U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 79-144-672

QUOIZEL, INC.
HAUPPAUGE, NEW YORK

MARCH 1980

I. TOXICITY DETERMINATION

A health hazard evaluation of the Tiffany lamp assembly area at the Quoizel Company was conducted on October 19, 1979, and November 22, 1979. NIOSH Regional (III) Industrial Hygienist, Frank A. Lewis, conducted a comprehensive walk-through survey, ventilation measurements, environmental sampling and twelve medical questionnaire interviews to determine possible employee exposures to asbestos, lead and zinc chloride fumes and hydrogen chloride.

The employees were not exposed to potentially toxic concentrations of lead and zinc chloride fumes and hydrogen chloride. However, because of the occurring symptomatology and observed fume conditions, it is recommended that local exhaust ventilation be installed for the assembly operators. Also because of uncertain risks of asbestos-induced cancers and asbestosis, it is recommended that the work-table surface be replaced with a non-asbestos material of similar thermal characteristics.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) NIOSH, Region II, III
b) OSHA, Region II
c) Operations Manager, Quoizel, Inc.
d) Int'l Brotherhood of Electrical Workers

For the purpose of informing the twelve employees of the results of the Quoizel, Inc., survey, the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) for their perusal.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, U.S.C. 669(a)(6) authorizes the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

On September 27, 1979, NIOSH Region III received a request for a health hazard evaluation of the Quoizel Corporation's Tiffany lamp assembly area. The request alleges possible employee exposure to asbestos, various fluxes, and hydrochloric acid; and insufficient ventilation at the assembly tables.

NIOSH Regional Hygienist, Frank A. Lewis, met with the plant manager and the union representative for the opening and closing conferences, walk-through survey and environmental sampling on October 19, 1979, and November 22, 1979. Discussions with management involved the collection of information concerning process description, engineering controls, personal protective equipment and clothing, work practices, training programs, monitoring, record-keeping and medical surveillance for the work areas and workers in question. Employee interviews focused on the job descriptions, work practices, training programs, and any associated health problems.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The Tiffany lamp department is composed of twelve employees: two glass-cutters, two copper foil wrappers, two assemblers, four fillers and two packagers. The glass-cutters cut, from patterns, glass pieces of different colors; copper foil is then wrapped around the edges of the glass to prepare for soldering (with a 60:40 lead/tin solder) into a set configuration around a wooden mold. The lamp is then filled in with more lead using a zinc chloride/muriatic acid (20% HCl) flux at the glass to glass interface and finally cleaned-up and packaged for shipping.

There is no exhaust ventilation being used. However, the area is situated in a large open-spaced building and small table-top fans are utilized to "blow" contaminants away from the faces of the assemblers. Unfortunately, it was observed that in many cases the contaminants are blown away from one assembler into the face of another; or the fans are just used intermittently.

Several large roof fans exist but were not used in order to "conserve energy." Thus airborne contaminants will usually pass through the breathing zone on their way up to the ceiling anyway.

Various solders and fluxes have been experimented with to try to minimize the release of solder and flux components into the air. No respiratory protection is used in these operations.

Barrier creams and gloves are provided and have been used to minimize skin contact with the hot solder and corrosive flux materials.

B. Evaluation Design

Personal air samples for lead and zinc chloride fumes and area air samples for hydrogen chloride were taken over the eight-hour work day and were utilized as the basis for evaluating employee exposure. All air samples represent exposures to the assemblers who use the lead/tin solders and muriatic acid/zinc chloride fluxes.

A bulk sample was taken of the work table-top material to identify presence and quantity of asbestos. The employees were worried that this material might become airborne and/or become imbedded in the skin while working their hands across the work surface.

C. Evaluation Methods

The personal air samples for lead and zinc chloride fumes were collected on 0.8μ AA filters using a three-piece cassette. Air was drawn through the filter and back-up pads at a flow rate of 1.5 liters/minute using a Model G personal air sampling pump. These samples were analyzed according to NIOSH Method P&CAM 173 using atomic absorption spectrophotometry. The limits of detection are 5μg Pb/sample and 2μg Zn/sample.

The area air samples for hydrogen chloride were collected in 20 ml of 0.1 N sodium acetate solution using an impinger apparatus and MSA Model G pumps at a flow rate of 1.0 liter/minute. These samples were analyzed for chloride using Method S246. The limit of detection is 20μg HCl/sample.

The asbestos bulk sample was collected by cutting off a piece of the work-table surface and analyzing for percent asbestos using polarized light microscopy and dispersion staining techniques.

D. Evaluation Criteria

1. Environmental Standards

Substance	OSHA	ACGIH	NIOSH
Lead	50μg/M^3-8hr.TWA* (Effective March 1, 1980)	150μg/M^3-8hr.TWA	100μg/M^3-8hr.TWA
Zinc Chloride	1 mg/M^3-8hr.TWA	1 mg/M^3-8hr.TWA 2 mg/M^3-STEL**	———
Hydrogen Chloride	7 mg/M^3-Ceiling***	7 mg/M^3-Ceiling	———

*TWA = time-weight average
**STEL = short-term exposure limit
***Ceiling = for OSHA, 15 min. sampling time to be legally enforceable.
= for ACGIH, cannot be exceeded at any time.

2. Toxicological Data

Lead(8)
Although capable of causing acute toxicity when absorbed in large amounts, lead in the form of dust, and/or fume, is usually associated with chronic toxicity due to absorption of small amounts over prolonged periods of time. The major route of entry of lead, and its inorganic compounds, into the body is the lung, although slight amounts may be ingested.

The early effects of lead absorption are non-specific, and except for laboratory testing of the blood, are difficult to distinguish from the symptoms of minor seasonal illness. These symptoms include decreased physical fitness, fatigue,

sleep disturbances, headache, aching bones and muscles, digestive symptoms (particularly constipation), abdominal pains and decreased appetite. These symptoms are reversible and complete recovery is possible on removal from exposure.

The three systems most commonly affected are the bone marrow (producer of red blood cells), the nervous system, and the kidneys. Scientific evidence has established that very low levels of lead inhibits at least two enzymes (ALA-D and ferrochelatase) in the heme synthesis pathway; higher levels may lead to anemia.

Extensive evidence accumulated in both adults and children indicates that the toxicity of lead is manifested in both the central and peripheral nervous systems (e.g. loss of motor nerve conduction velocity).

Kidney damage due to lead exposure has also been observed, although may be only deteeted after serious damage has already occurred.

Inorganic lead can cross the placental barrier, passing from the bloodstream of the mother to that of her unborn child. The effects upon the fetus have not been quantified.

Lead is eliminated from the body via urine and feces.

Because of more efficient material handling methods and biological monitoring, serious cases of lead poisoning are rare in industry today.

NIOSH has recommended that a blood lead value of 60 micrograms per 100 grams of whole blood (60 µg/100 g blood) be the maximum allowed occupational blood level. The new OSHA standard has dictated that by the end of four years this will become the level at which a worker must be removed from further lead exposure until the blood lead level has dropped to normal values. OSHA has further set an average blood lead level of 50 µg/100 g whole blood as requiring removal until blood lead levels are normal (by the fifth year of the standard). OSHA's air is to keep as many workers' blood lead levels as possible below 40 µg/100 g, the upper limit of blood leads in occupationally unexposed individuals.

Zinc Chloride

Local - Solid zinc chloride is corrosive to the skin and mucous membranes. Aqueous solutions of 10% or more are also corrosive and cause primary dermatitis and chemical burns, especially at sites or minor trauma. Aqueous solutions are also extremely dangerous to the eyes, causing extreme pain, inflammation and swelling, which may be followed by corneal ulceration. Zinc chloride may produce true sensitization of the skin in the form of eczematoid dermatitis. Ingestion of zinc chloride may cause serious corrosive effects in the esophagus and stomach, often complicated by pyloric stenosis.

Systemic - There are no reports on inhalation of zinc chloride from industrial exposures. All reported experience with inhaled zinc chloride is based on exposures caused by military accidents. In all of those cases, there was severe irritation of the respiratory tract. In the more severe cases, acute pulmonary edema developed within two to four days following exposure. The fatalities reported were due to severe lung injury with hemorrhagic alveolitis

and bronchopneumonia. In human experimentation with concentrations of 120 mg/m^3, there were complaints of irritation of the nose, throat, and chest after 2 minutes. With exposure to 80 mg/m^3 for 2 minutes, the majority of subjects experienced slight nausea, all noticed the smell, and one or two coughed.

Hydrogen Chloride

Local - Hydrochloric acid and high concentrations of hydrogen chloride gas are highly corrosive to eyes, skin, and mucous membranes. The acid may produce burns, ulceration, and scarring on skin and mucous membranes, and it may produce dermatatis on repeated exposure. Eye contact may result in reduced vision or blindness. Dental discoloration and erosion of exposed incisors occur on prolonged exposure to low concentrations. Ingestion may produce fatal effects from esophageal or gastric necrosis.

Systemic - The irritant effect of vapors on the respiratory tract may produce laryngitis, glottal edema, bronchitis, pulmonary edema, and death.

Asbestos

Asbestos is the common name for a group of mineral fiber silicates known as chrysotile (white asbestos), actinolite, amosite (brown asbestos), anthophyllite, crocidolite (blue asbestos) and tremolite. Each contains varying amounts of iron, chromium, calcium, sodium, magnesium, nickel, silicon dioxide, and water.

Asbestos can cause a pneumoconioses of the lung ("dust in the lungs") called asbestosis and certain forms of cancer. Asbestosis is a chronic lung disease which produced fibrous or scar tissue in the lung and which over the years results in respiratory impairment and disability. Lung cancer, mesothelioma (cancer of the pleura or peritoneum), cancer of the esophagus, colon and rectum are associated with exposure to asbestos.

Cigarette smoking and possibly other "air contaminants" together with asbestos exposure have a synergistic effect upon the lung tissue and exponentially increase the risk of lung cancer.[6,10]

NIOSH's latest evaluation of available data of human toxicity to asbestos provides no evidence for a threshold of carcinogenic response or for any so called "safe" level. Therefore, the standard is recommended by NIOSH to be set at the lowest level of detection using the latest analytical equipment and techniques.

E. Evaluation Results and Recommendations

1. The personal air samples taken for lead and zinc chloride fumes were found to be well below (non-detectable levels) the environmental criteria for these substances, and the area air samples taken for hydrogen chloride were also found to be well below (0.004 mg/M^3 to 0.03 mg/M^3) their environmental criteria. Therefore, these employees would not be exposed to potentially toxic concentrations of these substances under existing conditions and criteria. The results of air sampling are presented in Table I.

Non-directed interviews were given to nine employees in the Tiffany lamp assembly area. The following symptoms were reported: eye irritation, three; throat irritation, four; nose and sinus irritation, four; occasional chest tightness, three. Because of the numerous cases of minor skin, eye and upper respiratory

irritation and observations of zinc chloride fumes (short-term exposure) going into the breathing zone, it is recommended that local exhaust ventilation be utilized in conformance with good industrial hygiene practices. Refer to Attachment I-IV for recommended ventilation designs.

2. The asbestos bulk analysis of the table-top shows the material containing 2-5% chrysotile (a mineral-form asbestos). Because of the unknown risks of asbestos-induced cancer and asbestosis, it is recommended that the work-table surface be replaced with a non-asbestos material of similar heat/flame-proof characteristics; these materials are readily available in the market-place.

3. An eye-wash located "close-by" in an accessible area to the assemblers in case of a flux (acid) splash into the eyes or face.

4. Safety glasses with side shields should be worn by all employees in the assembly area.

5. No smoking, eating, drinking or storage of foods be allowed in the work area.

6. Continue to use protective gloves and/or barrier creams to avoid skin irritation from fluxes; when long-sleeve shirts/blouses are not worn, cover arms with cream or "long" gloves.

7. More extensive clean-ups of the table surfaces are needed to prevent skin contact with solder and flux. A sodium bicarbonate wash would be useful in neutralizing the effects of the acid fluxes.

8. It is recommended that the company institute a medical surveillance program that would include a check out of the pulmonary system (chest X-rays, pulmonary function tests). Blood analyses for lead would be useful to gather baseline data and monitor possible exposure to lead from breathing or ingestion of solder fumes/particulates.

V. REFERENCES

1. NIOSH Manual of Sampling Data Sheets, 1977 Edition, DHEW, PHS, CDC, NIOSH, March 1977.

2. General Industry, OSHA Safety and Health Standards, 29 CFR OSHA 2206, Revised January 1976.

3. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1978, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.

4. Occupational Diseases: A Guide to Their Recognition, U.S. DHEW, PHS, CDC, NIOSH, Publication No. 77-181, Revised June 1977.

5. Industrial Hygiene Toxicology, Frank A. Patty, July 1967.

6. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Inorganic Lead, Publication No. 78-158, Revised Criteria, 1978.

5. Industrial Hygiene Toxicology, Frank A. Patty, July 1967.

6. NIOSH Criteria for a Recommended Standard....Occupational Exposure to Inorganic Lead, Publication No. 78-158, Revised Criteria, 1978.

7. NIOSH Revised Recommended Asbestos Standard, December 1976.

VI. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By:

Frank A. Lewis
Regional Industrial Hygienist
Project Leader, HETAB, NIOSH

Originating Office:

Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations and Field Studies
Cincinnati, Ohio

Report Typed By:

Michelle DiCostanza
Secretary
NIOSH, Region III
Philadelphia, Pennsylvania

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NIOSH Measurements Support Branch
Cincinnati, Ohio

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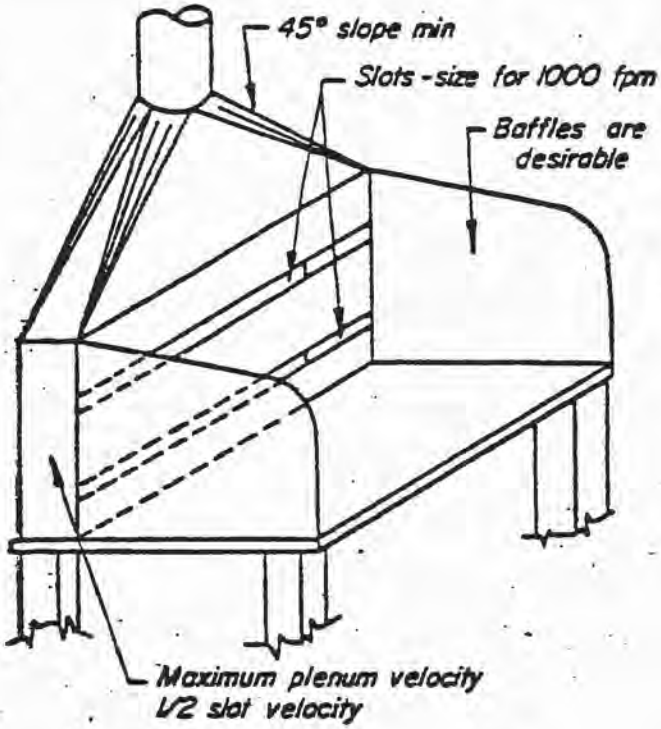
Table I
Results of Air Sampling
Quoizel, Inc.
Hauppauge, New York
November 20, 1979

Substance	Sample Type	Sampling Time (Mins.)	Job Operation or Location	Concentration
Lead Fumes*	Q-1 Personal	465	Assembler	<0.0072 mg/M^3
	Q-2 Personal	464	Assembler	<0.0072 mg/M^3
	Q-3 Personal	460	Assembler	<0.0073 mg/M^3
	Q-4 Personal	458	Assembler	<0.0073 mg/M^3
	Q-5 Personal	454	Assembler	<0.0073 mg/M^3
Zinc Chloride Fumes	Q-1 Personal	465	Assembler	0.020 mg/M^3
	Q-2 Personal	464	Assembler	0.030 mg/M^3
	Q-3 Personal	460	Assembler	0.004 mg/M^3
	Q-4 Personal	458	Assembler	0.040 mg/M^3
	Q-5 Personal	454	Assembler	0.010 mg/M^3
Hydrogen Chloride**	Q-6 Area	446	Table #2	<0.045 mg/M^3
	Q-7 Area	443	Table #2	<0.045 mg/M^3
	Q-8 Area	440	Table #1	<0.046 mg/M^3

* Lead - limit of detection is 5 µg/sample.
** Hydrogen Chloride - limit of detection is 20 µg/sample.



Q = 350 cfm/lineal ft of hood
Hood length = required working space
Bench width = 24" maximum
Duct velocity = 1000 - 3000 fpm
Entry loss = 1.78 slot VP + 0.25 duct VP

GENERAL VENTILATION, where local exhaust cannot be used:

Rod, diam	cfm/welder*
5/32	1000
3/16	1500
1/4	3500
3/8	4500

OR

A. For open areas, where welding fume can rise away from the breathing zone:
cfm required = 800 x lb/hour rod used
B. For enclosed areas or positions where fume does not readily escape breathing zone:
cfm required = 1600 x lb/hour rod used

*For toxic materials nigher airflows are necessary and operator may require respiratory protection equipment.

OTHER TYPES OF HOODS

Local exhaust: See VS-416.1
Booth: For design See VS-415, VS-604
Q = 100 cfm/sq ft of face opening

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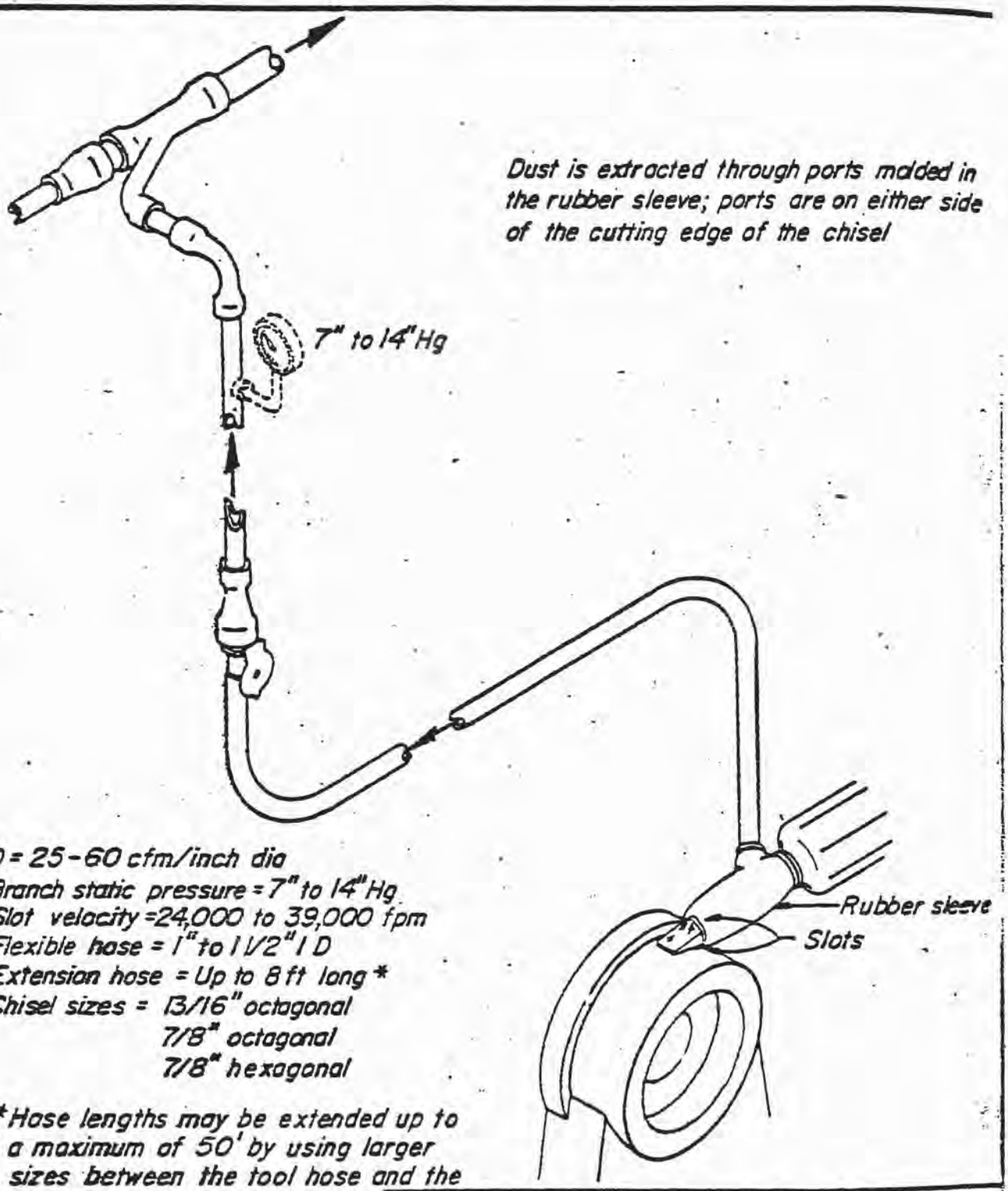
WELDING BENCH

DATE 1-76 | VS-416



Dust is extracted through ports molded in the rubber sleeve; ports are on either side of the cutting edge of the chisel

Q = 25-60 cfm/inch dia
Branch static pressure = 7" to 14" Hg
Slot velocity = 24,000 to 39,000 fpm
Flexible hose = 1" to 1 1/2" I D
*Extension hose = Up to 8 ft long **
Chisel sizes = 13/16" octagonal
7/8" octagonal
7/8" hexagonal

**Hose lengths may be extended up to a maximum of 50' by using larger sizes between the tool hose and the tubing system.*

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SOLDERING IRON
PNEUMATIC CHISEL SLEEVE

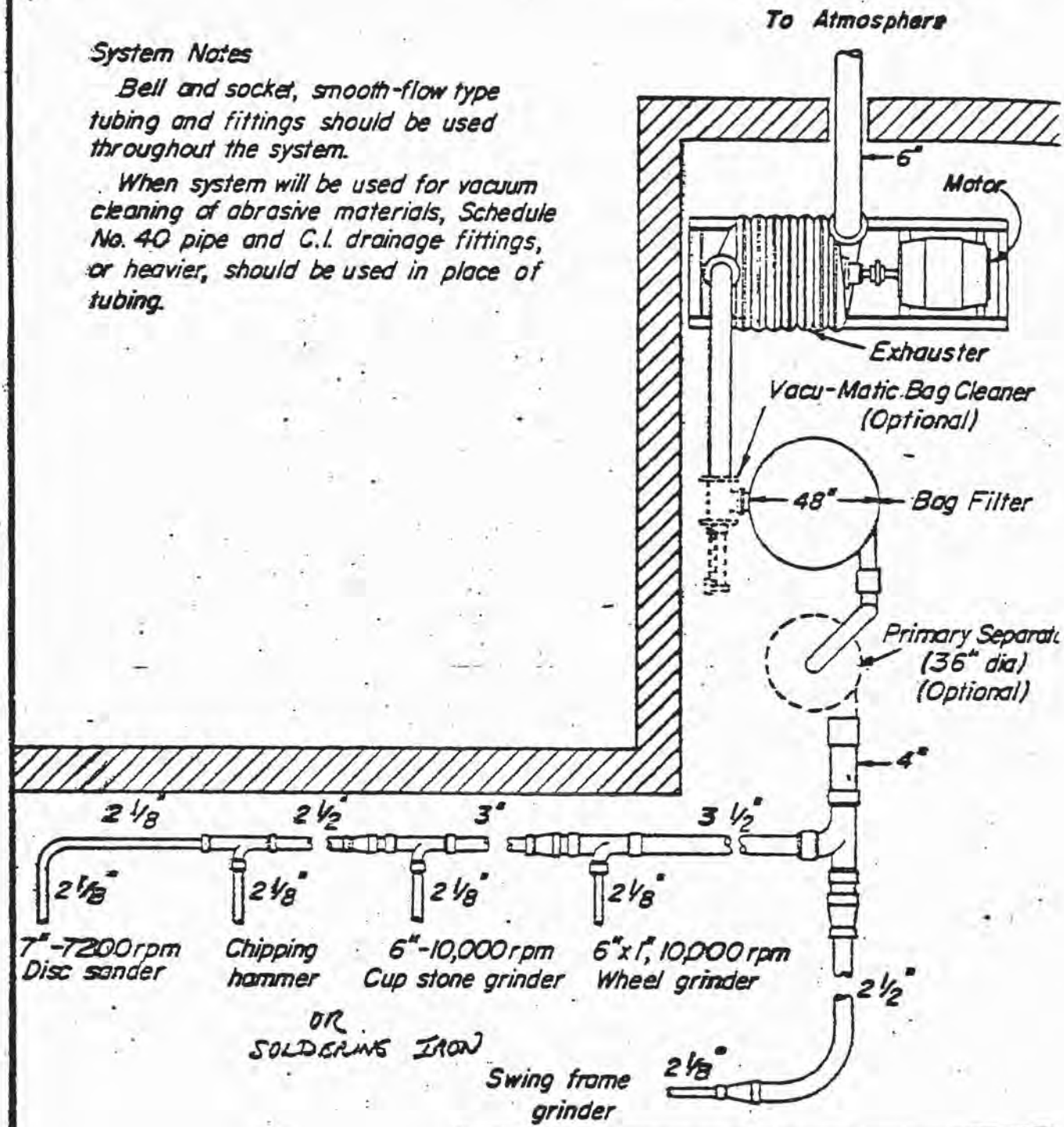
DATE 1-78 | VS-803

Reference 74

System Notes

Bell and socket, smooth-flow type tubing and fittings should be used throughout the system.

When system will be used for vacuum cleaning of abrasive materials, Schedule No. 40 pipe and C.I. drainage fittings, or heavier, should be used in place of tubing.



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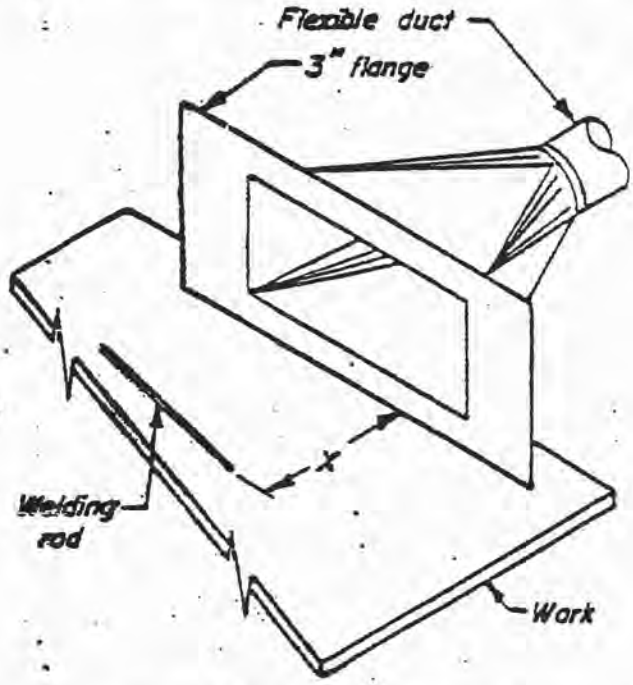
TYPICAL SYSTEM
LOW VOLUME HIGH VELOCITY

Reference 74

DATE 1-78 | VS-807



PORTABLE EXHAUST

X, inches	Plain duct cfm	Flange or cone cfm
up to 6	335	250
6 - 9	755	560
9 - 12	1335	1000

Face velocity = 1500 fpm
Duct velocity = 3000 fpm minimum
Plain duct entry loss = 0.93 duct VP
Flange or cone entry loss = 0.25 duct VP

GENERAL VENTILATION, where local exhaust cannot be used:

Rod, diam	cfm/welder
5/32	1000
3/16	1500
1/4	3500
3/8	4500

OR

A. For open areas, where welding fume can rise away from the breathing zone:
cfm required = 800x lb/hour rod used

B. For enclosed areas or positions where fume does not readily escape breathing zone:
cfm required = 1600x lb/hour rod used

For toxic materials higher airflows are necessary and operator may require respiratory protection equipment.

OTHER TYPES OF HOODS
Bench: See VS-416
Booth: For design See VS-415, VS-604
Q=100 cfm/sq ft of face opening
"Granite Cutting" VS-909

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WELDING BENCH

DATE 1-78 | VS-416.1