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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

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HEALTH HAZARD EVALUATION DETERMINATION REPORT 73-84-119
HEAD SKI COMPANY
BOULDER, COLORADO

MARCH 1974

I. TOXICITY DETERMINATION

Based on the results of environmental evaluations conducted by the National Institute for Occupational Safety and Health (NIOSH) on May 2, June 4, 5, and 26, July 2 and 3, and August 16, 1973, it has been determined that all environmental measurements were below established Federal standards. When using this many compounds in any industrial setting, the potential for a toxic exposure always exists. After completing medical questionnaires and personal interviews, both by the Industrial Hygienist and two different NIOSH physicians, it was unanimously concluded that the only hazard was dermatitis due to direct contact with Dow (330) and Epon (815) which are bisphenyl-A type epoxy resins. A dermatitis hazard due to direct contact with epoxy resin was identified in the ski mold department.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- (a) Head Ski Company
- (b) Authorized Representative of Employees
- (c) U.S. Department of Labor - Region VIII
- (d) NIOSH - Region VIII

For the purpose of informing approximately 300 exposed employees, this report shall be posted in a prominent place readily accessible to workers for a period of at least 30 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.

The National Institute for Occupational Safety and Health received such a request from management at Head Ski Company, Boulder, Colorado, to evaluate the potential hazards associated with the alleged exposures to

chemicals that were causing dermatitis in the work place. Management also requested that NIOSH evaluate other areas in the plant where possible harmful exposures might exist.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

This plant manufactures snow skis and tennis rackets. Many processes in the plant are done by hand. The only assembly line process in the plant is in the paint rooms. Materials used throughout the plant include those mentioned above. Workers come into direct contact with many solvents, epoxies, and fiberglass. Adequate personal protection is supplied in each of these areas, but the utilization of these protective measures is not strenuously enforced. Areas investigated during this evaluation determination included the ski and tennis racket paint rooms, final ski inspection area, foam core mold area, tennis racket spray paint area, silk screen paint area, ski mold release and finishing area, tennis racket molding area, ski cleaning and finishing area, and ski mold and wrap area. For a detailed list of chemicals used in each area, and concentrations of these chemicals found in breathing zone samples, refer to the Appendices.

B. Evaluation Design

This plant employs approximately 300 workers operating on three 8-hour shifts. A total of 87 environmental samples were collected, with a total of 357 chemical analyses performed. Direct trichloroethylene and noise measurements were made. All environmental measurements were below established Federal standards and the 1973 TLV. Medical evaluations were performed in these areas. The only positive occupational disease found among the workers was dermatitis. For actual concentrations, refer to the Appendices.

C. Evaluation Methods

All samples, with the exception of trichloroethylene, TDI, and MDI, were taken on organic vapor sampling tubes. Trichloroethylene was measured by a GasTech halide direct reading instrument. TDI and MDI were collected in impingers and analyzed by the Marcali method. Noise levels were taken using a General Radio sound level meter. These measurements may also be found in the Appendices.

D. Evaluation Criteria

The occupational health standards relevant to the substances of this evaluation as promulgated by the U.S. Department of Labor (Federal Register, October 18, 1972) are as follows:

<u>Substance</u>	<u>ppm (8-hour time weighted average)</u>
Ethyl acetate	400
Methyl ethyl ketone (MEK)	200
Methyl cellosolve	25

Cellosolve acetate	---	*
Methylene chloride	500	
Petroleum distillate (naphtha)	500	2,000 mg/M ³
Toluene-2,4-diisocyanate (TDI)	0.02	0.14 mg/M ³
Methylene bisphenyl isocyanate (MDI)... ..	0.02	0.2 mg/M ³
sec-butyl acetate	200	
Styrene	100	
Butyl carbitol	---	*
1,1,1-trichloroethylene	100	

ppm - parts of vapor or gas per million parts of contaminated air by volume

mg/M³ - milligrams of contaminant per cubic meter of air

* - no health standards are available at this time

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 and Discussion

This evaluation was begun on May 2, 1973, and was finished on September 21, 1973. A total of seven days were used for environmental sampling and four days for dermatologic testing and consultation. A total of 87 personal samples were taken in all areas where possible exposures were likely to occur. All environmental samples may be reviewed in the Appendices. A copy of the noise survey is also available in the Appendices. The Head Ski Company is actively implementing a hearing conservation program. Bulk samples were forwarded to the Salt Lake City laboratory for analyses of the epoxy compounds. These compounds were analyzed for epichlorohydrin, which is a major raw material used in epoxy resins and because of its high toxicity and skin irritant properties. No trace of this chemical was found in either the bulk or any of the personal samples.

F. Medical Results and Discussion

Background and Preliminary Investigation: During preliminary investigations by NIOSH personnel, it was determined that a significant dermatitis problem existed in this facility. Because of the wide variety of chemicals found in the work place, it was decided, following telephone consultation, that patch testing would ultimately be required to determine (1) whether allergic sensitization was responsible for the dermatitis and (2) which substance or substances were responsible. As a prelude, it was essential to determine the skin primary irritation index of each material used in the work place so that appropriate non-irritating concentrations could be prepared for utilization in patch testing. Samples of twelve suspected resins and plastic system materials were forwarded by the Safety Engineer, Head Ski Company, per instructions of Region VIII Industrial Hygienist, to the Toxicology Branch, Division of Laboratories and Criteria Development, NIOSH. Because of known skin irritation properties of fiberglass, this material was not subjected to patch testing. Skin irritation indices were determined for each substance by applying concentrations of 100%, 50%, 25%, 10%, 1%, and 0.1%

to separate intact and abraded skin areas on each of six male albino rabbits. Each animal and site was examined--both 24 and 48 hours after application. Positive responses were graded on a 1 to 4 scale (mild irritant to corrosive) and the highest concentration failing to produce mild irritation in a majority of animals (irritation index) determined. These tests were carried out by a NIOSH Research Industrial Hygienist, Toxicology Branch, Division of Laboratories and Criteria Development, and the results were as follows:

<u>Material</u>	<u>Solvent</u>	<u>Primary Irritation Index</u>	
		<u>Intact Skin</u>	<u>Abraded Skin</u>
Polyamide Resin V-40	Methyl Alcohol	10%	1%
Butyl Carbitol	" "	100%	100%
Epoxy Resin - Epon 815	" "	25%	1%
Polyamide Resin-Ciba 956	" "	10%	1%
Polyol Solution - Urethane Coating	" "	10%	1%
Mold Release	" "	25%	1%
Isocyanate Solution - Urethane Coating	" "	10%	1%
Foam Core Polyol	" "	10%	1%
Silk Screen Ink	" "	25%	10%
Epoxy Resin - Dow 330	Acetone	25%	25%
Paint Stripper	Glycerin	1%	0.05%
Foam Core Isocyanate - Mondur M-R	Methyl Alcohol	25%	25%

Concentrations 50% lower than the irritation index for intact skin were then prepared for patch test use. This extra dilution provides an increased margin of safety by ruling out the occasional human hyperreactor to irritants.

Clinical Investigation: A walk-through visit of the facility was made on September 19, 1973. As a result of this walk-through and consultation with the plant nurse, it was determined that the dermatitis problem was almost exclusively confined to the ski molding area. The suspected substances utilized in this area are as follows:

1. Mold release containing methylene chloride and chlorinated wax
2. Epoxy resin - Dow 330
3. Polyamide resin V-40

A total of twenty employees (17 women and 3 men) with recurrent or extant dermatitis were interviewed by NIOSH physicians. Eight of these individuals were felt to have their dermatitis either primarily on a non-occupational basis or had problems of obvious causation and were thus excluded from patch testing. Diagnoses in this group included psoriasis, perioral dermatitis, primary acute chemical irritation and maceration, pre-existing hand eczema, acne, and mechanical irritation due to fiberglass spicules (2 cases).

The remaining 12 workers had histories and/or physical findings suggestive of occupational contact dermatitis, either of the irritative or allergic variety. Standard patch tests using the above three substances and an appropriate control (diluent) were applied to the mid-back areas of these volunteers. In several instances (two), a second, additional polyamide (Ciba 956) was applied, and in a single instance a second epoxy resin (Epon 815) was applied. Test sites were read 48 hours after application and confirmed with a second reading 24 hours later.

Results: All patch tests to the mold release agent, polyamide resin V-40, and control diluents were negative. The two tests performed with polyamide resin-Ciba 956 were also negative. Six workers had positive tests with epoxy resin-Dow 330, ranging from strong 1+ to 3+ reactions. The single individual who was tested with epoxy resin-Epon 815 had a 2+ reaction to that resin, a not unexpected result, since her test to epoxy resin-Dow 330 was also similarly positive and the various epoxy resins are known to cross react, i.e., sensitivity to one epoxy formulation usually confers sensitivity to other similar formulations.

Volunteers were informed of the patch test results at the time initial readings were made and its significance explained.

Discussion: Epoxy resin systems are capable of producing both primary irritant and allergic contact dermatitis. In most instances patch testing is required to definitely identify the allergic worker. In this instance, 50% of the workers tested were determined to have allergic sensitization to the epoxy (Dow 330) utilized in the ski molding area. While dispensed in a pre-mixed manner, the material is weighed out by the worker prior to manual spatula application to fiberglass cloth and various reinforcing materials. Unfortunately, breaks in technique afford frequent direct skin contact which has been apparently sufficient to sensitize numerous workers. Examination of various characteristics (age, sex, atopic state, etc.) for both sensitized and non-sensitized workers revealed only one major difference, i.e., length of service (exposure) in the ski molding area. Sensitized workers had an average length of service of 17 months compared with 7 months for the non-sensitized. This finding was expected, since repeated exposure is important in initiating sensitization. Thus, the present lack of sensitization in a given individual does not preclude the eventual development of allergy.

Preventive Measures:

1. Skin contact with epoxy resins must be kept to a minimum. This is usually possible if scrupulous attention is paid to proper work practices. Workers must be educated in the hazards associated with these substances if management is to expect compliance with protective clothing and glove use requirements. Foremen and safety personnel must see that everyone complies with recommended work practices at all times.

2. In addition to rubber gloves, long protective sleeves must be worn. Floor length aprons or disposable smocks are essential. High-buttoned collars on shirts and blouses are necessary to protect the upper chest and neck. Rubber gloves should not be worn uninterruptedly unless plain white cotton liner gloves are worn under them. These liner gloves

should be changed at least twice daily to prevent maceration due to accumulated perspiration. Persons with hand dermatitis problems should change their liner gloves even more frequently. Gloves must be cleaned thoroughly before removal from the hands and inspected frequently for defects. Soiled personal clothing must be washed before wearing and fresh smocks and aprons supplied daily.

3. Some spills on the skin are almost inevitable in hand lay-up operations of this type. It is imperative that the epoxy be removed immediately, using copious amounts of mild soap (Dove or Ivory soaps are excellent) and water. Organic solvents should not be used for cleansing. Barrier creams are not recommended, since many are drying and all provide a false sense of security. Even persons with known sensitivity or allergy can usually continue to work with epoxies if skin contamination is promptly removed, since up to several hours of contact are usually required to elicit the dermatitis which becomes clinically apparent several days later. Sensitive individuals should also try to avoid any fumes given off, especially during mixing operations. Such fumes may result in extensive facial dermatitis. Repeated episodes of severe facial or extensive dermatitis dictate a permanent cessation of exposure by transfer to other plant areas.

4. Employees should be encouraged to report every case of dermatitis, no matter how minor, so that prompt medical attention may be received. Early therapy usually can prevent the development of extensive or disabling dermatitis.

5. Persons with suspected allergy to epoxies should not be hired for jobs involving utilization of these substances. Patch testing should be carried out as a pre-employment test in doubtful situations. Atopic individuals need not be eliminated from employment consideration, since they are no more susceptible to sensitization than non-atopics. However, they may be less tolerant to the frequent cleaning, heavy clothing, etc., required in this occupation.

Once employed, persons developing recurrent dermatitis should be patch tested to definitely establish a cause. Reference to the data presented earlier in this report can be referred to in order to determine the proper test concentration and solvent. Sensitized individuals require especially careful reindoctrination regarding work practices to prevent future recurrences and insure that they understand their responsibility in prevention.

G. Recommendations

1. Employees should be informed of the high incidence of dermatitis found among people working with epoxies. However, if handled properly during the ski wrapping process, this can be avoided.

2. The hearing protection devices provided by the management should be worn by those employees in high noise level areas.

3. When new processes are initiated that require new chemicals, these chemicals should be thoroughly researched for their toxic properties prior to incorporating into the system.

HEAD SKI
BOULDER, COLORADO

June 4-5, 1973

Ski and Tennis Racket Paint Rooms

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Ethyl Acetate ppm</u>	<u>Methyl Ethyl Ketone (MEK) ppm</u>	<u>Methyl Cellosolve ppm</u>	<u>Cellosolve Acetate ppm</u>
B.C.	Inspector	10	1	31	21	5	< 5
N.P.	Inspector	10	2	27	6	< 1	< 5
B.C.	Inspector	10	3	95	24	2	< 5
N.P.	Inspector	10	4	65	51	2	< 5
B.W.	Painter	9	5	< 20	< 10	< 1	< 5
J.S.	Painter	8	6	42	328	1	< 5
--	--	--	Blank 7	--	--	--	--
--	--	--	Blank 8	--	--	--	--
B.W.	Coater	8	9	< 20	196	< 1	< 5
J.S.	Coater	6	10	70	123	< 1	20
P.O.	Silk Screen	9	11	< 20	28	< 1	< 5
C.B.	Silk Screen	9	12	14	28	< 1	< 5
P.O.	Silk Screen	7	13	< 20	16	< 1	< 5
C.B.	Silk Screen	7	14	< 20	25	< 1	< 5
FEDERAL STANDARDS				400	200	25	--*

* no health standard available at this time

All concentrations reported above were collected on workers except for samples 7 and 8, which were blanks.

APPENDIX 2HEAD SKI
BOULDER, COLORADO

July 2, 1973

Ski Mold and Wrap Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Methyl Ethyl Ketone (MEK) ppm</u>	<u>Naphtha mg/M³</u>	<u>Methyl Cellosolve ppm</u>	<u>Methylene Chloride ppm</u>
S.C.	Molding	19	1	78	791	< 0.8	< 0.6
S.M.	Mixer	19	2	15	169	< 0.8	< 0.6
P.K.	Mold Cleaner	17	3	< 0.3	88	< 0.8	3
N.Y.	Wrapper	16	4	< 0.3	54	< 0.8	3
J.S.	Layout	16	5	< 0.3	141	< 0.8	6
FEDERAL STANDARDS				200	2,000	25	500

All concentrations reported above were collected on workers.

HEAD SKI
BOULDER, COLORADO

June 12, 1973

Final Ski Inspection Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Cellosolve Acetate ppm</u>	<u>Methyl Cellosolve ppm</u>	<u>Naphtha mg/M³</u>
P.M.	Inspector	8	1	< 0.4	< 6	26
B.C.	Inspector	7	2	< 0.4	< 6	27
--	--	--	Blank 3	--	--	--
G.B.	Inspector	9	4	< 0.4	< 6	29
P.B.	Inspector	9	5	< 0.4	< 6	33
B.C.	Inspector	9	6	< 0.4	< 6	43
FEDERAL STANDARDS				---*	25	2,000

* no health standard available at this time

All concentrations reported above were collected on workers except for sample 3, which was a blank.

HEAD SKI
 BOULDER, COLORADO

Foam Core Mold Area

<u>Date</u>	<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>TDI mg/M³</u>	<u>MDI mg/M³</u>
May 29, 1973	A.C.	Molder	34	1	< 0.01	< 0.03
" " "	S.K.	Molder	30	2	< 0.01	< 0.03
June 12, 1973	M.B.	Molder	30	1	0.02	--
" " "	A.C.	Molder	35	2	0.02	--
June 13, 1973	G.K.	Molder	60	8	0.002	--
FEDERAL STANDARDS					0.14	0.2

All concentrations reported above were collected on workers.

HEAD SKI
BOULDER, COLORADO

June 13, 1973

Tennis Racket Spray Paint Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Ethyl Acetate ppm</u>	<u>sec-butyl acetate ppm</u>	<u>Methyl Cellosolve ppm</u>
B.E.	Painter	10	N 1	3	0.4	< 0.8
B.C.	Silk Screen	9	N 2	33	51	< 0.8
F.S.	Silk Screen	10	N 3	4	5	< 0.8
--	--	--	Blank N 4	--	--	--
B.E.	Painter	8	N 5	5	1	< 0.8
F.S.	Silk Screen	7	N 6	5	7	< 0.8
L.C.	Silk Screen	7	N 7	4	5	< 0.8
FEDERAL STANDARDS				400	200	25

N - samples taken on the night shift

All concentrations reported above were collected on workers except for sample N 4, which was a blank.

HEAD SKI
BOULDER, COLORADO

June 4-5, 1973

Silk Screen Paint Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Methyl Ethyl Ketone (MEK) ppm</u>	<u>Styrene ppm</u>	<u>Methylene Chloride ppm</u>
--	--	--	Blank 15	--	--	--
T.M.	Degreaser	9	16	55	N/D	N/D
D.R.	Degreaser	9	17	52	N/D	N/D
D.R.	Degreaser	10	18	N/D	N/D	N/D
B.G.	Industrial Hygienist	10	19	N/D	N/D	N/D
FEDERAL STANDARDS				200	100	500

N/D - none detected

All concentrations reported above were collected on workers except for sample 15, which was a blank.

HEAD SKI
BOULDER, COLORADO

June 4-5, 1973

Ski Mold Release & Finishing Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Methylene Chloride ppm</u>	<u>Naphtha mg/M³</u>	<u>Cellosolve Acetate ppm</u>	<u>Butyl Carbitol ppm</u>
M.S.	Ski Mold Release	10	27	< 1	< 1	< 1	< 1
E.M.	Ski Mold Release	10	28	< 1	< 1	< 1	< 1
M.S.	Ski Mold Release	8	29	< 1	< 1	< 1	< 1
E.M.	Ski Mold Release	10	30	< 1	< 1	< 1	< 1
FEDERAL STANDARDS				500	2,000	---*	---*

* no health standards available at this time

All concentrations reported above were collected on workers.

HEAD SKI
BOULDER, COLORADO

June 4-5, 1973

Tennis Racket Molding Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>Methylene Chloride ppm</u>	<u>Naphtha mg/M³</u>	<u>Butyl Carbitol ppm</u>	<u>Methyl Cellosolve ppm</u>
J.S.	Molder	8	20	< 1	< 1	1	3
A.A.	Molder	8	21	< 1	< 1	< 1	3
S.K.	Molder	9	22	< 1	< 1	< 1	3
J.S.	Molder	8	23	< 1	< 1	< 1	3
A.A.	Molder	8	24	< 1	< 1	< 1	2
S.K.	Molder	9	25	< 1	< 1	< 1	2
T.M.	Mold Cleaner	10	26	36	1	< 1	< 1
FEDERAL STANDARDS				500	2,000	---*	25

* no health standard available at this time

All concentrations reported above were collected on workers.

HEAD SKI
BOULDER, COLORADO

June 12, 1973

Ski Cleaning & Finishing Area

<u>Worker</u>	<u>Job</u>	<u>Sample Volume liters</u>	<u>Sample Number</u>	<u>sec-butyl acetate ppm</u>	<u>Ethyl Acetate ppm</u>	<u>Naphtha mg/M³</u>
R.C.	Clean and Wax	12	20	< 1	11	950
M.L.	Clean and Wax	11	21	< 1	4	701
D.G.	Painter	11	22	< 1	4	602
FEDERAL STANDARDS				200	400	2,000

All concentrations reported above were collected on workers.

HEAD SKI
BOULDER, COLORADO

June 13, 1973

Ski Mold & Wrap Area

Worker	Job	Sample Volume liters	Sample Number	Methylene Chloride ppm	1,1,1-Trichloro- ethylene ppm	Naptha mg/M ³	Ethyl Acetate ppm
W.S.	Wrapper	9	7	0.3	0.4	< 6	*
C.K.	Wrapper	9	8	0.2	0.8	< 6	*
V.P.	Wrapper	10	9	0.2	0.8	< 6	*
K.E.	Wrapper	9	10	0.2	0.7	< 6	*
C.K.	Wrapper	9	11	0.4	0.7	< 6	*
V.P.	Wrapper	11	12	0.1	0.9	< 6	*
C.S.	Epoxy Weigher	8	13	< 0.5	34	*	*
E.S.	Lead Man	10	14	< 0.5	19	*	*
C.S.	Epoxy Weigher	8	15	< 0.5	21	*	*
D.Y.	Molder	11	16	1.1	27	*	*
J.F.	Molder	12	17	1.3	23	*	*
E.M.	Mold Cleaner	10	18	0.6	46	*	*
V.B.	Wrapper	8	19	0.8	26	*	*
C.C.	Scraper	13	N 21	1	7	*	< 2
G.S.	Scraper	11	N 22	3	12	*	< 2
D.D.	Scraper	9	N 23	3	12	*	< 2
M.K.	Epoxy Weigher	6	N 24	7	0.5	*	< 2
J.S.	Epoxy Mixer	8	N 25	2	0.5	*	< 2
J.B.	Mold Cleaner	9	N 26	1	0.4	*	< 2
J.P.	Wrapper	9	N 9	3	6	*	*
C.G.	Wrapper	12	N 10	2	10	*	*
J.P.	Wrapper	9	N 11	2	3	*	*
C.G.	Wrapper	10	N 12	4	6	*	*
K.G.	Wrapper	10	N 13	6	10	*	*
M.M.	Wrapper	10	N 14	4	16	*	*
B.V.	Wrapper	9	15	3	8	*	*
K.G.	Wrapper	11	16	3	9	*	*
M.M.	Wrapper	12	17	< 0.5	44	*	*
C.T.	Wrapper	10	18	3	9	*	*
J.H.	Scraper	7	19	3	7	*	*
M.M.	Scraper	9	20	2	7	*	*
FEDERAL STANDARDS				500	100	2,000	400

* these chemicals were not analyzed

N - samples taken on the night shift

All concentrations reported above were collected on workers.

APPENDIX 11HEAD SKI
BOULDER, COLORADOSound Level Measurements
(Second Shift - June 13, 1973)

<u>Tennis Mold Area</u> <u>Operation</u>	<u>Noise Level (dBA)</u>
Mold opening	94-96
Mold cleaning	88
Mold packing	88
Mold closing	96-98
Mold mixing	88, 96
 <u>Tennis Grinding Area</u> <u>Operation</u>	 <u>Noise Level (dBA)</u>
Grinding	86
Router	108
Throat sanding	88, 95
String grooving	98
Drilling machine (a)	90
Drilling machine (b)	86
Bevel	88
Scratch brush	90
 <u>Ski Finishing Area</u> <u>Operation</u>	 <u>Noise Level (dBA)</u>
Rough grind	94
Bevel grind	99
Second wet bottom grind	88, 92
First wet bottom grind	88, 92
Rough bottom grind	98-101
Vonneguit #240 grind	101
Buff steel	95
Top sanding	90, 92
Finish bottom grind	88
First wet top grind	88

APPENDIX 11 (continued)

<u>Ski Detail Area</u> <u>Operation</u>	<u>Noise Level (dBA)</u>
Wigo mill	94
Foam core (guide)	92
Foam core (foamer)	94
Side Shape	102
Router	92
Sand blast	88
Hand sand blaster	86
Grinding (still assemblies)	89
Sand blast (rails and small parts)	94

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