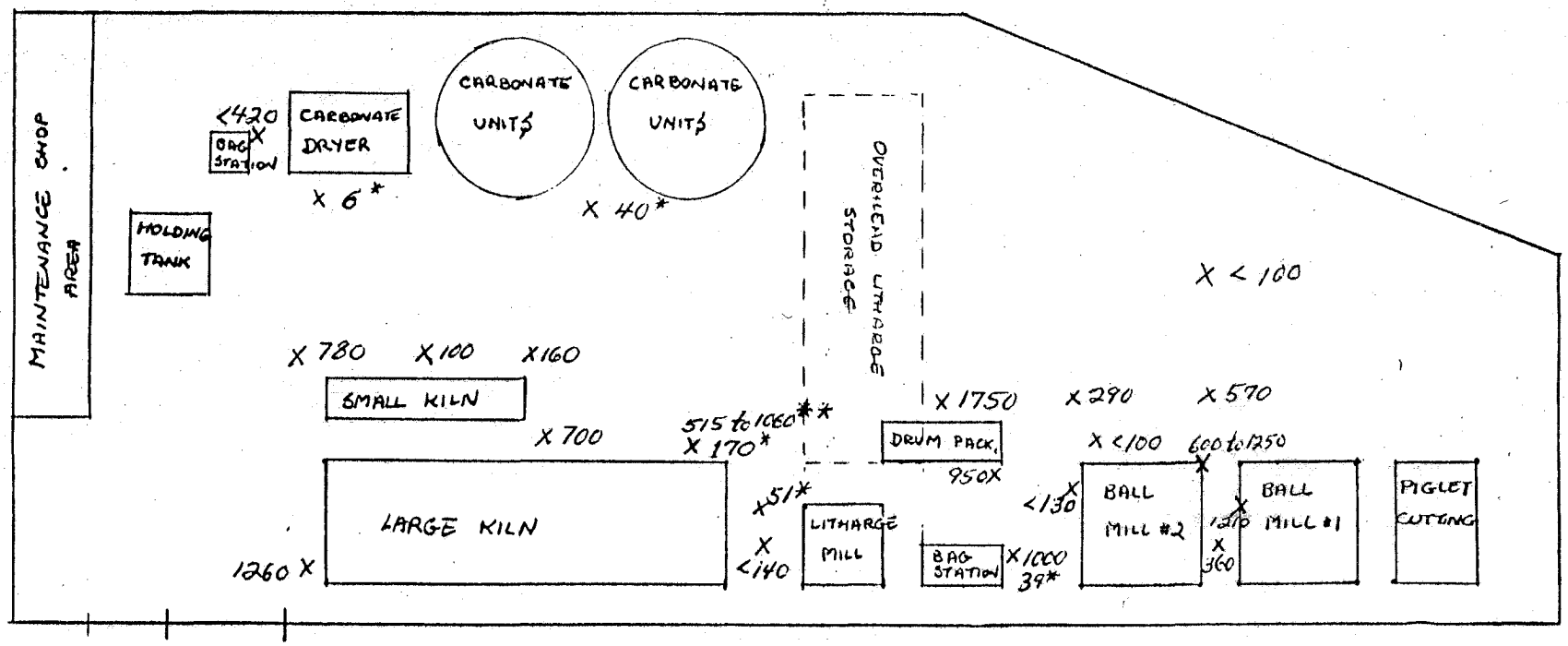
APPENDIX C

AREA AIR SAMPLING RESULTS

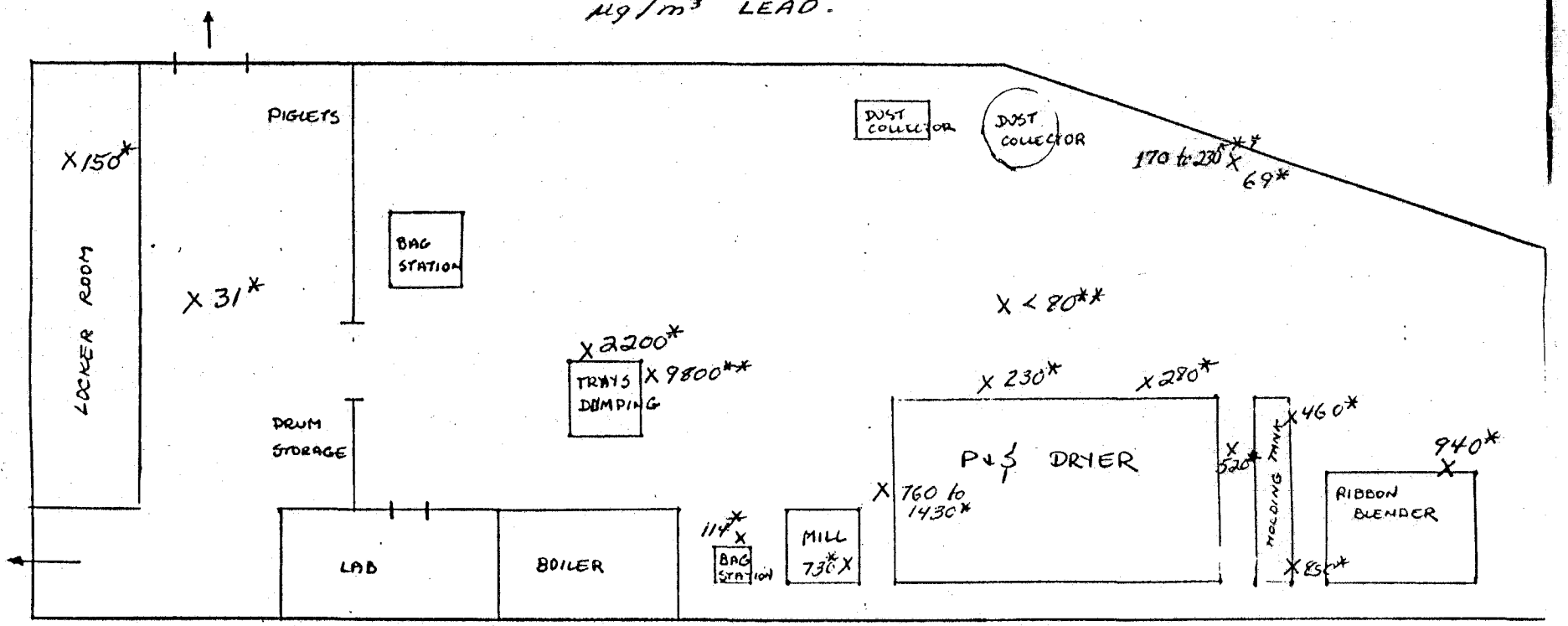
BUILDING #19: AREA SAMPLING RESULTS AT LOCATIONS MARKED BY AN "X" IN UNITS OF $\mu g/m^3$ LEAD. MEASUREMENTS MADE IN 1976 WITH EXCEPTIONS NOTED.



* Levels measured in February, 1980 during shutdown conditions. All other levels measured during regular operations.

** Indicates the range of levels measured during 1978 and 1979.

BUILDING 20 & 20A: AREA SAMPLING RESULTS AT LOCATIONS MARKED BY AN "X" IN UNITS OF µg/m³ LEAD.

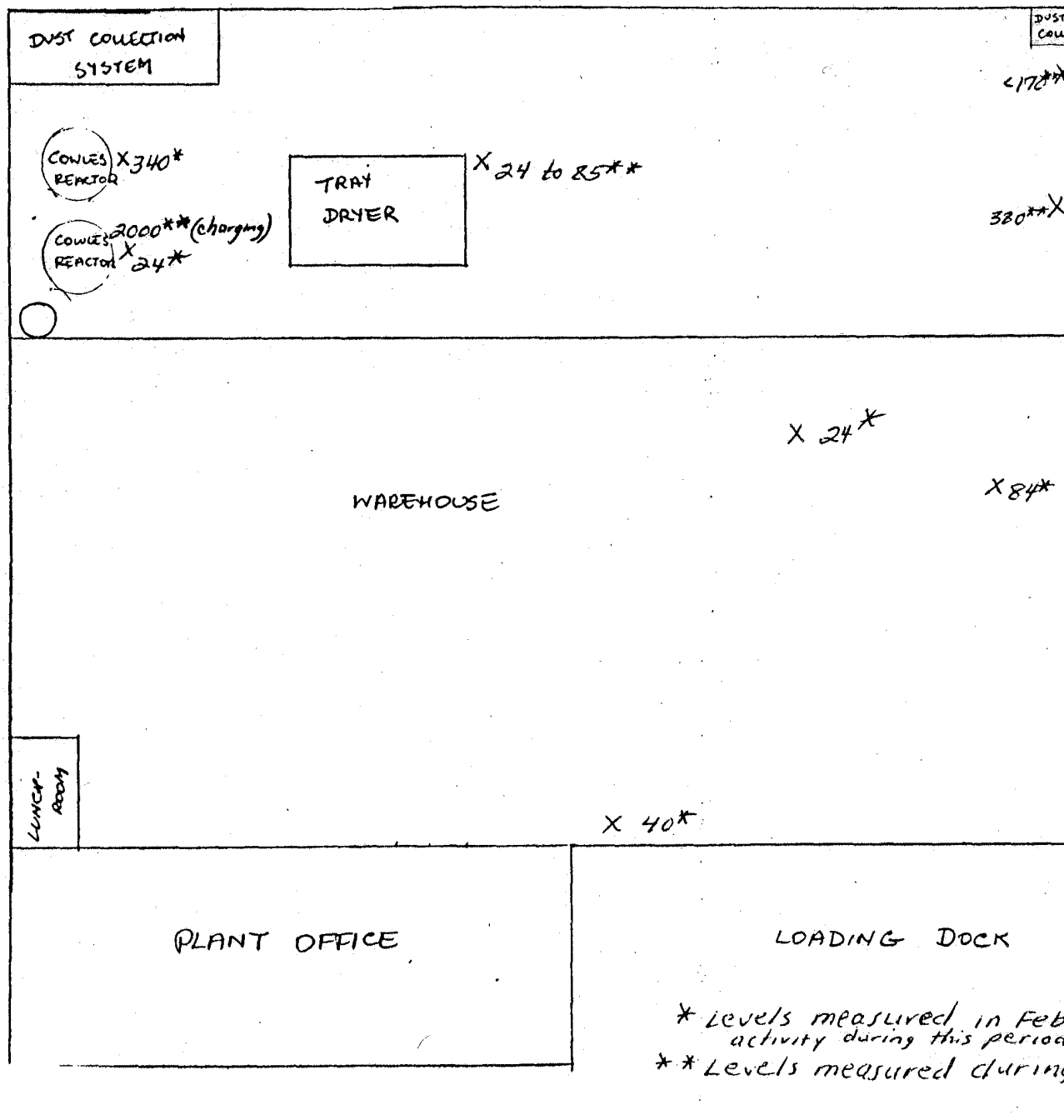


*Levels measured in February, 1980. Locker room level measured during and following clothes changing activities.

**Levels measured in 1976.

***Range of levels measured in 1978 and 1979.

BUILDING 24: AREA SAMPLING RESULTS AT LOCA
BY AN "x" IN UNITS OF µg/m³ LEAD.



* Levels measured in Feb
activity during this period
** Levels measured during

CXMI 3-000797

APPENDIX D

PLANT OPERATIONS INFORMATION

I. Building 19

A. Litharge

1. Process Description:

Pig lead is cut into 15-20 pound pieces and fed into a water-cooled ball mill where partial oxidation occurs. The dross is fed through a series of two kilns, one gas-fired and one oil-fired, in which oxidation to lead monoxide is completed. The litharge is milled and packaged or used further in production.

2. Equipment Used:

Lead cutter
Ball mills (2)
Kilns (2)
Mill
Packers (2)
Dust collectors (5)

3. Ventilation System: Two Northern blowers, two Pangborns and one Micro-Pulsaire dust collector.

4. Manning: One man/shift plus help when required.

5. Job Description - Litharge Operator:

Utilizing the lead cutter, proceeds to cut pig lead into approximately five pieces and moves the pig lead to the ball mill charging area using a lift truck. Feeds pig lead to the ball mill at the prescribed rate maintaining proper process controls.

drum mill elevator

Allows the ball mill discharge (dross) to be charged through screw conveyors to the two kilns maintaining proper process controls by visual observations and chemical tests. Allows the material to be completely oxidized and transfers via screw conveyors and elevators to storage bins.

Mills the product for further processing or packaging.

B. Lead Carbonate

1. Process Description:

Litharge is slurried in water and carbonated with carbon dioxide. The slurry is dried on a steam-heated double drum dryer, milled, and packaged or used in carbonate blends.

2. Equipment Used:

Carbonators (2)
CO^2 storage tank
Drum dryer
Mill Packer
Dust collector

3. Ventilation System: One Northern blower dust collector.

4. Manning: Two men/shift.

5. Job Descriptions:

a. Process Operator - Lead Carbonates, Sulfates, Phthalates, and Phosphites

Weighs and charges materials to the reactor performing various tests to assure the process is under control and completed.

Transfers the completed reaction slurry to a dryer hold tank and performs the drying operations which are required. Uses a belt dryer, double drum dryer or a tray dryer depending on which process is being run.

Maintains plant housekeeping standards.

b. Blender-Packer

Performs packing of product, as assigned, at any packing station in the plant. Stencils proper I.D. on paper bag, places same on an auger packer and fills to 50 pounds. Checks and adjusts weight as necessary and stacks bags on a pallet. Moves the filled pallets to the warehouse using a rider lift truck.

Samples the packed product as required.

C. Major Sources of Lead Contamination in Building 19

1. Milling Process

2. Kilns

3. Drumming & bagging stations (litharge)

4. Transfer of material between processing stations.

5. Litharge charging to carbonate units.

6. Carbonate drum dryer: slurry dries on the floor leaving lead residue.

7. Carbonate bag packaging unit.

II. Building 20 and 20A

A. Proctor & Schwartz Unit - Lead Phthalate and Lead Sulfate

1. Process Description:

Lead Phthalate

Litharge is slurried in water in a ribbon blender and reacted with phthalic anhydride which is pre-slurried in water before charged. The product slurry is dried in a continous belt dryer, milled, conveyed to a blender, and packaged.

Lead Sulfate

Litharge is slurried in water in a ribbon blender and reacted with sulfuric acid to make either the monobasic or the tribasic lead sulfate. Phthalic anhydride is included in the case of the sulfophthalate. The product slurry is dried in a continuous belt dryer, milled and packaged or transferred to the blender.

2. Equipment Used:

Ribbon mixers (2)
Dryer
Mill
Packer
Dust collectors (3)

3. Ventilation System: Consists of one Northern Blower and two Micro-Pulsaire dust collectors.

4. Manning: Two men/shift.

5. Job Description - Blender-Packer:

Performs packing of product, as assigned, at any packing station in the plant. Stencils proper I.D. on paper bag, places same on an auger packer and fills to 50 pounds. Checks and adjusts weight as necessary and stacks bags on a pallet. Moves the filled pallets to the warehouse using a rider lift truck.

Samples the packed product as required.

C. Major Sources of Lead Contamination in Buildings 20 and 20A

1. Charging to the ribbon blender
2. Mixing of phthalate or sulfate
3. Transfer to dryer
4. Drying
5. Milling

} phthalate or sulphate

6. Bagging
7. Tray dumping
8. Milling
9. Bagging

} phosphate

III. Building 24

A. Cowles Unit - Lead Phosphite

1. Process Description

Litharge is slurried in water in a Cowles reactor and reacted with phosphorous acid to make dibasic lead phosphite. The slurry is fed directly to dryer pans. These products are dried in a tray dryer, milled and packaged.

2. Equipment Used:

Cowles reactor
Dryer
Mill
Packer
Dust collector

3. Ventilation System: Micro-Pulsaire dust collector.

4. Manning: One-two men/shift.

B. Major Sources of Lead Contamination in Building 24

1. Materials handling to Cowles
2. Tray filling: material becomes a source of dust after it dries.

3. Drying

4. Tray handling

5. Blending

6. Bagging

IV. Building 24 - Warehouse

A. Description of Operations:

Storage and transfer of bagged material.

B. Sources of Lead Contamination:

1. Movement of bags and pallets

2. Fork lift movement

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CONTROL RECOMMENDATIONS

Recommendations for reducing lead dust emissions and protecting workers against hazardous airborne lead levels are presented in Appendix A. Recommendations are listed by building and process in order of source significance on the basis of a source priority rating. This rating was calculated as follows:

Priority Rating = C x P x T

Where C = average lead dust concentration associated with the given source (mg/m^3)

P = average number of persons exposed to the source

T = average number of hours (per 24 hours) of dust generation

For several processes more than one alternative recommendation is submitted. These are listed numerically in order of effectiveness in reducing or eliminating dust sources.

Supplementary information in the form of process descriptions, equipment lists, existing controls and job descriptions, is included in Appendix D.

GENERAL PLANT RECOMMENDATIONS

General control recommendations applying to the plant as a whole rather than specific processes are listed below:

1. Transfer all lead compounds in sealed containers. Special equipment may be required.

2. Consider enclosing major dust sources and/or providing clean rooms or clean areas for employees to occupy when stationary. This is especially important in light of the fact that the current regulatory [redacted] calls for use of [redacted] for a maximum of [redacted] hours per [redacted] two years.

3. Efforts to keep surfaces free of dust should be expanded to include pipes, window ledges, equipment and other dust laden surfaces.

4. Consider methods to prevent the release of lead products from bags during handling (e.g., shrink wrap, vacuum after filling).

5. Continue air sampling at regular intervals in the lab, warehouse and office to determine which of these areas are adequate for placing employees who may be removed from lead exposure due to high blood-lead levels.

PERSONAL HYGIENE AND GENERAL EMPLOYEE PROTECTION CONTROLS

Although the major intent of this study was the development of workplace control recommendations aimed at reducing airborne lead levels in the Chicago plant, some observations of personal hygiene and employee protection practices were made. These practices, of course, have a major impact on the blood-lead levels and health of exposed employees. For this reason, efforts to upgrade and maintain controls in this area are of prime importance. The following recommendations are submitted for consideration:

1. Continue efforts to improve respiratory protection. The MSA forced air respirator shows promise as the manufacturer reports recent improvements. Its evaluation is ongoing and final recommendations will be forthcoming.

2. Provide disposable suits and shoe covers for maintenance activities.

3. Improve showering facilities and practices.

   a. Investigation into the use of an air shower exhaust prior to locker room entry is recommended. These units, currently used by the Ford Motor Corporation, may be used in lieu of vacuums and would reduce the airborne lead levels in the locker room during change periods (greater than 100 ug/m^3). An improved general ventilation system in this area is also recommended.

   b. The use of both sides of the existing shower to provide both a clean and dirty locker room is recommended.

   c. Provide an adequate supply of warm water for the shower facility to promote compliance with showering requirements.

4. Assure that adequate storage facilities are provided for all types of respirators: half-masks, full masks, and air supplied units.

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APPENDIX A

RECOMMENDATIONS FOR THE PREVENTION AND CONTROL OF AIRBORNE LEAD

CHICAGO PLANT

RECOMMENDATIONS FOR THE PREVENTION AND CONTROL OF AIRBORNE LEAD

CHICAGO PLANT

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 19:				
Kiln Charging	170	1. Provide automatic conveying system to eliminate rodding operation.	-	-
		2. Tighten seals on south door of kiln	-	Provide air supplied hood to operator performing rodding
		NOTE: Alternative 2 will not significantly reduce the overall dust levels in the building.		
Knot Removal	140	1. Upgrade local exhaust ventilation to assure 4500 fpm transport velocity. Replace Pangborne blower units and increase duct elbow radii to prevent accumulation within ducts. Provide enclosed knot transfer system (Kiln to Ball Mill).	-	-
		2. -	Tightly cover transfer container.	-

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 19: (continued)				
Litharge Transfer System	130	1. Fully enclose and seal the litharge conveying system (includes floor conveyor and elevator to storage bin). Upgrade ventilation system to assure transport velocity of 4500 fpm and prevent litharge accumulation.	-	-
Dust Collectors-removal and recharging of collected materials	110	1. Provide enclosed conveying system.	-	-
		2. Install exhaust ventilation at each discharge point and the charging station. Transfer material in closed containers.	-	Provide air supplied respirator to person performing malterial removing operation.
Ball Mills	100	1. Replace the ball mills with new units. Charge and discharge points should be fully enclosed.	-	-
		2. Improve current equipment a. Enclose the mill. b. Improve fines removal ventilation.	-	-

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 19: (Ball Mills continued)		c. Upgrade ventilation system to assure transport velocity of 4500 fpm and prevent lead accumulation.		
Carbonate Dryer	70	1. Fully enclose and ventilate dryer. Contain overflow deposites below dryer.	-	-
Carbonate Material Transfer and Milling	50	1. Tightly enclose conveying system (elevator).	-	-
Litharge Bagging and Drumming	13	1. Enclose and exhaust entire operation including bag stacking. Improve enclosure and ventilation of drum station.	-	-
		2. -	-	Provide air supplied hood to bagger.
Holding Tank Discharge	9	1. Modify conveying system and remove existing holding tank.	-	-
Carbonate Bagging	5	1. Enclose and exhaust entire operation including bag stacking.	-	-

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 19: (Carbonate Bagging continued)				
		2. -	-	Provide air supplied hood to bagger.
Carbonate Reactors Charging	2.5	1. Provide enclosed system.	-	-
		2. -	-	Provide air supplied hood to operator.
Building 20:				
P&S Dryer	145	1. Provide exhaust ventilation assuring negative pressure within the dryer and ensure containment of material deposited on floor below dryer belt.	-	-
		2. Enclose the dryer and provide exhaust ventilation. Ensure containment of material deposited on floor below dryer belt.		
		3. Provide partial enclosure of dry end and exhaust at face velocity of 150 to 200 fpm.		

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 20: (P&S Dryer continued)				
		4. -	-	Provide clean air room and air supplied hood.
Ribbon Blender	135	1. Install new ribbon blender, tightly covered and vented. Install enclosed litharge charging system.	-	-
		2. -	-	Provide air supplied hood to operator.
Dryer Charging	90	1. Modify slurry holding tank and wheel box to prevent spillage. Provide containment of material falling to floor. Enclose the wet end of dryer and ventilate.	-	-
		2. -	-	Provide clean air room.
Milling and Bagging	5	1. Enclose and exhaust entire bagging operation including bag stacking.	-	-
		2. -	-	Provide air supplied hood to bagger.

Location/Process	Priority Rating	Control Recommendations		
		Engineering	Administrative	Employee Protection
Building 20: (continued)				
Tray Dumping and Bagging	1.4	1. Fully enclose and ventilate tray cart. Improve ventilation at the bag station. Include modification of enclosures around charging hopper and bagging point.	-	-
		2. -	-	Provide air supplied hood to operator.
Building 24:				
Cowles Reactor Charging	3.0	1. Install enclosed litharge charging system.	-	-
		2. -	-	Provide air supplied hood to operator.
Slurry Transfer and Drying	1.8	1. Exhaust dryer air providing negative pressure.	Prevent overflow of trays.	-
Holding Tanks and Bagging Station	1.2	1. Enclose and exhaust entire bagging operation including bag stacking.	-	-
		2. -	-	Provide air supplied hood to bagger.

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APPENDIX B

PERSONAL AIR SAMPLING RESULTS SUMMARY