

1986

LOUISIANA DIVISION INDUSTRIAL HYGIENE REPORT

AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY.

REV
B(2)

<u>DEPARTMENT</u>	<u>FILE NUMBER</u>	<u>DATE</u>
Chlorinated Polyethylene	LAD-CPE-86.01	2/18/87
<u>TITLE</u>		
Industrial Hygiene Survey Protocol for CPE		
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SUMMARY/RECOMMENDATIONS

Outlined in this report are the Industrial Hygiene Survey plans for 1987 at the CPE plant. Also included are:

1. Explanation fo sampling strategy
2. Summary of pertinent toxicology for priority chemicals
3. Explanation of evaluation criteria
4. Summary of sampling and analytical methods
5. Process description and flow diagram
6. Job descriptions and plant roster
7. Chemical and physical agent inventories

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PURPOSE

Recommendations for assessing potential exposures to chemical and physical agents at the Louisiana Division Chlorinated Polyethylene Plant, Block 19, are outlined in this industrial hygiene survey plan. Periodic assessments of employee exposures are necessary to ensure that exposures are being adequately controlled. These recommendations are based on a revision of the chemical and physical agent inventories and on reviews of the exposure data on file. The chemical and physical agent inventories, via the priority rating, are used to estimate the exposure potential for each job classification. All priority ratings of 1-3 should be subject to an industrial hygiene survey to determine employee exposures. In addition to those, some priority ratings of 4 and 5 need to be surveyed to improve the existing data base or to verify our judgements of low potential exposure.

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DEFINING EMPLOYEE EXPOSURES/SAMPLING STRATEGY

The survey priorities were determined from the "Chemical and Physical Agent Inventories" and from statistical evaluation of the existing data. Setting priorities in this manner develops an efficient and logical framework for an industrial hygiene survey.

The Chemical and Physical Agent Inventory was used to meet two basic requirements of a realistic survey. These two requirements are:

1. Determine the degree of exposure for each job classification to each chemical used in the plant. This is based on the normal conditions of use and the physical properties of the material. (Appendix I).
2. Determine a priority rating for each job/agent that is based on the degree of exposure and the toxicity of the chemical (Appendix 2). A summary of the priorities can be found in Table 1.

→ The statistical guidelines in Appendix 3 were used to evaluate the existing data (Tables 2-7). These guidelines are based on the following:

1. The lognormal distribution is used to model long term occupational exposures. This distribution is characterized by the geometric mean and the geometric standard deviation.
2. Most workplace environments have geometric standard deviations between 1.5 and 3.0.
3. For chemicals that are dose-rate independent, the upper 95% confidence limit should be used to test if the arithmetic mean is below the exposure guidelines.
4. For chemicals that are dose-rate dependent, a tolerance limit approach should be used to test if the 95th percentile is below the exposure guidelines.

A summary of the survey work planned for 1987 can be found in Table 8.

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REDUCING CHLORINE EXPOSURE AT CPE

PURPOSE: To reduce Cl_2 exposure to personnel in the CPE block.

DEFINITION:

1. The Scott AO half mask dual element respirator (blue) is the approved respirator for CPE. The approved cartridge is Scott R52A.
3. All CPE assigned personnel, whether Dow or contract, are required to use the dual element, half mask respirator. The mouthbit escape respirator is no longer acceptable for block assigned personnel.
4. Visitors in the block are required to have as a minimum, a mouthbit respirator which will be used for escape only.

MAINTENANCE:

1. It is the responsibility of each person to maintain their respirator to insure good and proper hygiene.
2. Respirator cartridges will be changed out monthly during the monthly safety meeting.

TRAINING:

Each individual will be properly trained on the use of the half mask respirator and fit tested to insure a good seal. Use of the respirator will begin prior to fit testing which will be arranged with industrial hygiene as soon as possible.

ADDITIONAL BLOCK PROTECTION:

1. All assigned CPE personnel are required to carry a dual half mask respirator.
2. Six yellow flashing lights are being installed in the block to warn and alert personnel of possible chlorine exposure during a reactor moveover. The locations are
 - a. South side of Tr 1 between MMC and T-31
 - b. North entrance of Tr 2 area above main north-south ditch
 - c. C-103 on ground level
 - d. C-103 on deck level
 - e. C-203 on ground level
 - f. C-203 on deck level.
3. Wind socks are being installed in the block to aid personnel in determining the wind direction.

OPERATION:

1. Each individual should put more emphasis on scheduling jobs to limit possible exposure to chlorine. Unless necessary to maintain normal operation (safety, production, or quality), process area should not be entered when reactor moveovers are in process (flashing light).
2. All personnel should attempt to work upwind from the chlorine source thus limiting exposure.
3. If working downwind of chlorine source, the respirator must be worn to prevent exposure if required to be in process area.
4. If at anytime chlorine is detected, personnel must either evacuate the area or use the half mask respirator until the chlorine hazard no longer exists.

WARNING: This respirator is not a replacement for a full face mask using breathing air or a Scott Air Pack and is not to be used on job presently requiring breathing air.

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SUMMARY OF PERTINENT TOXICOLOGY

Chlorine - Capable of producing burns on the eye and skin. Overexposure by inhalation will produce marked irritation of the nasal and throat linings with possible lung injury. The LC_{50} for rats and mice is 293 and 137 ppm respectively, after an inhalation exposure of one hour. OSHA permissible exposure limit is 1 ppm (ceiling). The ACGIH TLV is 1 ppm time weighted average and was recommended to minimize chronic changes in the lungs, accelerated aging, and erosion of the teeth.

Non-asbestos Talc - The asbestos content of talc chiefly determines the extent of the health hazard it poses. The talc used at CPE does not contain asbestos, but does contain small amounts of particles that meet the definition of a fiber (aspect ratio >3.1). The health effects of these particles are presently unknown. Some studies have suggested that these particles may cause lung disease. The ACGIH Threshold Limit Value is 2 mg/m^3 respirable dust for non-asbestos dust with $< 1\%$ silica.

Tetrahydrofuran - Acute effects of overexposure are nausea, headache, and dizziness. Early animal studies reported liver and kidney effects from Sub-chronic exposures at 3,000 ppm. It is now believed that this was due in part to the impurities in the compound tested. The ACGIH Threshold Limit Value of 200 ppm with a short-term exposure limit of 250 ppm was recommended to protect against irritative effects. This limit should also provide a wide margin of safety for narcotic and systemic effects.

Varsol (Stoddard solvent) - A mixture of straight and branched chain paraffins, naphthenes, and aromatic hydrocarbons. The ACGIH Threshold Limit Value is 100 ppm. This limit was based on the toxicities of the major ingredients and is recommended to prevent irritative and narcotic effects of the vapor. Skin contact with the liquid may defat and irritate the skin.

Welding Fumes - May consist of numerous metallic oxides from the metal being welded and from the rod itself or the rod coating. The ACGIH Threshold Limit Value is 5 mg/m^3 for welding fumes that are not otherwise classified. The TLV refers only to manual metal arc or oxy-acetylene welding of iron, mild steel, or aluminum. The fumes from stainless steel, cadmium or lead coated steel, and other metals such as copper, nickel, or chrome are more toxic and should be controlled to the level of the TLV of the metal involved.

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EVALUATION CRITERIA

The Dow Industrial Hygiene Guidelines (IHG's) are concentrations of airborne substances to which nearly all employees may be repeatedly exposed throughout a working lifetime without adverse effect. Other published exposure criteria frequently used are the American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit Values (TLV) and the OSHA Permissible Exposure Limits (PEL's) of the U.S. Department of Labor.

Most exposure guidelines are time-weighted average concentrations for an 8-12 hour working day and a 40-hour workweek. Limited excursion exposures to concentrations exceeding the guidelines are permitted, provided that the time-weighted average for the workday is not exceeded. For some chemicals, no excursion exposures are allowed. For these chemicals, ceiling limits are assigned and should not be exceeded for any amount of time. Also, some chemicals are assigned a short-term exposure limit which is a guideline for a 15-minute time period.

<u>CHEMICAL</u>	<u>EXPOSURE GUIDELINE</u>	<u>SOURCE</u>
Calcium Carbonate	10 mg/m ³ (total dust)	ACGIH
Chlorine	1 ppm (ceiling)	OSHA
Hydrochloric Acid	5ppm (ceiling)	ACGIH
Non-asbestos talc	2 mg/m ³ (respirable)	ACGIH
Noise	85 db(A)	LAD Guide
Varsol	200 ppm (STEL)	ACGIH
Welding Fumes	5 mg/m ³	ACGIH

When the exposure data indicates a potential problem, control measures will be recommended. Methods of control include engineering controls, administrative controls, and personal protective equipment. Engineering control methods include containment, isolation, substitution, local exhaust ventilation, general ventilation, and change of operation procedures. Administrative controls limit exposure time through remote operation or job rotation. Personal protective equipment may be used as a last resort when other controls are not feasible or until other controls can be implemented.

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2/19/87

SAMPLING AND ANALYTICAL METHODS

Collection of airborne contaminants will be obtained using sampling methods approved by the IAD Industrial Hygiene Department. In most cases, the preferred technique will be the NIOSH approved method. For tetrahydrofuran and varsol, a calibrated air sampling pump will be used with a charcoal collection tube. The tube will be analyzed at the Environmental Laboratory using a chilled CS₂/gas chromatograph method. the 3M passive dosimeter badge may also be used for collection where approved.

Sampling for respirable dust will be done using two methods. The air sampling pump with a filter cassette and midget cyclone will be used for the personnel sampling for talc and calcium carbonate. The Sibata P-5 direct reading dust instrument will be used for excursion sampling on short-term jobs with additives to document exposures. This instrument will also be used for area dust and welding fume sampling.

Noise exposures will be evaluated using the Dupont MK-2 Audio Dosimeter. This dosimeter may also be used to take area measurements.

Personnel sampling for chlorine will be done using a data logger with a wolcott probe. Area samples for chlorine will be made using the same probe but with a direct reading instrument.

Area sampling for hydrochloric acid will be done using a Drager pump and detection tube.

MDR:lm1
2/19/87

DEGREE OF EXPOSURE RATINGS

<u>DE</u>	<u>Description</u>
NEG	Within this job assignment*, the normal conditions of use and the physical properties of the material indicate that both inhalation and skin exposures are likely to be no more than negligible. Characterized by remote handling operations with the equipment isolated from the employees' work area. There is no equivalent exposure category on the T.I.M.E. system since the categories on the T.I.M.E. system serve primarily to determine appropriate handling precautions for known exposure situations. Typical job assignments which might be assigned a DE rating of 'NEG' include computer personnel and secretaries.
LOW	Within this job assignment, the normal conditions of use and the physical properties of the material indicate that both inhalation and skin exposure are likely to be no more than minor. Characterized by work around <u>closed systems</u>; sampling, laboratory work, packaging or dumping of materials with low to moderate volatility or dustiness with sufficient ventilation. The equivalent T.I.M.E. system category would be 'LOW'.
MOD	Within this job assignment, the normal conditions of use and the physical properties of the material indicate that there is a potential for moderate inhalation and/or skin exposures. Characterized by manual handling of materials such as sampling, packaging, filter changing or dumping of materials with low to moderate volatility or dustiness using potentially insufficient ventilation. This category may also include handling of materials with high volatility or dustiness if sufficient local exhaust ventilation is present. The equivalent T.I.M.E. system category would be 'MOD'.
HIGH	Within this job assignment, the normal conditions of use and the physical properties of the material indicate that there is a potential for high inhalation and/or skin exposures. Characterized by manual operations such as sampling, packaging or dumping of materials with high volatility or dustiness without sufficient local exhaust ventilation. Control is generally achieved through extensive use of protective equipment. The equivalent T.I.M.E. system category would be 'HIGH'.

*Job assignment is defined as a group of employees doing the same type of work which results in their having comparable exposures.

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PRIORITY RATINGS

The priority rating is useful for representing and communicating the risks present in particular work situations. It is also helpful in establishing industrial hygiene priorities. The priority rating is based on two things: the conditions of use and physical properties (Degree of Exposure Rating), and the toxicity and warning properties of the material (Industrial Hygiene Guide if available). Within a given plant, the rating for a single chemical may be different for various job assignments because of the varying degree of exposure.

Industrial hygienists use the following six categories as guidelines for assigning the priority ratings.

<u>PR</u>	<u>Description</u>
5	The degree of exposure rating, the toxicity of the material, and the warning properties are such that, for this job assignment under normal operating conditions, there is a negligible potential for exposures to approach or exceed acceptable levels. No further exposure evaluation is needed.
4	The degree of exposure rating, the toxicity of the material, and the warning properties are such that, for this job assignment under normal operating conditions, there is a minor potential for exposures to approach or exceed acceptable levels. Only minimal monitoring may be needed to confirm this rating.
3	The degree of exposure rating, the toxicity of the material, and its warning properties are such that, for this job assignment under normal operating conditions, there is a moderate potential for exposures to approach or exceed acceptable levels. Employees' exposures should be monitored regularly or subjectively evaluated by a health professional.
2	The degree of exposure rating, the toxicity of the material, and the warning properties are such that, for this job assignment under normal operating conditions, there is a significant potential for exposures to approach or exceed acceptable levels. Periodic monitoring should be initiated and employees' exposure levels reevaluated on a regular basis.

- 1 The degree of exposure rating, the toxicity of the material, and the warning properties are such that, for this job assignment under normal operating conditions, there is a high potential for exposures to exceed acceptable levels.

Immediate action by plant supervision and industrial hygiene is necessary to evaluate and control employees' exposure levels. Periodic follow-up documentation is needed to ensure control measures are effective.

- T This "T" category is available to indicate that training has been conducted on certain chemicals which may be encountered on a nonroutine or emergency basis. No degree of exposure* is assigned with this "T" rating since exposures may never occur or may occur to an unpredictable degree. Situations which may be appropriate for a "T" priority rating include:

a. For Security, Fire and Emergency Response Groups

- Typically, training is conducted on selected chemicals which may be encountered in an emergency situation.

b. For Service Groups

- Training may be conducted on chemicals which are not part of a group's own inventory, but which have the potential for being encountered based on the type and location of the job being performed.

*Note: A dash (-) is used under degree of exposure when a "T" is assigned as a priority rating.

a80868,14

S. Norwood

STATISTICAL DECISION GUIDELINES

For acceptable workplace conditions when the estimated
geometric standard deviation is 2.5

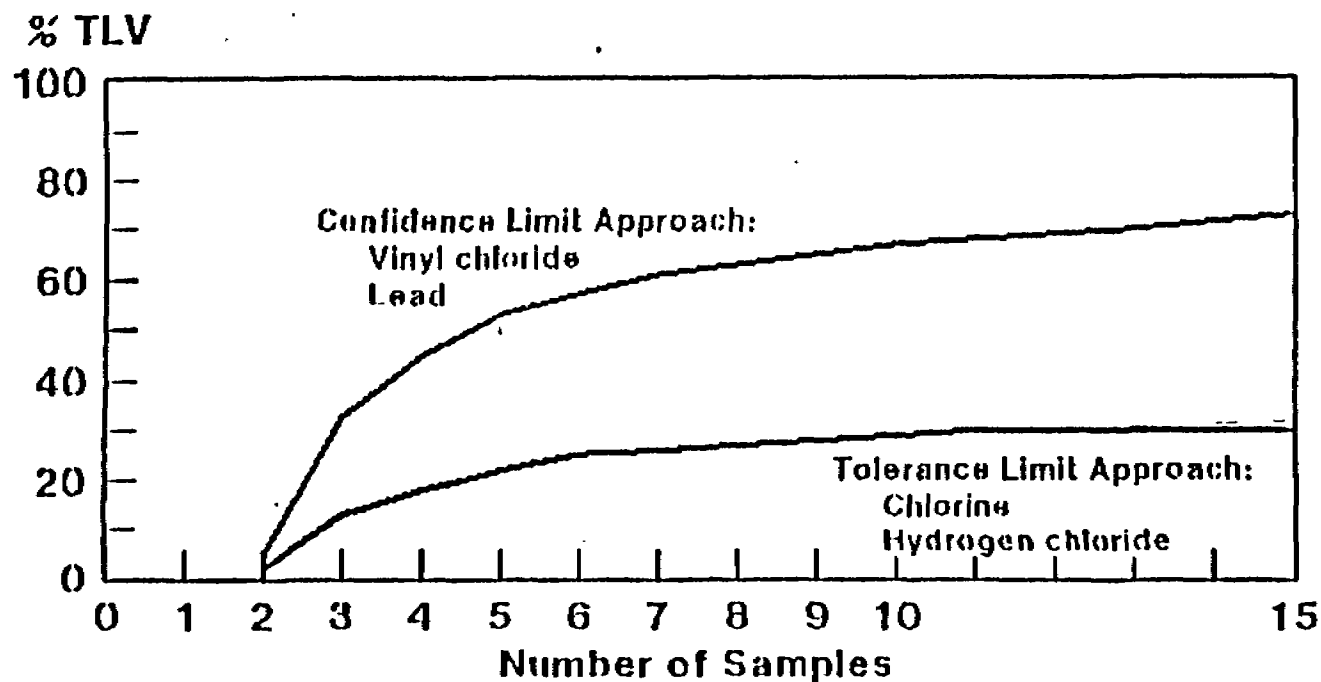


TABLE 1

SUMMARY OF PRIORITY CHEMICALS AT THE CPE PLANT, 1987

JOB CLASSIFICATION	CHLORINE	TALC	NOISE
O. T.	1	3	3
Outside S. O. T.	1	5	3
Outside O. S.	1	5	3
Environmental Specialist	1	5	3
Maintenance Coordinator	1	4	3
Day Maintenance	1	4	3
Contract Pipefitter	1	4	3
Contract Welder	1	4	3
Contract Laborer	1	3	3

MDR:lm1
1/19/87

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TABLE 2

SUMMARY OF CHLORINE EXPOSURE DATA FOR THE CPE PLANT

Permissible Exposure Limit = 1 ppm (ceiling)

1983 *high* ✓

Job	# of Samples	Duration (minutes)	Avg.* Peak Exposure	Avg. 15-min. Exposure	Avg. time-weight Average
Outside S.O.T.	8	311-423	> 5.4ppm <i>> 13.0</i>	0.5ppm	0.02ppm <i>0.2</i>

1984

Job	# of Samples	Duration (minutes)	Avg.* Peak Exposure	Avg. 15-min. Exposure	Avg. time-weight Average
Outside S.O.T.	4	372-390	<i>5.8</i> 2.1ppm	0.01ppm	<i>0</i> 0.00ppm
Day Maintenance	2	261-360	<i>8.1</i> 8.1ppm <i>> 12.0</i>	0.70ppm	<i>0.11</i> 0.05ppm

*Instantaneous

MDR:lm1
2/19/87

PERSONNEL ARE
TRAINED TO
WEAR DUAL
CARTRIDGE WHEN
Cl₂ IS SMELLED.

H-7

H-6

H-5

H-4

T101
A

L 1A
L 2A

T41

D70

DO 107832
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TABLE 3

H-3

H-2

MCC

T
31

R
102B

1.8 - 10

R
102B

T
104A

T
105A

EP
205

EP
105

1.5 - 14

R102B: Transferring
(R202A Transferring)

NEW
SCRUBBER

C103

FBD 106

□ □ □

12,

Wind

D40

16 - 20

C
103

C
104B

(3 - 16)

R
202A

C
203

T
204A

T
205A

T100B

D100A

R
202B

> 12

T
204B

T
205B

T232A

T232B

CMP100A

□ □ □

FBD 206

E600

602A 602B

□ □

□ □

601A 601B

601

602

603

604

605

606

Scrubber

Peak Cl₂ Levels 1984 Samples.

1ppm Max Exposure

SHOP

OFFICE

TALC ROOM

B 651

SW 651

P 651

603B

603A

RAMP

TABLE 4

SUMMARY OF NON-ASEESTOS TALC DATA FOR THE CPE PLANT

Threshold Limit Value = $2\text{mg}/\text{m}^3$ respirable dust

1983

Job	# of Samples	Duration (minutes)	Respirable Dust (mg/m^3)	<i>High</i>	Non-Respirable Dust (mg/m^3)
Excursion (house-keeping weigh-feeder room)	4	90-340	1.8	<i>2.6</i>	7.0

1984

Job	# of Samples	Duration (minutes)	Respirable Dust (mg/m^3)		Non-Respirable Dust (mg/m^3)
Excursion (house-keeping weigh-feeder room)	3	16-180	2.2	<i>3.5</i>	8.6
Excursion (bag slitter)	5	36-43	2.9	<i>4.1</i>	6.1

1985

Job	# of Samples	Duration (minutes)	Respirable Dust (mg/m^3)		Non-Respirable Dust (mg/m^3)
O. T.	8	368-420	0.3	<i>0.8</i>	0.8

1986

Job	# of Samples	Duration (minutes)	Avg. Fibers/cc* > 5 microns		High Fibers/cc* > 5 microns
Area - Weigh-feeder room	3	328-411	0.01	<i>0.013</i>	0.013

TABLE 5

SUMMARY OF TETRAHYDROFURAN DATA FOR THE CPE PLANT

Threshold Limit Value - 200 ppm; 250 ppm STEL¹

1983

Job	# of Samples	Duration (minutes)	Average Exposure (ppm)
Outside S.O.T.	2	380-420	< 0.4
Lab S.O.T.	3	380-420	< 0.4

1984

Job	# of Samples	Duration (minutes)	Average Exposure (ppm)
Lab S.O.T. (Excursion)	2	15	<10.2
Outside S.O.T. (Excursion)	2	15-18	56.6

1985

Job	# of Samples	Duration (minutes)	Average Exposure (ppm)
O.T.	1	385	< 1.0
Lab S.O.T.	1	391	ND

¹ 15-minute exposure guideMDR:lml
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TABLE 6

SUMMARY OF POTENTIAL NOISE EXPOSURE DATA FOR THE CPE PLANT

LAD Guide - 85 db(A) for 8 hours

1984

Job	# of Samples	Duration (minutes)	Avg ¹	High ¹
Technical	2	407-420	10%	14%

1985

Job	# of Samples	Duration (minutes)	Avg ¹	High ¹
O. T.	3	302-406	78%	148%
Outside S.O.T.	4	402-420	80%	126%
Day Maintenance	3	386-406	193%	338%
Inside S.O.T.	3	385-417	33%	48%

¹ Percent of 85 db(A) for 8 hours.MDR:lm1
2/19/87*PERSONNEL
WEAR HEARING
PROTECTION.*DO 107835
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TABLE 7

SUMMARY OF HYDROCHLORIC ACID DATA FOR THE CPE PLANT

Threshold Limit Value = 5 ppm (ceiling limit)

1983

Job	# of Samples	Duration (minutes)	Avg. (ppm)	High (ppm)
Outside S.O.T.	4	230-415	0.5	1.1
Area - Wash Column	4	175-300	<0.6	0.9

MDR:lm1
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TABLE 8

SUMMARY OF I.H. SURVEY WORK PLANNED AT THE CPE PLANT, 1987

JOB CLASSIFICATION	CHLORINE*	NOISE	HCL*	TALC	VAR SOL	CALCIUM CARBONATE	WELDING FUMES	THF
O. T.	-----	2	-----	-----	-----	-----	-----	-----
Outside S. O. T.	4	2	-----	-----	-----	-----	-----	-----
Outside O. S.	-----	3	-----	-----	-----	-----	-----	-----
Day Maintenance	4	2	-----	-----	3	-----	-----	-----
Maintenance Coordinator	-----	2	-----	-----	-----	-----	-----	-----
Contract Pipefitter	-----	3	-----	-----	-----	-----	-----	-----
Contract Welder	-----	3	-----	-----	-----	-----	-----	-----
Contract Laborer	-----	3	-----	-----	-----	-----	-----	-----
Environmental Specialist	-----	3	-----	-----	-----	-----	-----	-----
Area (Plant)	3	1	1	-----	-----	-----	-----	-----
Area (Weigh-Feeder Room)	-----	-----	-----	3	-----	-----	-----	-----
Excursion (Bag Slitter)	-----	-----	-----	4	-----	4	-----	-----
Area (Shop)	-----	-----	-----	-----	-----	-----	3	-----
Excursion (Cleaning Equipment)	-----	-----	-----	-----	3	-----	-----	-----
Area (Housekeeping Weigh-Feeder Room)	-----	-----	-----	3	-----	-----	-----	-----
Excursion (Bag Compactor Maint.)	-----	-----	-----	-----	-----	-----	-----	-----
Excursion (pH Test Control Lab)	-----	-----	-----	-----	-----	-----	-----	3

* After engineering controls are implemented.

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