PLAINTIFF'S EXHIBIT

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ZURICH
SERVICES CORPORATION

RISK ENGINEERING

May 8, 1996

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Lori Yeager
Corporate Government Regulatory Manager
Hill and Griffith Company
3637 Farnsworth Avenue
Indianapolis, IN 46241

RE: **INDUSTRIAL HYGIENE SURVEY**
APRIL 10, 1996

Dear Ms. Yeager:

This letter will serve as a review of the results of the recent industrial hygiene survey at your plant. The survey focused on dust exposures in the Core and Mixing Rooms, on formaldehyde and sulfur dioxide (SO2) exposures in the Core Room and on noise exposures in the Core Room, Maintenance and Mixing Room areas. Hearing conservation and respiratory protection activities were reviewed. Thank you for your interest in the health and safety of your employees and for your assistance during the survey.

Data generated during the survey are shown in Tables I-II included in the Appendix. A summary of results begins on Page 3 in the Conclusions section.

DISCUSSION OF FINDINGS

Air Sampling Results

Air sampling was conducted in the following areas:

Area	Contaminant Evaluated
Core Room	Respirable dust, silica-quartz, silica-cristobalite, formaldehyde, sulfur dioxide
Mixing Room	Total dust

Contaminant concentrations were generally below established exposure guidelines, the ACGIH Threshold Limit Value (TLV) and the OSHA Permissible Exposure Limit (PEL). Personal breathing zone air monitoring was conducted. The employees monitored in the Core Room were operating warm box, large shell, SO2 isoset, strainer core, sand mixing and oil

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sand machines. The employees monitored in the Mixing Room operated the little Ford and disperser mixers. The results and the corresponding TLV/PEL are shown in Table I.

The areas of exception are noted below:

Core Room/Sand Mixing

The silica-quartz concentration noted for the employee operating the Sand Mixer in the Core Room was 0.41 mg/m^3, which is above the ACGIH TLV of 0.1 mg/m^3 and OSHA PEL of 0.2 mg/m^3. The sand at this point in the operation is dry. Improved local exhaust ventilation or other engineering controls to reduce the silica exposure are needed. The operations should be closely analyzed to develop a long term plan to eliminate employee exposures. In the interim, proper respirators, which protect against particulates, should be worn while working in this area.

Core Room/Warm Box Machine

The formaldehyde concentration noted for the warm box machine operator in the Core Room was 0.25 ppm, which is slightly less than the ACGIH Ceiling limit of 0.3 ppm and below the OSHA PEL of 0.75 ppm. A ceiling limit is a concentration level which should never be exceeded. In order to be exposed to an average level approaching the ceiling limit, the employee is most likely exposed to a concentration of formaldehyde above the ceiling limit periodically. Local exhaust ventilation in the area is needed while moving product in and out of the machine. The operation should be closely analyzed to develop a long term plan to eliminate employee exposures. In the interim, proper respirators, which protect against formaldehyde, should be worn during this operation. Additional information on ventilation systems is included in the Appendix.

Sound Level Measurements

Three employees in the Core Room, operating a warm box machine, a strainer core machine, and a large shell machine/oil sand, one employee in the Maintenance area, and three employees in the Mixing Room area, operating an air motor and conducting liquid parting operations, were chosen for personal audio dosimetry to determine their average noise exposure. The levels noted ranged from 82.2 - 96.3 dBA. The highest level was noted for the strainer core machine operator. Three employees were exposed to an average noise level equal to or exceeding the OSHA AL of 85 dBA. Two employees were exposed to an average noise level exceeding the OSHA PEL of 90 dBA. Use of hearing protection is required in the Core Room. The warm box machine operator in the Core Room indicated that normally two more machines are operating in the area, so the noise levels are expected to be greater on a normal production day. Audio dosimetry results are shown in Table II in the Appendix.

The eight hour allowable noise exposure established by OSHA is 90 dBA. Employee exposures above 90 dBA require reduction by the implementation of engineering controls or by the use of hearing protection. Exposures over the OSHA action level of 85 dBA require the development and implementation of a hearing conservation program. A hearing conservation program consists of a written program, annual training, annual audiograms, notification of test results, and the availability of a variety of hearing protection.

Employees in the Core Room area were exposed to average noise levels greater than 90 dBA. Noise levels may be reduced by engineering controls. Mandatory use of hearing protection should continue unless noise levels are reduced below 90 dBA. The levels may be reduced by improved maintenance, mufflers, upgrading the damping mounts on machinery, enclosures, lining the metal chutes with sound damping material or by replacing older, noisier equipment with new, quieter equipment when needed. Machines with broken parts, loose bolts or out of adjustment can produce higher noise levels. Proper lubrication of equipment can also help reduce noise levels. Ongoing preventive maintenance can identify machines needing repair. When equipment needs to be replaced, the manufacturers of replacement equipment should be required to provide information on the noise levels produced by their equipment. Selecting the quieter equipment will eliminate noisier equipment being brought into the plant.

Program Review

Hearing conservation and respiratory protection activities were discussed. The respiratory protection program includes a written program, training, employee physicals and fit-testing. Records should be kept of the training. Mixing Room operators wear half mask respirators with HEPA cartridges. The hearing conservation program is complete. A variety of hearing protection is provided and wearing hearing protection is mandatory in the Core Room area. Audiometric exams are given annually and employees are notified of the results. Annual training is conducted on the effects of noise on hearing and on the proper wearing of hearing protection. Hearing conservation activities are documented into a written program. A written program ensures follow through over time. A 25 dB or greater threshold shift is now recordable on the OSHA 200 Injury and Illness log.

CONCLUSIONS

High levels of silica noted in the sampling during sand mixing operations and high levels of formaldehyde noted in the sampling during warm box machine operations, both in the Core Room, require further engineering or other controls to reduce employee exposures.

All other contaminant levels noted in the air sampling are below their recommended guidelines.

Noise exposure monitoring indicates the need to continue your hearing conservation program for employees working in the Core Room and Mixing Room areas.

Noise exposures exceeding the OSHA PEL of 90 dBA were noted in the Core Room. Mandatory wearing of hearing protection should continue in this area until noise exposures are lowered.

The hearing conservation and respiratory protection programs are well organized and complete.

RECOMMENDATIONS

96-A Reduce employee exposures to silica in the Core Room during sand mixing operations and to formaldehyde in the Core Room during warm box machine operations. Consider the following options in your plan to reduce exposures:

- o Improved local exhaust ventilation.
- o Change work practices, reduce the amount of dust generated during mixing operations.
- o The use of approved respirators. A respiratory protection program includes medical examinations, written operating procedures, training, fit-testing, cleaning, storage, and selection. Information on respiratory protection programs is included in the Appendix.

96-B Continue to include employees in the Mixing and Core Rooms in your hearing conservation program. Mandatory use of hearing protection should continue for employees in the Core Room.

I hope that the observations in this report will assist in your program for employee safety and health. Employees should be informed of the results of the air sampling and audio dosimetry.

I will be contacting you to discuss your plans to address these recommendations and to offer assistance with implementation. At your convenience, I would appreciate verbal or written documentation regarding your progress on addressing these issues. Please call me at 708/605-6478 if you have any questions on the report, recommendations or if I can be of further assistance in any safety and health matter.

Sincerely,

Janice Turner

Janice Turner, CIH
Industrial Hygienist
Risk Engineering

cc: Diann Meneilly-Moore - Indianapolis C.I.

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APPENDIX

Purpose, Standards and Methods
Equipment Used During the Survey
Hearing Conservation Program Technical Topic
Respiratory Protection Program Technical Topic
Ventilation Design Information
Ventilation System Maintenance Programs Tech Topic

PURPOSE

The purpose of the survey was to evaluate the work environment for potential health hazards associated with various employee exposures. Manufacturing processes, procedures and materials were reviewed and evaluated in terms of employee exposure to chemical and/or physical factors. Where appropriate, environmental monitoring was conducted so as to represent employee exposures. Whenever possible, methods of sampling and analysis were designed to conform with the methods recommended by the National Institute for Occupational Safety and Health (NIOSH). All chemical samples were analyzed by NATLSCO laboratory accredited through the American Industrial Hygiene Association.

STANDARDS

The standards of the Occupational Safety and Health Administration (OSHA) and/or guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH) were used as a basis for evaluating the results of environmental sampling data. Some caution must be exercised in the interpretation of these standards, however. Threshold Limit Values (TLV) refer to concentrations of airborne substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day, without adverse effects. Due to individual variation and susceptibility, some workers may experience discomfort or aggravation of preexisting conditions at exposure concentrations at or below the threshold limit. The TLV should be used as a guide in the control of health hazards and should not be used to strictly differentiate between safe and dangerous concentrations.

The sampling data presented in this report represent full and partial period samples. It should be noted that daily variation in employee work practices, production levels, machine operations, and seasonal factors may individually or in combination alter employee exposure parameters as well as sampling data. It is believed that the data developed during this survey are fairly representative of typical conditions.

METHODS

AIR SAMPLING

Air Samples were collected using Gilian Models Gilair SRMF Constant Flow Samplers. Personal breathing zone samples were collected. Periodic pump flow rate checks were completed during the sample period using a rotameter calibrated via bubble meter. A discussion of the specific sampling methods used during the survey will follow.

Formaldehyde

The formaldehyde samples were collected using 3M Model 3721 Formaldehyde Monitors. The samples were then desorbed with toluene and analyzed by gas chromatography using a nitrogen selective detector following OSHA analytical method ID-205.

Dust Containing Silica

The samples for dust containing silica were collected using preweighed PVC filters at a flow rate of 1.7 liters/minute. A 10 mm nylon cyclone was used to collect only respirable dust. The samples were reweighed and then digested in a plasma low temperature asher. The residue was then transferred to a silver membrane filter and the free silica was determined by x-ray diffraction.

Total Dust

The samples for total dust were collected at a flow rate of 2.0 liters/minute using preweighed PVC filters. The filters were re-weighed upon return to the lab to determine the total weight concentration.

Sulfur dioxide

The samples for sulfur dioxide were collected using SO2 filters at a flow rate of 1.0 liters/minute. Once returned to the lab, the filters were analyzed according to NIOSH Method 6004.

SOUND LEVEL MEASUREMENTS

Personnel noise monitoring using DuPont Mark I and Mark II Audio Dosimeters were also completed in several areas. The noise dosimeters integrate noise levels between 80 and 138 dB, with an 80 dB threshold level, 90 dB criterion level and 5 dB exchange rate. Calibration checks on all units were acceptable before and after the survey.

EQUIPMENT USED DURING THE SURVEY

lian Gilair Constant Flow Sampler

Model SR MF

mp No	Serial No
	9739
	9742
	19149
	11374
	11380
	11383

ıPont Audio Dosimeters
ɔdels MK-1, MK-2

ɔsimeter	Serial No
	10686
	10757
	25574
	25407
	24870
2	10447
3	10691

ıPont Acoustical Calibrator, Model AC 1

librator	Serial No
2	01097

TABLE I

Air Sampling Data

SAMPLE NUMBER DATE	DEPARTMENT/ OPERATION	EMPLOYEE MONITORED	SAMPLE PERIOD	AIR CONTAMINANT	CONTAMI-NANT CONCEN-TRATION (PPM)	ACGIH TLV (PPM)	OSHA PEL (PPM)
4537 4/10/96	Core Room/Warm Box Machine	Lester Wessel	6:42-2:10	Formaldehyde	0.25	0.3 C, A2	0.75
5043 4/10/96	Core Room/Large Shell Machine-Oil Sand	Mike Smith	6:50-2:10	Formaldehyde	<0.022	0.3 C, A2	0.75
HG 34 4/17/96	Core Room/SO2 Isoset Machine	Scott Allen	466 minutes	Sulfur dioxide	0.14	2	5

< = Less than. Below the laboratory's detection limit.
C = Ceiling limit - a level which can never be exceeded.
A2 = The substance is considered a suspect human carcinogen by the ACGIH.

TABLE I

Air Sampling Data

SAMPLE NUMBER DATE	DEPARTMENT/ OPERATION	EMPLOYEE MONITORED	SAMPLE PERIOD	AIR CONTAMINANT	CONTAMI-NANT CONCEN-TRATION (MG/M^3)	ACGIH TLV (MG/M^3)	OSHA PEL (MG/M^3)
HG 52 4/10/96	Core Room/Strainer Core Machine	Kevin DePew	6:45-2:15	Respirable dust Silica-Quartz Silica-Cristobalite	0.27 <25 ug <25 ug	3 0.1 0.05	5 NA NA
HG 21 4/10/96	Core Room/Sand Mixing	Kenneth Douglas	6:51-2:18	Respirable dust Silica-Quartz Silica-Cristobalite	0.84 0.41 <25 ug	3 0.1 0.05	5 0.2 NA
HG 24 4/10/96	Core Room/Oil Sand	Tony McFarland	6:53-2:18	Respirable dust Silica-Quartz Silica-Cristobalite	0.32 <25 ug <25 ug	3 0.1 0.05	5 NA NA
HG 53 4/10/96	Mixing Room/Little Ford Mixer	Barry Ragan	7:12-2:10	Total dust	2.7*	10	15
HG 54 4/10/96	Mixing Room/Disperser Mixer	Kevin Norris	7:17-2:21	Total dust	2.8*	10	15

* = Laboratory noted loose particulate. Sample results may be an underestimation.
< = Less than. Below the laboratory's detection limit.
u = Micrograms.
NA = Not applicable. The PEL is calculated based on % silica in the sample. Since silica levels were below the detection limit, a PEL could not be calculated.

TABLE II
AUDIO DOSIMETRY DATA

DOSIMETER NUMBER DATE	DEPARTMENT	EMPLOYEE MONITORED	SAMPLE PERIOD	% EXPOSURE DURING SAMPLE PERIOD	LMAX (dBA) DURING SAMPLE PERIOD	LAVG (dBA) DURING SAMPLE PERIOD
14 4/10/96	Core Room/Warm Box Machine	Lester Wessel	6:42-2:17	76.6	114.2	88.5
M2 4/10/96	Core Room/Strainer Core Machine	Lesley Watson	6:45-2:15	213	121.5	95.9
9 4/10/96	Core Room/Large Shell Machine-Oil Sand	Mike Smith	6:50-2:10	112.3	112.4	91.3
30 4/10/96	Maintenance	Shawn Strader	6:57-1:40	28.4	110.6	82.2
3 4/10/96	Mixing Room/Air Motor	Rodney Gilliatt	7:02-2:29	45.8	121.1	84.9
M8 4/10/96	Mixing Room/Liquid Parting(Tank)	John Wethington	7:09-2:27	35.6	111.3	83.2
32 4/10/96	Mixing Room/Liquid Parting	Damon Bergen	7:14-10:31	29.1	121.7	87.5
M8 4/17/96	Core Room/Strainer Core Machine	Lesley Watson	6:00-2:51	232	128.1	96.3