and Water Pumps - June 1, 1980.

#7 - Ash Particles and Home Clean-up Problems--Advice from the University of Idaho - May 30, 1980.

#8 - Physical and Chemical Characteristics of the Mount St. Helens Deposits of May 18, 1980 - June 2, 1980.

#9 - Volcanic Ash Advice to Berry Growers - June 2, 1980.

#10 - Center for Disease Control (CDC) Community Based Health Surveillance Program (Update) - June 3, 1980.

#11 - Poultry - Bees - Livestock - June 5, 1980.

#12 - Foodstuffs and Volcanic Ashfall - June 5, 1980.

#13 - Research Into the Free Crystalline Silica Content of Mount St. Helens Ash - June 6, 1980.

#14 - Protecting Children from Volcanic Ash - Related Health Hazards - June 7, 1980.

#15 - Volcanic Ash and Your Water Supply - June 7, 1980.

#16 - Health and Medical Update - June 8, 1980.

#17 - Insurance Concerns - June 9, 1980.

#18 - Health and Medical Update - June 10, 1980.

#19 - Controlling Blowing Dust from Volcanic Ash - June 16, 1980.

#20 - Health and Medical Update - June 16, 1980.

#21 - Aviation Considerations - June 20, 1980.

#22 - Electric/Electronic Protection--Commercial and Major Systems - June 20, 1980.

#23 - Farm Equipment "Ash" Maintenance - June 21, 1980.

#24 - Vehicle Maintenance Guidelines - June 23, 1980.

#25 - Flood Hazard Reduction in the Vicinity of Mount St. Helens - June 25, 1980.

#26 - Volcanic Ash Effects on Municipal Water Supply and Sewage Treatment Plants - June 26, 1980.

#27 - Air Quality Monitoring Network for Volcanic Ash - June 26, 1980.

#28 - Volcanic Hazard Analysis - June 27, 1980.

#29 - Wildlife and Plant Community Impacts - June 27, 1980.

#30 - Management Approaches to Dust Exposure Control - June 28, 1980.

#31 - Economic Factors - June 28, 1980.

#32 - Health Surveys and Analysis - Center for Disease Control (CDC) - Surveillance Program (Update) - June 28, 1980.

Mental Health

As with other natural (e.g., earthquake or flood) or man-made (e.g., Three Mile Island) disaster situations, especially those which persist for prolonged periods or have a potential for frequent reoccurances, mental health problems are a very important concern. The CDC hospital surveillance system will be used to evaluate trends in hospital admissions for mental health and psychiatric problems. Data on this subject from other agencies, federal, state, and local, will also be addressed in detail in future CDC Mount St. Helens Volcano Health Reports.

CDC--Mount St. Helens Volcano Health Reports are now being issued on a twice-a-week basis (Tuesdays and Fridays).* Information in these reports represents the latest data reported to CDC; much of the information is preliminary in nature and subject to confirmation and change. It is distributed for the purpose of providing up-to-date health data from CDC and the many other groups involved in public health assessment. We hope to continue to receive relevant reports and data from others working on this problem. To be added to the circulation list, please contact: CDC, Attn: Carolyn Forrester, Chronic Diseases Division, Bureau of Epidemiology, Atlanta, GA 30333, Phone: (404) 452-4086, FTS: 236-4086.

*There will be no issue on July 4. This is the only issue this week.

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