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. 75-135-328

A & S TRIBAL INDUSTRIES
POPLAR, MONTANA

SEPTEMBER 1976

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted at the A & S Tribal Industries in Poplar, Montana, by the National Institute for Occupational Safety and Health (NIOSH) on September 16-17, 1975, and January 21-23, 1976. It was concluded that, based on the high number of workers reporting symptoms and showing physical signs of respiratory tract effects, adverse health effects are associated with working with the camouflage netting. Environmental sampling did not demonstrate any airborne exposures to anti-mildew agents containing lead, chromate, antimony, tin, xylene, cellosolve, vinyl acetate, and vinyl chloride. It is recommended that the NIOSH Appalachian Laboratory for Occupational Safety and Health perform additional studies to attempt to further define problems presented by the workers of A & S Tribal Industries.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this hazard evaluation determination report are available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Copies have been sent to:

(a) A & S Tribal Industries
(b) U.S. Department of Labor - Region VIII
(c) NIOSH - Region VIII

For the purpose of informing 100 affected employees, copies of the report shall be provided to these employees or the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any 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.

NIOSH received such a request from the Fort Peck Indian Tribes, Poplar, Montana, to evaluate potential exposures to contaminants generated from the assembly of camouflage netting.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The product of the A & S Tribal Industries is camouflage netting which is used by the military. The process consists of opening packed bales of netting from the supplier, cutting the netting to specifications by use of a finger knife, sewing an edge on the netting, folding and packing the netting, and then shipping the netting to another plant for continuation of the manufacturing process. When the netting is received, it has already been precolored and pretreated with anti-mildew agents. Workers at the A & S Tribal Industries involved include the following: Net splitters, net tiers, edge corders, sewers, inspectors, squarers, receiving clerks, edgers, security guards, housekeepers, bookkeepers, supervisors, and packers. The anti-mildew agents applied to the netting include: Lead, chromate, antimony, and tin. Xylene, cellosolve, vinyl acetate, and polyvinyl chloride also are applied to the netting prior to receipt by A & S Tribal Industries. All of the above-mentioned workers were equally exposed to the netting.

B. Evaluation Progress and Design

A preliminary observational, environmental, and medical evaluation was conducted on September 16-17, 1975, by a NIOSH industrial hygienist and the Montana epidemic intelligence service (EIS) officer. The EIS officer was mainly interested in an epidemiologic analysis of all the people who had ever been employed by the A & S Tribal Industries. His epidemiologic analysis of 133 current or former workers at the A & S Tribal Industries strongly implicated the plant as a source of upper respiratory illnesses. Breathing zone and general room samples were obtained in all areas of the plant and on workers in every job classification. These samples were analyzed for lead, chromate, antimony, tin, xylene, cellosolve, vinyl acetate, and vinyl chloride. There was no local exhaust ventilation throughout the plant. All metal samples were collected using MSA Model G pumps with AA filters and flow rates of 1.5 to 2.0 liters per minute. Sample results are presented in Tables I and II. Xylene, cellosolve, vinyl acetate, and vinyl chloride samples were collected using Sipin pumps with flow rates of approximately 50 cubic centimeters per minute and organic vapor sampling tubes. Sample results are presented in Tables III, IV, and V.

After reviewing the results of the preliminary evaluation, it was decided that additional study was necessary. Subsequently, additional environmental and medical studies were performed in January 1976. A non-directed and a directed medical questionnaire was administered by a NIOSH physician to randomly-selected workers covering all job classifications, i.e., those mentioned under IV/A-Plant Process on January 21-23, 1976. Utilizing the RAND table of random numbers, 34 workers were selected (all of whom volunteered to participate in the study). The age of the cohort varied from 18-63 years, with a mean of 28 years. Forty-one percent of the workers were male; 59% were female; 79% of the workers were Indians; and 21% were non-Indians. The NIOSH physician, in addition

to administering the questionnaire, performed a physical examination, placing special emphasis on the mucous membranes of the eyes, nose, and throat; auscultation of the lungs; and careful examination of the exposed portions of the body.

C. Evaluation Methods

All personal breathing zone and general room samples collected for lead, chromate, antimony, and tin were collected on AA filters and analyzed by atomic absorption spectroscopy. All personal breathing zone and general room samples collected for xylene, cellosolve, vinyl acetate, and vinyl chloride were collected on organic vapor sampling tubes and analyzed by gas chromatography.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

The two sources of criteria used to assess workroom concentrations of air contaminants in this evaluation are: (1) Recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH)(1975) and (2) Occupational Safety and Health Standards (29 CFR 1910.1000), U.S. Department of Labor, as of January 1, 1976.

In the following tabulation of criteria, the most appropriate value is presented with its reference and other information footnoted.

Substance	Permissible Exposures 8-Hour Time-Weighted Exposure Basis
[1]Lead	0.15 mg/M^3
[1]Chromate (as CrO_3)	0.1 mg/M^3
[2]Antimony	0.5 mg/M^3
[2]Tin	2.0 mg/M^3
[2]Xylene	435.0 mg/M^3
[1]Cellosolve (2-ethoxyethanol)	370.0 mg/M^3
[1]Vinyl Acetate	30.0 mg/M^3
Vinyl Chloride	*

mg/M^3 = approximate milligrams of substance per cubic meter of air

* = No safe exposure level has been described as required in Section 20(a)(3) of the Occupational Safety and Health Act of 1970; therefore, any detectable level of vinyl chloride is unsafe. The Occupational Safety and Health Standard (29 CFR 1910.1000) as of January 1, 1976, for vinyl chloride is one part per million averaged over any 8-hour period; at five parts per million, averaged over any period not exceeding 15 minutes.

[1]Reference: Recommended and proposed TLV's and their supporting documentation as set forth by the ACGIH (1975).

[2]Reference: Recommended and proposed TLV's and their supporting documentation as set forth by the ACGIH (1975) and Occupational Safety and Health Standards (29 CFR 1910.1000), U.S. Department of Labor, as of January 1, 1976.

Occupational health standards are established at levels designed to protect individuals occupationally exposed to individual toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

E. Evaluation Results

Results of environmental sampling are presented in Tables I through V.

Personal breathing zone and general room samples were obtained in all areas of the plant and on workers in every job classification. Sampling time ranged from one to eight hours. Environmental sample results for September 16-17, 1975, and January 22, 1976, show levels that were below the NIOSH lower limit of detection. Prior to these surveys information was obtained from the A & S Tribal Industries and from the supplier of the camouflage netting on the chemical composition of the anti-mildew agents. All of these substances were sampled using NIOSH field sampling methods.

Even though environmental sampling by the industrial hygienist on September 15-16, 1975, and January 22, 1976, failed to demonstrate levels of air contaminants to be in excess of present occupational health standards and guidelines, it should be noted that the NIOSH team of an industrial hygienist and medical officer experienced nausea and developed nasal discharge during the January 22 visit, upon first entering the worksite. The workers were carefully questioned as to their experiences when first coming to work. A consensus of the workers statements generally agreed that for the first week on the job, most workers experienced similar symptoms; but after two of three weeks, the symptoms disappeared and only recurred when new bales were opened.

The most frequent complaint consisted of dry and sore throats. The next most common complaint was stuffy or runny nose with subsequent coughing up of phlegm. These complaints occurred periodically and, as stated, especially when new bales were opened. Sixty-five percent of workers in this large building developed these symptoms. It is interesting to note that security personnel who work in a separate outside area did not seem to be affected by exposures to the camouflage netting. Workers who complained of these symptoms reported the symptoms gradually disappeared within three to four days. Physical examination by the medical officer confirmed subjective symptomatology. Thirty-seven percent of the workers showed evidence of inflammation of either their eyes, nose, or throat at the time of the examination. Auscultation of the lungs revealed rales, wheezes, or diminished breath sounds in 18% of the workers examined.

F. Medical and Environmental Conclusions

Environmental sampling failed to show any exposures to lead, chromate, antimony, tin, xylene, cellosolve, vinyl acetate, and vinyl chloride. A health hazard was judged to exist based on the industrial hygienist's personal observations, positive medical findings, confidential employee interview forms, and the fact that the NIOSH industrial hygienist and physician developed similar symptoms including headaches, burning and tearing of the eyes and nose, and soreness of the throat while conducting this survey. These symptoms disappeared without recurrence approximately 14 hours after leaving the plant.

V. RECOMMENDATION

It is recommended that the NIOSH Appalachian Laboratory for Occupational Respiratory Diseases conduct further studies to define the problem, and its etiology.

VI. AUTHORSHIP

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TABLE I

ATMOSPHERIC CONCENTRATIONS OF LEAD, CHROMATE, ANTIMONY, AND TIN
A & S TRIBAL INDUSTRIES
September 16-17, 1975

Sample Number	Location	Job Classification	Time of Sample	Atmospheric Concentrations mg/M^3 Lead	Chromate	Antimony	Tin	Type of Sample
1	Net Preparation	Net Splitter	12:58-4:05 P.M.	*	*	*	*	BZ
2	Net Preparation	Net Splitter	1:00-4:11 P.M.	*	*	*	*	BZ
3	Hexagonal Nets	Net Tieup	1:02-4:11 P.M.	*	*	*	*	BZ
8	Edge Cording	Edge Corder	1:04-4:11 P.M.	*	*	*	*	BZ
9	Sewing Room	Sewer	1:10-4:15 P.M.	*	*	*	*	BZ
7	Sewing Room	Sewer	1:11-4:14 P.M.	*	*	*	*	BZ
6	Sewing Room	Sewer	1:12-4:13 P.M.	*	*	*	*	BZ
5	Squaring	----	1:14-4:12 P.M.	*	*	*	*	General Room
4	Net Rollup	----	1:17-4:28 P.M.	*	*	*	*	General Room
13	Sewing Room	Sewer	5:06-9:10 P.M.	*	*	*	*	BZ
17	Sewing Room	----	5:13-9:10 P.M.	*	*	*	*	General Room
18	Sewing Room	Sewer	5:08-10:15 P.M.	*	*	*	*	BZ
15	Rhombic Nets	Net Tieup	5:10-10:15 P.M.	*	*	*	*	BZ
12	Squaring	----	5:15-10:00 P.M.	*	*	*	*	General Room
16	Edge Cording	Edge Corder	5:05-9:23 P.M.	*	*	*	*	BZ
14	Net Cutting	Net Cutter	5:02-10:20 P.M.	*	*	*	*	BZ
10	Hexagonal Nets	Net Tieup	5:12-10:15 P.M.	*	*	*	*	BZ
11	Net Cutting	Net Cutter	5:00-10:20 P.M.	*	*	*	*	BZ
22	Sewing Room	Sewer	8:26-11:10 A.M.	*	*	*	*	BZ
20	Sewing Room	Sewer	8:27-2:48 P.M.	*	*	*	*	BZ
26	Sewing Room	Sewer	8:31-2:45 P.M.	*	*	*	*	BZ
24	Rhombic Nets	Net Tieup	8:34-2:50 P.M.	*	*	*	*	BZ
23	Rhombic Nets	Net Tieup	8:35-2:47 P.M.	*	*	*	*	BZ
21	Rhombic Nets	Net Tieup	8:36-1:00 P.M.	*	*	*	*	BZ
25	Net Rollup	Net Roller	8:38-1:50 P.M.	*	*	*	*	BZ
27	All Areas	Inspector	8:41-3:17 P.M.	*	*	*	*	BZ
19	Squaring	----	8:44-1:10 P.M.	*	*	*	*	General Room
			EVALUATION CRITERIA	0.15	0.1	0.5	2.0	
			(October 1975) NIOSH LIMIT OF DETECTION IN MILLIGRAMS	0.01	0.007	0.03	0.03	

mg/M^3 = approximate milligrams of substance per cubic meter of air
* = below the NIOSH lower limit of detection
BZ = breathing zone

TABLE II

ATMOSPHERIC CONCENTRATIONS OF LEAD, CHROMATE, ANTIMONY, AND TIN

A & S TRIBAL INDUSTRIES
JANUARY 22, 1976

Sample Number	Location	Job Classification	Time of Sample	Atmospheric Concentrations mg/M^3 Lead	Chromate	Antimony	Tin	Type of Sample
1	Hexagonal Nets	Net Cutter	8:55 A.M.-1:00 P.M.	*	*	*	*	BZ
2	Hexagonal Nets	Net Cutter	8:55-10:30 A.M.	*	*	*	*	BZ
3	Rhombic Nets	Net Tieup	9:05 A.M.-2:05 P.M.	*	*	*	*	BZ
4	Rhombic Nets	Net Tieup	9:05 A.M.-2:05 P.M.	*	*	*	*	BZ
5	Sewing Room	Sewer	9:18 A.M.-2:00 P.M.	*	*	*	*	BZ
			EVALUATION CRITERIA	0.15	0.1	0.5	2.0	
(February 1976) NIOSH LIMIT OF DETECTION IN MILLIGRAMS				0.002	0.001	0.005	0.020	

mg/M^3 = approximate milligrams of substance per cubic meter of air

* = below the NIOSH lower limit of detection

BZ = breathing zone

TABLE III

ATMOSPHERIC CONCENTRATIONS OF XYLENE AND BUTYL CELLOSOLVE

A & S TRIBAL INDUSTRIES
SEPTEMBER 17, 1975

Sample Number	Location	Job Classification	Time of Sample	Atmospheric Concentrations mg/M^3 Xylene	Butyl Cellosolve	Type of Sample
1	Squaring	Squarer	1:39-4:22 P.M.	*	*	BZ
4	Squaring	Squarer	1:40-4:22 P.M.	*	*	BZ
5	Net Repair	Net Repairer	1:44-4:26 P.M.	*	*	BZ
6	Sewing Room	Sewer	1:46-4:50 P.M.	*	*	BZ
8	Squaring	----	2:00-5:23 P.M.	*	*	General Room
9	Squaring	Squarer	4:55-5:22 P.M.	*	*	BZ
			EVALUATION CRITERIA	435.0	240.0	
			(October 1975) NIOSH LIMIT OF DETECTION IN MILLIGRAMS	0.01	0.01	

mg/M^3 = approximate milligrams of substance per cubic meter of air

* = below the NIOSH lower limit of detection

BZ = breathing zone

TABLE IV

ATMOSPHERIC CONCENTRATIONS OF XYLENE, BUTYL CELLOSOLVE, AND VINYL ACETATE

A & S TRIBAL INDUSTRIES
JANUARY 22, 1976

Sample Number	Location	Job Classification	Time of Sample	Atmospheric Concentrations mg/M^3 Xylene	Butyl Cellosolve	Vinyl Acetate	Type of Sample
2888	Sewing Room	Sewer	9:20 A.M.-2:05 P.M.	*	*	*	BZ
2892	Squaring	Squarer	9:30 A.M.-2:05 P.M.	*	*	*	BZ
2882	Squaring	Squarer	9:31 A.M.-2:05 P.M.	*	*	*	BZ
2890	Sewing Room	Sewer	9:40 A.M.-1:00 P.M.	*	*	*	BZ
2891	Sewing Room	Sewer	9:40 A.M.-1:00 P.M.	*	*	*	BZ
2886	Sewing Room	Sewer	10:00 A.M.-2:10 P.M.	*	*	*	BZ
			EVALUATION CRITERIA	435.0	240.0	30.0	
			(February 1976) NIOSH LIMIT OF DETECTION IN MILLIGRAMS	0.01	0.01	0.01	

mg/M^3 = approximate milligrams of substance per cubic meter of air

* = below the NIOSH lower limit of detection

BZ = breathing zone

TABLE V

ATMOSPHERIC CONCENTRATIONS OF VINYL CHLORIDE

A & S TRIBAL INDUSTRIES
September 17, 1975

Sample Number	Location	Job Classification	Time of Sample	Concentrations Vinyl Chloride ppm	Type of Sample
10	Squaring	Squarer	9:30 A.M.-5:16 P.M.	< 0.25	BZ
11	Squaring	Squarer	9:30 A.M.-5:23 P.M.	< 0.25	BZ
			EVALUATION CRITERIA	< 0.25*	
			(October 1975) NIOSH LIMIT OF DETECTION IN MILLIGRAMS	0.25	

ppm = parts per million

BZ = breathing zone

* = no safe exposure level has been described as required in Section 20(a)(3) of the Occupational Safety and Health Act of 1970; therefore, any detectable level of vinyl chloride is unsafe.

TABLE VI

A&S Tribal Industries
Poplar, Montana

SYMPTOM COMPLAINTS RELATED TO WORK

Symptoms	Sometimes	Usually	Total
Dry or Sore Throat	18 (53%)	4 (12%)	65%
Burning, itching, yearing of eyes	10 (29%)	6 (19%)	47%
Headaches	11 (32%)	0 (0%)	11%
Stuffy, runny or sore nose	18 (53%)	4 (12%)	65%
Nasal irritation	10 (29%)	1 (3%)	32%
Coughing (phlegm)	12 (35%)	3 (9%)	62%
Chest tightness, soreness, heaviness	5 (15%)	2 (6%)	21%
Wheezing, whistling of chest	2 (6%)	2 (6%)	12%
Shortness of breath	7 (21%)	1 (3%)	24%
Nausea	11 (32%)	0 (0%)	32%
Dryness of skin	10 (29%)	0 (0%)	10%
Itching of skin	6 (18%)	0 (0%)	6%
Irritation of skin	6 (18%)	0 (0%)	6%
Dizziness	3 (9%)	0 (0%)	3%

*Totals more than 100% due to multiple responses.

TABLE VII

A&S Tribal Industries
Poplar, Montana

PHYSICAL FINDINGS

Physical Findings	Positive Percent	Negative Percent
Mucosal inflammation of eyes, nose, throat	47	53
Auscultation of Lungs*	18	82
Dermatitis** (Fungus, eczema)	6	94

*One worker had controlled TB and under medical care

**Two workers had stains