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Table 2-3
Work Injuries and Illnesses
By Source of Injury or Illness
Alaska 1982
(continued)

SDS Code	Source of Injury or Illness	Number of Cases	Percent
1200	Cold (Atmospheric, Environmental)	54	.5
	Conveyors	31	.3
1300	Conveyors, Uns.	4	.0
1301	Gravity	2	.0
1350	Powered	25	.2
	Drugs & Medicine	1	.0
1490	Other Medicines	1	.0
	Electric Apparatus	94	.9
1500	Electric Aparatus, Uns.	2	.0
1501	Motors	15	.1
1505	Generators	19	.2
1510	Transformers, Converters	8	.1
1515	Conductors	4	.0
1520	Switches, Fuses, etc.	8	.1
1530	Rheostats, Starters, Etc.	15	.1
1540	Magnetic Apparatus	1	.0
1599	Electrical Apparatus, Nec	22	.2
1700	Flame, Fire, Smoke	41	.4
	Food Products	166	1.6
1800	Food Products, Uns.	6	.1
1810	Fruits	2	.0
1820	Grains	6	.1
1840	Meats	115	1.1
1870	Vegetables	28	.3
1890	Food Products, Nec	9	.1
	Furniture, Fixtures, Etc.	326	3.2
1900	Furniture, etc., Uns.	4	.0
1901	Cabinets, Etc.	36	.4
1910	Chairs, Etc.	31	.3
1920	Counters, Etc.	7	.1
1930	Desks	26	.3
1950	Floor Coverings	14	.1
1960	Lighting Equipment	6	.1
1970	Tables	42	.4
1999	Furniture, Nec	160	1.6
2000	Glass Items, Nec	74	.7
	Hand Tools, Not PWD	578	5.7
2200	Hand Tools, Not Pwd. Uns.	9	.1
2201	Axe	5	.0
2205	Blow Torch	1	.0
2210	Chisel	1	.0
2215	Crowbar	36	.4
2220	File	2	.2
2230	Hammer	83	.8
2235	Hatchet	1	.0
2240	Hoe	1	.0
2245	Knife	154	1.5
2250	Pick	5	.0
2260	Pliers, Tongs	5	.0
2270	Rope, Chain	86	.8
2280	Scissors	3	.0
2285	Screwdriver	5	.0
2290	Shovel	50	.5
2295	Wrench	50	.5
2299	Hand Tools, Not Pwd, Nec	81	.8
	Hand Tools, PWD	214	2.1
2301	Grinder	10	.1
2305	Buffer, Etc.	5	.0
2315	Drill	28	.3
2320	Hammer	13	.1
2335	Powder Actuated	2	.0
2345	Riveter	2	.0
2355	Saw	120	1.2
2370	Welding Tools	4	.0
2399	Hand Tools, PWD, Nec	30	.3
2400	Heat, (Atmospheric, Environmental)	1	.0

Table 2-3
Work Injuries and Illnesses
By Source of Injury or Illness
Alaska 1982
(continued)

SDS Code	Source of Injury or Illness	Number of Cases	Percent
2500	Heating Equipment, Nec	42	.4
	Hoisting Apparatus	121	1.2
2600	Hoisting Apparatus, Uns.	5	.0
2610	Cranes, Derricks	22	.2
2620	Elevators	12	.1
	Other Hoisting Apparatus	55	.5
2641	Air Hoist	2	.0
2642	Chain Hoist	4	.0
2645	Jacks	49	.5
2699	Hoisting Apparatus, Nec	27	.3
2700	Infectious, Parasitic Agents, Nec	28	.3
	Ladders	45	.4
2800	Ladders, Uns	21	.2
2810	Fixed	2	.0
	Movable	21	.2
2830	Movable, Uns	7	.1
2831	Extension	11	.1
2833	Step Ladders	3	.0
2899	Ladders, Nec	1	.0
	Liquids, Nec	84	.8
2910	Water	61	.6
2999	Other Liquids, Nec	23	.2
	Machines	414	4.1
3000	Machines, Uns.	7	.1
3001	Agitators, Mixers	20	.2
3050	Agricultural Machines, Nec	1	.0
3100	Buffers, Polishers, Etc.	17	.2
3150	Casting, Forging, Welding	4	.0
3200	Crushing, Pulverizing	10	.1
3250	Drilling, Boring	34	.3
3300	Highway Construction	105	1.0
3400	Office	29	.3
3[illegible]0	Packaging, Wrapping	6	.1
3550	Planers, Shapers, Molders	2	.0
3600	Presses, (Not Printing)	8	.1
3650	Printing	3	.0
3700	Rolls	2	.0
3750	Saws	47	.5
3850	Shears, Slitters, Slicers	39	.4
3999	Machines, Nec	80	.8
	Mechanical Power Transmission Apparatus	18	.2
4020	Chains, Ropes, Cables	14	.1
4030	Drums, Pulleys, Sheaves	2	.0
4099	Mechanical Power Transmission Apparatus, Nec	2	.0
	Metal Items	971	9.6
4100	Metal Items, Uns	21	.2
4110	Automobile Parts	67	.7
4115	Beams, Bars	79	.8
4120	Bullets	8	.1
4135	Nails, Spikes, Etc.	62	.6
4140	Pipe	215	2.1
4145	Screws, Nuts, Bolts	9	.1
4199	Metal Items, Nec.	510	5.0
4200	Mineral Items, Metallic, Nec	2	.0
4300	Mineral Items, Nonmetallic, Ner	135	1.3
4400	Noise	3	.0
4500	Paper and Pulp	62	.6
4600	Particles (Unidentified)	62	.6
4700	Plants, Trees, Vegetation	30	.4
4800	Plastic Items, Nec	7	.1
	Pumps and Prime Movers	60	.6
4900	Pumps and Prime Movers, Uns	1	.0
4910	Engines	26	.3
4930	Pumps	32	.3
4950	Turbines	1	.0

Table 2-3
Work Injuries and Illnesses
By Source of Injury or Illness
Alaska 1982
(continued)

SOS Code	Source of Injury or Illness	Number of Cases	Percent
	Radiating Substances and Equipment	35	.3
5000	Radiating Substances and Equipment, Uns	1	.0
5050	Sun	2	.0
5060	Ultraviolet Equipment	1	.0
5070	Welding Equipment	31	.3
5100	Soaps, Detergents, Etc., Nec	29	.3
5300	Scrap, Debris, Waste Materials, Nec	10	.1
5400	Steam	22	.2
5500	Textile Items, Nec	8	.1
	Vehicles	778	7.7
5600	Vehicles, Uns	2	.0
5610	Aircraft	56	.6
5620	Highway Vehicles, Powered	426	4.2
	Plant or Industrial Vehicles	215	2.1
5630	Plant or Industrial Vehicles, Uns	7	.1
5631	Nonpowered Vehicles	122	1.2
5635	Powered Carriers	81	.8
5638	Power Towing Vehicles	5	.0
5640	Rail Vehicles	8	.1
5650	Sleds, Snow, Ice Vehicles	22	.2
5660	Water Vehicles	20	.2
5699	Vehicles, Nec	29	.3
	Wood Items	416	4.1
5700	Wood Items, Uns	8	.1
5710	Logs	66	.7
5720	Lumber	213	2.1
5730	Skids, Pallets	61	.6
5749	Wood Items, Nec	68	.7
	Working Surfaces	2066	20.4
5800	Working Surfaces, Uns	281	2.8
5801	Floor	601	5.9
5810	Ground	817	8.1
5815	Ramps	28	.3
5820	Roofs	11	.1
5825	Runways, Platforms	17	.2
5830	Sidewalks, Paths, Etc.	38	.4
5840	Stairs, Steps	191	1.9
5845	Street, Road	15	.1
5899	Working Surfaces, Nec	67	.7
	Person	334	3.3
6010	Person Injured	114	1.1
6020	Person, Other than Injured	220	2.2
6100	Recreation and Athletic Equipment	23	.2
	Rubber Products	51	.5
6210	Tires	48	.5
6299	Rubber Products, Nec	3	.0
6500	Ice, Snow	8	.1
8800	Miscellaneous, Nec	92	.9
9800	Nonclassifiable	229	2.3

Note: Uns = Unspecified. Information not available to classify at a more detailed level.
Nec = Not elsewhere classified
Note: Data includes only those reported cases which occurred during 1982 involving death, or one or more lost workdays beyond the day of injury.
Source: Alaska SOS Table 103.

Table 2-4
Work Injuries and Illnesses
By Type of Accident or Exposure
Alaska 1982

SOS Code	Type of Accident or Exposure	Number of Cases	Percent
	Total	10125	100.0
	Struck Against	679	6.7
010	Struck Against, Uns	59	.6
011	Stationary Object	539	5.3
012	Moving Object	81	.8
	Struck By	1584	15.6
020	Struck by, Uns	48	.5
021	Falling Object	699	6.9
022	Flying Object	167	1.6
029	Struck By, Nec	670	6.6
	Fall From Elevation	1034	10.2
030	Fall from Elevation, Uns	10	.1
031	From Scaffolds, Etc	187	1.8
032	From Ladders	132	1.3
033	From Piled Materials	10	.1
034	From Vehicles	256	2.5
035	On Stairs	171	1.7
036	Into Shafts, Etc	68	.7
039	Fall to Lower Level, Nec	200	2.0
	Fall on Same Level	1157	11.4
050	Fall on Same Level, Uns	24	.2
051	Fall to the Walkway, Etc	823	8.1
052	Fall Unto or Against Objects	307	3.0
059	Fall on Same Level, Nec	3	.0
	Caught In, Under, Between	673	6.6
060	Caught, In, Under, Between, Uns	87	.9
061	Inrunning or Meshing Objects	50	.5
062	Moving and Stationary Object	421	4.2
063	Two or More Moving Objects	22	.2
064	Collapsing Materials	20	.2
069	Caught In, Under, Between, Nec	73	.7
	Rubbed or Abraded	336	3.3
080	Rubbed or Abraded, Uns	1	.0
081	Leaning, Kneeling, Etc	32	.3
082	Objects Handled	61	.6
083	Vibrating Objects	3	.0
084	Foreign Matter in Eyes	224	2.2
085	Repetition of Pressure	9	.1
089	Rubbed or Abraded, Nec	6	.1
100	Bodily Reaction	683	6.7
	Overexertion	2818	27.8
120	Overexertion, Uns	154	1.5
121	Lifting Objects	1330	13.1
122	Pulling or Pushing Objects	359	3.5
123	Wielding, Throwing, Holding, or Carrying	683	6.7
129	Overexertion, Nec	292	2.9
130	Contact with Electric Current	14	.1
	Contact with Temp. Extremes	251	2.5
150	Contact with Temp. Extremes, Uns	1	.0
151	General Heat	1	.0
152	General Cold	53	.5
153	Hot Objects	188	1.9
154	Cold Objects	8	.1
	Contact with Radiations, Caustics, Etc	254	2.5
180	Contact with Radiations, Caustics, Etc, Uns	71	.7
181	By Inhalation	65	.6
182	By Ingestion	9	.1
183	By Absorption	87	.9
189	Contact with Radiations, Caustics, Etc, Nec	22	.2
	Transportation Accidents, Other Than Motor Vehicle	40	.4
201	Aircraft	36	.4
205	Ship or Boat	3	.0
298	Transportation Accidents, Other than Motor Vehicles, Nec	1	.0

Table 2-4
Work Injuries and Illnesses
by Type of Accident or Exposure
Alaska 1982
(continued)

SOS Code	Type of Accident or Exposure	Number of Cases	Percent
	Motor Vehicle Accidents	344	3.4
300	Motor Vehicle, Uns	21	.2
	Both Vehicles in Motion	81	.8
310	Both Vehicles in Motion, Uns	6	.1
311	Oncoming Vehicle	24	.2
312	Vehicles Moving in Same Direction	12	.1
313	Vehicles Moving in Intersection	39	.4
	Standing Vehicle or Stationary Object	62	.6
320	Standing Vehicle or Stationary Object, Uns	1	.0
321	Standing Vehicle or Object in Roadway	12	.1
322	Standing Vehicle on Side of Road	12	.1
323	Struck by While Standing in Roadway	34	.3
324	Struck by While Standing off Roadway	3	.0
	Noncollision Accidents	180	1.8
330	Noncollision, Uns	1	.0
331	Overturned	49	.5
332	Ran off Roadway	43	.4
333	Sudden Stop or Start	25	.2
338	Other Noncollision Accidents	62	.6
	Exposure to Noise	3	.0
402	Sudden or Single Exposure	1	.0
405	Repeated Noise	2	.0
500	Explosions	29	.3
899	Accident Type, Nec	118	1.2
999	Nonclassifiable	108	1.1

NOTE: Uns = Unspecified. Information not available to classify at a more detailed level.
Nec = Not elsewhere classified.
NOTE: Data includes only those reported cases which occurred during 1982 involving death, or one or more lost workdays beyond the day of injury.
Source: Alaska SOS Table 104.

how much noise exposure was underreported here?

TABLE 2-13
Work Injuries and Illnesses
Nature of Injury or Illness By Type of Accident or Exposure
Alaska 1982

Nature of Injury or Illness	TOTAL	STRUCK BY OR STRUCK AGAINST	FALL	CAUGHT IN OR BETWEEN	RUBBED OR A-BRADED	BODILY REAC-TION	OVER EXER-TION	CONTACT WITH TEMP. EXTRM.	CONTACT W/RADIA-TIONS, CAUSTICS	MOTOR VEHI-CLE ACCT.	ALL OTHER CLASSI-FIABLE	NON-CLASSI-FIABLE
TOTAL	10125	2263	2191	673	336	683	2818	251	254	344	204	108
Amputation or Enucleation	44	20	-	23	-	-	-	-	-	1	-	-
Asphyxia, Strangulation, Etc.	11	-	-	2	-	-	-	-	10	-	1	-
Burn (Heat)	203	-	-	-	-	-	-	184	-	-	19	2
Burn (Chemical)	60	-	-	-	-	-	-	-	56	-	4	-
Concussion	55	27	22	1	-	-	-	-	-	3	2	-
Infective or Parasitic Diseases	15	-	-	-	-	-	-	-	13	-	1	1
Contusion, Crushing, Bruise	1459	712	433	276	6	-	1	-	-	26	3	2
Cut, Laceration, Puncture	938	707	51	107	57	-	-	-	-	6	3	7
Dermatitis	42	-	-	-	-	-	-	2	38	-	-	2
Dislocation	110	4	34	-	2	12	51	-	-	4	-	3
Electric Shock, Electrocution	5	-	-	-	-	-	-	-	-	-	5	-
Fracture	795	277	303	103	8	8	17	-	-	27	7	5
Effects of Exposure to Low Temp	35	-	-	-	-	-	-	35	-	-	-	-
Hearing Loss, or Impairment	13	3	1	-	1	-	-	2	-	-	6	-
Hernia, Rupture	164	3	8	-	-	5	145	-	-	-	-	3
Inflammation of Joints, Etc.	166	10	14	1	10	3	114	2	1	1	1	9
Poisoning, Systemic	75	-	-	-	-	-	-	-	73	-	2	-
Radiation Effects	35	-	-	-	-	-	-	-	35	-	-	-
Scratches, Abrasions	290	54	7	1	226	-	-	-	-	1	-	1
Sprains, Strains	4677	221	1016	87	19	652	2474	-	-	155	11	42
Hemorrhoids	6	-	-	-	-	-	4	-	-	-	2	-
Hepatitis	17	-	-	-	-	-	-	-	17	-	-	-
Multiple Injuries	655	184	250	63	1	1	8	3	1	113	30	1
Effects of Changes in Atmospheric Prs.	6	-	-	-	4	-	-	-	-	-	2	-
Cerebrovascular and Other Cond. of the Circulatory System	5	-	-	-	-	-	1	-	-	-	5	-
Complications Peculiar To Medical Care	2	-	-	-	-	-	-	-	1	-	1	-
Eye, Other Diseases of the Eye	4	2	-	-	2	-	-	-	2	-	-	-
Mental Disorders	13	-	-	-	-	-	-	-	-	-	13	-
Nervous System, Conditions of	7	-	-	-	-	-	-	2	-	-	4	1
Respiratory System, Conditions of	32	-	-	-	-	-	-	20	4	-	6	2
Symptoms and Ill-Defined Conditions	45	1	2	-	1	-	3	-	3	1	30	4
No Injury or Illness	2	-	-	-	-	-	-	-	-	-	-	2
Damage to Prosthetic Devices	10	6	1	1	-	-	-	-	-	-	-	2
Heart Conditions (Incl. Heart Attack)	41	-	-	-	-	-	-	-	-	-	41	-
Other Injury, Nec	12	3	2	-	1	1	-	1	-	-	4	-
Nonclassifiable	116	29	47	10	-	1	1	-	-	6	1	21

NOTE: Uns = Unspecified. Information not available to classify at a more detailed level.
Nec = Not elsewhere classified.
NOTE: Data includes only those reported cases which occurred during 1982 involving death, or one or more lost workdays beyond the day of injury.
SOURCE: Alaska SOS Table 5-1

TABLE 2-14
Work Injuries and Illnesses
Source of Injury or Illness By Type of Accident or Exposure
Alaska 1982

Source of Injury or Illness	TOTAL	STRUCK BY OR STRUCK AGAINST	FALL	CAUGHT IN OR BETWEEN	RUBBED OR A-BRADED	BODILY REAC-TION	OVER EXER-TION	CONTACT WITH TEMP. EXTRM.	CONTACT W/RADIA-TIONS, CAUSTICS	MOTOR VEHI-CLE ACCT.	ALL OTHER CLASSI-FIABLE	NON-CLASSI-FIABLE
TOTAL	10125	2263	2191	673	336	683	2818	251	254	344	204	108
Air Pressure	8	1	-	-	5	-	-	-	-	-	2	-
Animals, Insects	19	17	-	-	-	-	2	-	-	-	-	-
Animal Products	2	-	-	-	1	-	1	-	-	-	-	-
Bodily Motion	683	-	3	-	-	683	-	-	-	-	-	-
Boilers, Pressure Vessels	81	22	-	4	1	-	50	-	-	-	4	-
Boxes, Barrels, Containers	1103	163	13	41	3	-	874	4	-	-	5	-
Buildings & Structures	309	121	24	56	4	-	104	-	-	-	-	-
Ceramic Items	4	1	-	-	1	-	2	-	-	-	-	-
Chemicals & Chem. Compounds	91	-	-	-	3	-	-	2	84	-	2	-
Clothing	18	2	1	2	6	-	3	-	3	-	-	1
Coal & Petroleum Products	33	5	-	-	3	-	-	14	11	-	-	-
Cold (Atmospheric, Environmental)	54	-	-	-	-	-	-	54	-	-	-	-
Conveyors	31	3	9	18	-	-	1	-	-	-	-	-
Drugs and Medicines	1	-	-	-	-	-	-	-	1	-	-	-
Electric Apparatus	94	17	1	4	-	-	54	2	-	-	16	-
Flame, Fire, Smoke	41	-	-	-	-	-	-	26	13	-	2	-
Food Products	166	23	-		4	-	79	35	23	-	1	-
Furniture, Fixtures, Etc.	326	110	26		7	-	163	-	-	-	1	-
Glass Items, Nec	74	36	2	-	33	-	2	-	-	-	-	1
Hand Tools, Not PWD	478	323	-	34	8	-	210	2	-	-	-	1
Hand Tools, PWD	214	126	1	14	2	-	71	-	-	-	-	-
Heat (Atmospheric, Environmental)	1	-	-	-	-	-	-	1	-	-	-	-
Heating Equipment, Nec	42	5	1	5	-	-	20	7	-	-	4	-
Hoisting Apparatus	121	45	3	40	-	-	29	-	-	4	-	-
Infectious, Parasitic Agents, Nec	38	-	-	-	-	-	-	-	28	-	-	-
Ladders	45	13	6	4	-	-	22	-	-	-	-	-
Liquids, NEC	84	1	1	-	3	-	1	65	12	-	1	-
Machines	414	150	19	116	3	-	81	1	-	39	3	2
Mechanical Power Trans Apparatus	18	8	-	2	-	-	8	-	-	-	-	-
Metal Items	971	462	18	81	96	-	294	17	-	-	2	1
Mineral Items, Metallic, Nec	2	2	-	-	-	-	-	-	-	-	-	-
Mineral Items, Nonmetallic, Nec	135	64	3	24	30	-	12	-	1	-	1	-
Noise	3	-	-	-	-	-	-	-	-	-	3	-
Paper & Pulp	62	18	-	1	-	-	43	-	-	-	-	-
Particles (Unidentified)	62	1	-	-	61	-	-	-	-	-	-	-
Plants, Trees, Vegetation	39	33	2	-	-	-	4	-	-	-	-	-
Plastic Items, NEC	7	4	-	-	-	-	3	-	-	-	-	-
Pumps & Prime Movers	60	15	3	6	-	-	35	-	-	-	1	-
Radiating Substances & Equip.	35	-	-	-	-	-	-	-	35	-	-	-
Soaps, Detergents Etc. Nec	29	-	-	-	1	-	-	-	28	-	-	-
Scrap, Debris, Waste Materials	10	-	-	1	1	-	6	-	1	-	1	-
Steam	22	-	-	-	-	-	-	21	1	-	-	-
Textile Items, Nec	8	-	-	-	-	-	7	-	1	-	-	-
Vehicles	778	153	41	123	4	-	115	-	-	301	40	1
Wood Items	416	148	31	32	27	-	178	-	-	-	-	-
Working Surfaces	2066	19	1984	32	22	-	8	-	-	-	1	-
Person	334	79	-	2	3	-	137	-	-	-	110	3
Recreation & Athletic Equip.	23	12	1	1	-	-	9	-	-	-	-	-
Rubber Products	51	12	1	2	-	-	35	-	-	-	1	-
Ice, Snow	8	6	-	1	-	-	1	-	-	-	-	-
Miscellaneous, Nec	92	25	-	4	2	-	58	-	-	-	2	1
Non-Classifiable	229	18	-	3	2	-	96	-	12	-	1	97

NOTE: Uns = Unspecified. Information not available to classify at a more detailed level.
Nec = Not elsewhere classified.
NOTE: Data includes only those reported cases which occurred during 1982 involving death, or one or more lost workdays beyond the day of injury.
Source: Alaska SDS Table 514.

NIOSH

A Recommended Standard for Occupational Exposure to.....

Hot Environments

Section 20(a)(3) of the Occupational Safety and Health Act directs that the Secretary of Health, Education, and Welfare on the basis of such research, demonstrations, and experiments, and any other information available to him, shall develop criteria dealing with toxic materials and harmful physical agents and substances which will describe exposure levels that are safe for various periods of employment, including, but not limited to, the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience.

The criteria document contains much of the supplemental information required by Section 6(b)(7) of the Act to be in the final standard.

The recommendations for an occupational exposure standard for heat take into consideration available information on health effects and limited data on technical feasibility of achieving various levels of exposure.

The criteria document was reviewed by six knowledgeable consultants, government agencies with interest and responsibility in occupational safety and health, and input resulting from the *Federal Register* request for information.

Reviewers were of the opinion that the recommended heat stress standard was appropriate and that it is a positive approach to the medical and environmental facts and to the controls necessary to prevent excessive harm to a worker.

The document is a result of substantial changes incorporated into the original draft subsequent to extensive review by qualified experts. The incorporated changes are reflected in the simplification of the approach used to control heat exposure of workers and of the recommendations involving medical requirements for examinations. Other substantial changes involved recommendations regarding work practices.

Comments by official agencies with interest and responsibilities in occupational health and HEW consultants will be made available to the Ad Hoc Committee to be appointed by the Department of Labor.

The following is the first chapter of the criteria document. It contains the NIOSH recommendations for controlling worker exposure to Hot Environments.

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

I. RECOMMENDATIONS FOR A STANDARD FOR WORK IN HOT ENVIRONMENTS

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to heat in the workplace be controlled by requiring compliance with the work practice standard set forth in the following sections. Adherence to the precautionary procedures prescribed will prevent acute or chronic heat disorders and illnesses and heat induced unsafe acts, and will reduce the risk of harmful effects due to the interactions between excessive heat and toxic chemicals and physical agents. The standard is amenable to techniques that are valid, reproducible, and presently available. It will be reviewed and revised as necessary.

Section 1 — Definitions

(a) Acclimatization to heat means a series of physiological and psychological adjustments that occur in an individual during his first week of exposure to a hot environment so that thereafter the individual is capable of working in a hot environment without excessive strain.

(b) Unimpaired mental performance means the ability of an employee to cope with conditions where safety and health depend on constant alertness because he has to make critical decisions, nine discriminations, or fast and skillful actions.

(c) Intermittent heat exposure means exposure to hot environmental conditions which continues no longer than fifteen minutes without an interrupting interval spent either spontaneously or according to a prescribed schedule in a cooler environment.

(d) Continuous heat exposure means any exposure to hot environmental conditions which is not an intermittent exposure.

(e) Hot environmental condition means any combination of air temperature, humidity, radiation and wind speed that exceeds a Wet Bulb Globe Temperature (WBGT) of 79°F.

Section 2 — Applicability

The provisions of this standard are applicable to all places of employment, indoors and outdoors, and to all employees except those who are required to wear impermeable protective clothing.

Section 3 — Work Practices

(a) For sedentary jobs where continuous unimpaired mental performance is required, no employee shall be exposed to conditions which exceed the limits set forth in Figure I-1.

(b) No employee should be permitted to work without protective observation at high heat stress levels.

(c) When exposure of an employee is continuous for one hour or intermittent for a period of two hours and the time-weighted average WBGT exceeds 79°F for men or 76°F for women, then any one or combination of the following practices shall be initiated to insure that the employee's body care temperature does not exceed 100.4°F:

(i) Acclimatization

(1) Unacclimatized employees shall be acclimatized over a period of 6 days. The acclimatization schedule shall begin with 50 percent of the anticipated total work load and time exposure on the first day, followed by daily 10 percent increments building up 100 percent total exposure on the sixth day.

(2) Regular acclimatized employees who return from nine or more consecutive calendar days of leave, shall undergo a four day acclimatization period. The acclimatization schedule shall begin with 50 percent of the anticipated total exposure on the first day, followed by daily 20 percent increments building up to 100 percent total exposure on the fourth day.

(3) Regular acclimatized employees who return from four consecutive days of illness should have medical permission to return to the job, and should undergo a four day re-acclimatization period as defined in (2) above.

(ii) A work and rest regimen shall be implemented to reduce the peaks of physiological strain and to improve recovery during rest periods.

(iii) The total work load shall be evenly distributed over the entire work day when possible.

(iv) When possible hot jobs shall be scheduled for the coolest part of the work shift.

(v) Regular breaks, consisting as a minimum of one every hour, shall be prescribed for employees to get water and replacement salt. The employer shall provide a minimum of 8 quarts of cool potable 0.1 percent salted drinking water or a minimum of 8 quarts of cool potable water and salt tablets per man per shift. The water supply shall be located as near as possible to the position where the employee is regularly engaged in work, but never further than 200 feet* therefrom.

(vi) Appropriate protective clothing and equipment shall be provided and used.

(vii) Engineering controls to reduce the environmental heat load shall be utilized.

*Except where a variance had been granted.

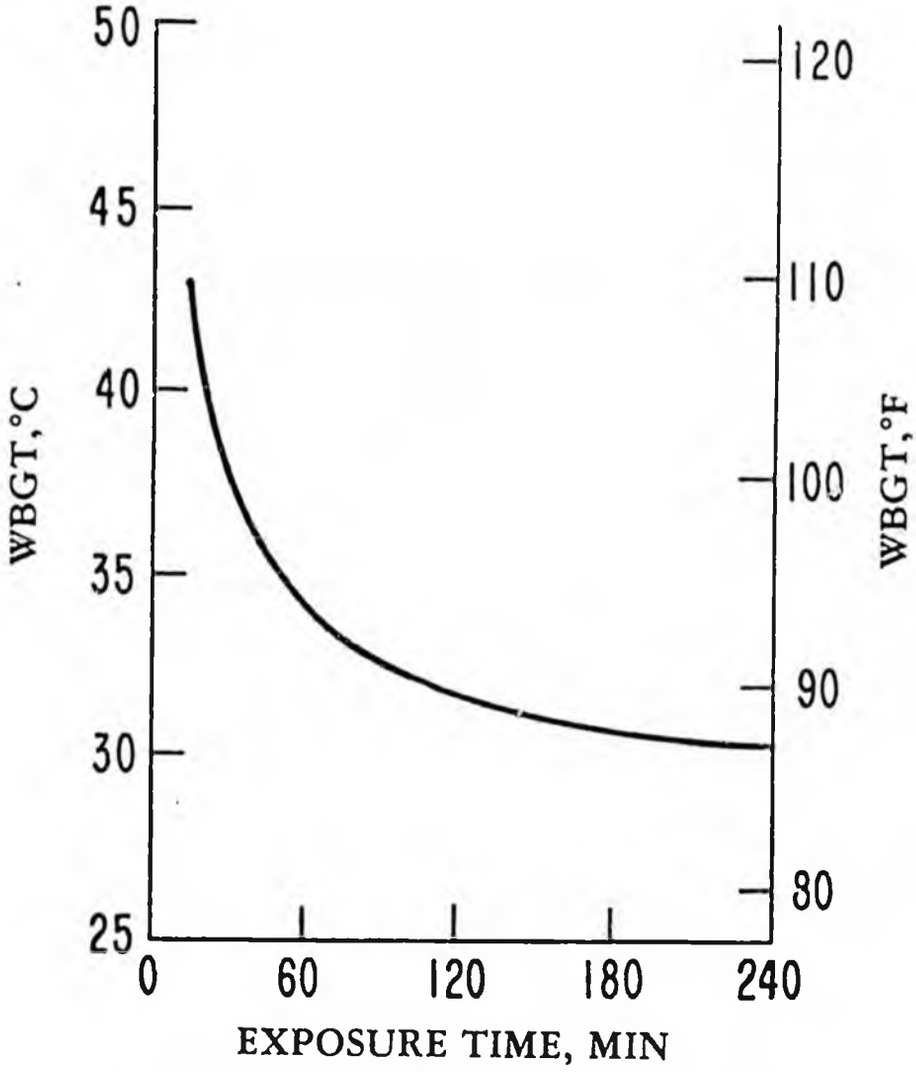

FIGURE I-1. UPPER LIMITS OF EXPOSURE FOR UNIMPAIRED MENTAL PERFORMANCE

Section 4 — Environmental Measurements

(a) The WBGT index used as the parameter in determining the environmental conditions for implementation of work practices shall be calculated by the following equations:

For indoor exposure, or outdoor exposure with no solar load:

WBGT = 0.7 WB + 0.3 GT

For outdoor sunlit exposure:

WBGT = 0.7 WB + 0.2 GT + 0.1 DB,

where WB = the natural wet-bulb temperature obtained with a wetted sensor exposed to the natural air movement (unaspirated)

GT = globe thermometer temperature

DB = dry-bulb temperature

(b) The time-weighted average WBGT shall be determined by the equation:

$$\text{Av. WBGT} = \frac{(\text{WBGT}_1) \times (t_1) + (\text{WBGT}_2) \times (t_2) + \text{——} (\text{WBGT}_n) \times (t_n)}{(t_1) + (t_2) + \text{————} (t_n)}$$

where $WBGT_1$, $WBGT_2$, $WBGT_n$, are calculated values of WBGT for the various work and rest areas occupied during total time period; t_1, t_2, t_n are the elapsed times in minutes spent in the corresponding areas which are determined by a time study.

(i) Where exposure to environmental conditions is continuous for several hours or the entire work day, the WBGT shall be calculated as an hourly time-weighted-average.

(ii) Where exposure is intermittent, the WBGT shall be calculated as a two-hour time-weighted average.

Section 5 — Medical

(a) All employees who are 45 years of age and older and who have not had previous occupational exposure to heat shall not be assigned to jobs where the environmental conditions equal or exceed 79°F WBGT for men and 76°F WBGT for women, until they are acclimatized.

(b) All personnel who are to be assigned to hot jobs for the first time shall be evaluated by a physician prior to assignment to assure that the individual can cope with the hot environment. In the examination special emphasis should be on the cardiovascular, renal, hepatic, endocrine, and respiratory system and the skin. The examination should also include a complete medical history of the worker with specific emphasis on previous heat-related disorders or illnesses.

(c) All employees exposed to hot environmental conditions should be given a periodic physical examination every 2 years for employees under age 45, and every year for employees 45 years of age or older, that should include all components of the preplacement examination.

(d) There shall be a person available during working hours, who shall have had first aid training in recognizing the signs and symptoms of any heat disorder or illness.

Section 6 — Apprisal of Employees of Hazards from Exposure to Excessive Heat

Each employee who may be exposed to environmental conditions that exceed the prescribed limits shall be given training in health and safety procedures through a program that shall include the following as a minimum:

(a) Information as to water intake for replacement purposes.

(b) Information as to salt replacement.

(c) Importance of weighing each day before and after the day's work.

(d) Instruction on how to recognize the symptoms of heat disorders and illnesses, including dehydration, exhaustion, heat syncope, heat cramps, salt deficiency exhaustion, prickly heat, and heat stroke.

(e) Information as to special caution that shall be exercised in situations where employees are exposed to toxic agents and/or other stressful physical agents which may be present in addition to and simultaneously with heat.

(f) Information concerning heat acclimatization. The information shall be kept on file and readily accessible to the worker at all places of employment where he may be exposed to excessive heat.

Section 7 — Warning Sign

The following warning sign shall be appropriately located at one or more places to be noticed by any one entering an area where environmental conditions are 86°F WBGT or above.

WARNING

HEAT STRESS AREA

Section 8 — Monitoring

(a) A WBGT profile shall be established for each work place for winter and summer seasons to serve as a guide for deciding when work practices shall be initiated to conform with the requirements of the standard. The first profile shall be established within 3 months of the effective date of this standard.

(b) After the WBGT profiles have been established, monitoring shall be conducted once during July and August of each year.

Section 9 — Recordkeeping

(a) The following records shall be maintained:

(i) Medical records for each employee.

(ii) Records of acclimatization as required by Section 3(c)(i).

(iii) Records of the WBGT for each work area as specified in Section 8.

(b) Records required by provisions (i) and (ii) above shall be maintained for a period of the employee's employment and for one year thereafter.

(c) Records of the WBGT as specified in (iii) above shall be maintained for a period determined by the Secretary of Labor with consultation with the Secretary of Health, Education, and Welfare

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HEAT/COLD

HEAT

A worker's ability to do the job is affected by working in a hot environment: strength declines and the onset of fatigue comes sooner than it would otherwise. Constant heat can also impair a worker's mental alertness, often increasing the possibility of an accident.

Moreover, constant heat can lead to serious health effects such as heat rash, heat cramps, heat exhaustion, and heat stroke.

Health Effects

- Heat Rash (prickly heat). Excessive sweating can plug up sweat ducts and cause an inflammation or rash. This rash sometimes affects the body's ability to sweat and to cool itself, and therefore can lead to more serious problems, such as heat cramps or heat stroke (see below).

- Heat Cramps. Prolonged sweating with inadequate replacement of salt can lead to muscle spasms--usually in arms, legs, and abdomen.

- Heat Exhaustion (heat fainting), due to dehydration or low blood pressure from physical exertion. Results in headache, tiredness, nausea, dizziness, clammy skin, heavy sweating and, sometimes, fainting.

- Heat Stroke. Sometimes sweat supression and increased storage of body heat lead to high body temperature (106° F) which causes extreme stress. Symptoms include hot, dry skin, mental confusion, and, if serious enough, convulsions, and eventually coma.

Measuring Heat Stress

There are four basic factors affecting the amount of heat stress we receive from working in a hot area:

Air temperature is not the only factor contributing to the amount of heat stress we receive. The three other factors are:

- Humidity

- Radiant Heat (direct heat radiating from an object such as an oven or even the sun)

- Air Velocity

There is a way to evaluate the contributing effects of these four factors and determine the amount of heat stress you receive. The measurement is called the Wet Bulb Globe Temperature (WBGT). If you think heat is a problem in your workplace, you may want to measure the WBGT. Finding out what the WBGT is can give you ways to control heat exposure (See How to Beat the Heat).

Reuter-Stokes Inc. manufactures a miniaturized instrument that quickly gives you the WBGT in a digital read-out after three minutes in the hot environment. Their address is: 18530 South Miles Parkway, Cleveland, Ohio 44128. Write for the literature and get your company to purchase one.

Another alternative is having the union call NIOSH (National Institute for Occupational Safety and Health). Also the employer can contact the OSHA consultation service to come in and do a free evaluation.

How to Beat the Heat

There are essentially two ways to reduce heat stress: through engineering controls and/or good work practices.

Engineering controls are the best way to go because they actually reduce or eliminate the factors responsible for the heat stress (e.g. hot air temperature, high humidity, radiant heat, lack of air velocity). Examples of ways to deal with each factor are listed below:

- o Air Temperature:
  - Use air conditioning.
- o Humidity:
  - Use local exhaust ventilation at the sources in the process where humidity is generated.
  - Enclose processes that give off humidity.
  - Use dehumidifiers.
- o Radiant Heat:
  - Use insulation to contain the heat of hot machinery (ovens, dryers, etc.). Some types of insulation include fiberglass, polished metal reflectors and metal screens.
- o Air Velocity:
  - Use portable fans or roof fans that move air through the work area.
  - Use local exhaust ventilation at the sources where heat is generated.

Good Work Practices

1. Acclimatization. No matter how hot the surrounding air becomes, the human body must always maintain its internal temperature of 98.6° F. If the workplace air temperature increases, workers should be given time to get used to the new environment before being asked to work in it full-time. This is called acclimatization.

   It takes roughly one week for the body to adjust its internal temperature controls, such as sweating to increased heat. On the first day of work in a hotter environment body temperature, pulse rate and general discomfort are high. With each succeeding day, the body becomes acclimatized to the heat. Gradual exposures, over a period of one week, reduce the likelihood of serious heat disorders among workers exposed to increased heat.

2. **Providing Isotonic Beverages.** A person may sweat away as much as three gallons of fluid that is essential for normal body functioning without feeling thirsty. Isotonic beverages should be provided at all times -- free of charge -- to replace vital salts and fluids lost through perspiration. Gatorade is one brand name. Another brand which is claimed to taste better is Squincher. Their address is: P. O. Box 192, Columbus, Mississippi 39701. Write for information and get your company to buy some.

3. A Work-Rest Regimen has been developed by the American Conference of Governmental Industrial Hygienists (ACGIH). Based on many workplace studies conducted by industrial hygienists, ACGIH states that these guidelines should be followed to reduce the incidence of the serious health effects caused by heat stress.

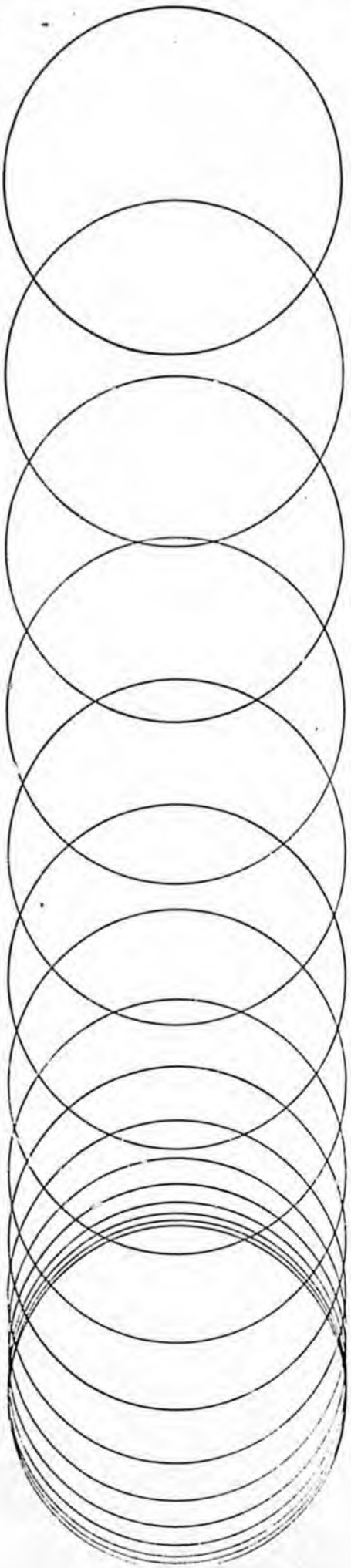
Work-Rest Regimen	Work Load		
	Lt.	Mod.	Hvy.
Continuous Work	86°F*	80°F	77°F
75% work/25% rest each hour	87°	82°	79°
50% work/50% rest each hour	89°	85°	82°
25% work/75% rest each hour	90°	88°	86°

* All temperatures are WBGT

During these rest periods, cool places should be provided. Rest is important because it gives the body an opportunity to get rid of excess heat, slows down the production of internal heat and provides greater blood flow to the skin (a natural cooling mechanism).

NOTE:

Although temperature extremes, such as heat, present serious health problems for workers, there is no OSHA standard at this time. The best chance for success in prevention is through a strong union health and safety committtee.



Construction Health Hazards Prevention

Action Tips

Construction Health Hazards Education Program
Institute of Rural Environmental Health
Occupational Health and Safety Section
110 Veterinary Science Building
Colorado State University
Fort Collins, Colorado 80523
303/491-6151

Hans H. Johnson, Ph.D.

Jeffrey R. Geiger
Industrial Hygienist

HEAT STRESS

Anyone in charge of a group of workers should be aware of the signs of heat stress. Physical activity at high temperatures can directly affect health and indirectly be the cause of accidents.

WHAT IS HEAT STRESS? It is a signal that says the body is having difficulty maintaining its narrow temperature range. The heart pumps faster, blood is diverted from internal organs to the skin, breathing rate increases, sweating increases — all in an attempt to transfer more heat to the outside air and to cool the skin by evaporation of sweat. If the body can't keep up then the person suffers effects ranging from cramps to heat stroke.

DRY CLOTHES AND SKIN DON'T MEAN YOU'RE NOT SWEATING! In dry climates you might not feel wet or sticky, but you are still sweating. On a very warm day as much as two liters of fluid may be lost due to sweating.

ACTION TIPS — BEATING THE HEAT The following steps will help to prevent the ill effects of heat stress.

- drink water frequently and moderately (every 15-30 minutes about a glassful). Due to the fact that most of us already consume excessive salt in our diets, salt tablets are not recommended for general use.

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TYPES OF HEAT STRESS How to detect workers suffering from heat stress, and some things to help. (Why not copy this section, cut it out and post it for quick reference!)

HEAT CRAMPS	pain and spasm of muscles used during work	— give water — alternate tasks between easy and strenuous jobs
HEAT EXHAUSTION	fatigue, nausea, headache, giddiness clammy skin, red complexion, rapid heart rate, fainting while standing	— remove to cool area — give water — keep at rest
HEAT STROKE	hot and dry skin, red and blotchy appearance, mental confusion, convulsions, loss of consciousness	— immediate and rapid cooling by immersing in water or wrapping in wet cloth — GET MEDICAL ATTENTION IMMEDIATELY — can cause irreversible damage

BEATING THE HEAT — more Action Tips

- rest frequently
- eat a light lunch
- consider a summer schedule with starting and ending times a few hours earlier. Do the strenuous jobs during the cooler morning hours, rotating workers through strenuous jobs during the hotter times of the day.
- ventilate or use a fan in enclosed areas
- Break in new workers gradually. The body will adjust in 1-2 weeks. This adaptation to heat is quickly lost so workers just back from vacation will need an adjustment period too.
- instead of soft drinks, try a non-carbonated thirst quencher such as Gatorade.
- reduce alcohol consumption. Many cases of heat stroke have occurred the day after a "night on the town."
- wear light colored, cotton clothes and keep your shirt on — desert nomads don't wear all of those clothes for nothing!

Occupational Health and Safety Section
Institute of Rural Environmental Health
110 Veterinary Science Building
Colorado State University
Fort Collins, Colorado 80523

DC 37 Safety & Health Factsheet

HEAT STRESS

Safety and Health Unit, District Council 37, AFSCME, AFL-CIO, 140 Park Place, New York, NY 10007

Beat The Heat!

It's hot, it's muggy, and you feel miserable. Nobody has to tell you that working in hot environments is uncomfortable. But what about the safety and health hazards? And what can be done to minimize them? This factsheet explores these questions and tells you how to beat the heat.

Q. Who has trouble with heat?

A. Nearly anyone can, but heat is more of a problem for certain groups of City workers especially:

- *people who work out of doors*—such as highway repairers, traffic device maintainers, arterial workers, parks laborers, lifeguards and MVOs.
- *people who work near hot equipment*—stationary firemen, highway repairers, hospital laundry workers, custodians, hospital dietary workers, and school lunch aides.
- *people who work in confined spaces*—sewer laborers, water supply, gas and electricity laborers, sewage treatment workers.

Q. Why do you get hot?

A. Your body constantly produces heat. Hard work and physical exertion produces even more heat. The body must maintain a constant temperature, so it has to shed the extra heat.

Q. How does the body keep cool?

A. In two ways: first, by varying the rate of blood circulation; and second, by evaporation, or sweating. Blood circulates close to the skin so that heat can be expelled into the environment. However, blood pumped to the body's surface cannot give off its heat if air temperatures are as warm or warmer than the skin's temperature. Therefore, when environmental temperatures reach normal body temperature (98.6 degrees F.), cooling the body becomes more difficult. Sweating then becomes the only effective way to keep your body cool.

Q. What does humidity do to the body's ability to cool itself?

A. High humidity makes it even more difficult to cool off. Your body continues to sweat, but high humidity slows the evaporation process—and it is evaporation that does the cooling.

Q. How does heat affect working ability?

A. When blood is being pumped to the skin surface to keep you cool, less blood is in the muscles and inner organs. This has an effect on working ability. People working in hot environments tire easily, have difficulty concentrating, work less efficiently, make more mistakes, and suffer more accidents.

Q. Does extra heat make work less safe?

A. Because overall physical performance and mental alertness are lowered, workers in hot environments tend to experience higher accident rates. And, as temperatures rise, tempers shorten, sometimes causing people to act rashly or carelessly. Also, sweaty, slippery hands, dizzyness, and fogged-up safety glasses contribute to accidents.

Common Heat Hazards

	Symptoms	Treatment
Heat Cramps	Muscle spasms and pain — usually in the arms, legs or abdomen.	Drink lightly salted water (one half teaspoon per gallon). **CAUTION: People with high blood pressure, heart condition, or on a low sodium diet must consult a physician.**
Heat Stroke	Blotchy, hot, dry skin; body temperature is 105° and rising; mental confusion. Severe symptoms are loss of consciousness, delirium, and convulsions leading to death.	**Get medical attention immediately.** This is a serious medical emergency. Move to a cool area, soak clothes with water and fan the body vigorously to increase cooling.
Heat Exhaustion	Clammy skin, headache, giddyness, fatigue, nausea, dizziness, heavy sweating.	Rest in a cool place, drink lightly salted liquids. **CAUTION: People with high blood pressure, heart condition, or on a low sodium diet must consult a physician.**
Heat Rash (Prickly heat)	Inflammation of the skin and sweat glands.	Rest, at regular intervals, in a cool place. Shower after each work shift.

Q. What is the effect of heat on health?

A. It depends. If you are not used to working in high temperatures, or if intense prolonged heat overwhelms your body's ability to cool itself, you can suffer several unhealthy, and sometimes dangerous, reactions to heat. Learn to recognize the signs and treatment of heat stress.

Q. Does long term heat exposure present any special health problems?

A. Though the research is skimpy, it suggests that some psychological conditions, digestive tract problems, and heart strain are more frequent among workers routinely exposed to high temperatures.

Q. Is it possible to adjust to high temperatures?

A. Yes. Through a process known as acclimatization, within one or two weeks people get used to working in hot environments. During the first few days of heat exposure, body temperatures rise to a feverish level, heart and pulse rates quicken, and general discomfort is increased. Gradually, with each day of exposure, the body acclimates and further heat exposure becomes more endurable.

Not everyone acclimates as well or as quickly. Young people acclimate better than older people. Leaving a hot environment for more than one week can cause a loss of from one quarter to two-thirds of the acclimatization. An absence of three weeks or more can cause a total loss. Take care to acclimatize slowly. Heat disorders are more likely to afflict workers who have not been given adequate time to adjust.

Q. Do any laws protect me from working in excessive heat?

A. The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) doesn't have an official standard for heat. However, OSHA has recommended a standard of 86 degrees F effective temperature. The effective temperature is obtained by use of a special thermometer (called Wet Globe Thermometer) which combines on a single dial reading air temperature, heat from machinery and processes (thermal radiation), humidity, and air movement. The combined effective temperature is supposed to simulate the way the human body reacts to heat. *Remember*, the recommended standard is just that—a recommendation. But it can be used as a guide.

The American Industrial Hygiene Association recommends the following temperatures for persons not in direct sunlight:

Q. What's the best way to keep cool?

A. Drink plenty of cool water. It should be available near your work area. When you feel hot or uncomfortable, drink more than satisfies your thirst, and drink it every 15 or 20 minutes. Don't drink alcohol to cool off—it dehydrates the body.

Q. What about salt?

A. When you sweat, particularly if you are not acclimated, you lose some salt. The best way to replace it is to literally salt your food, or to drink a mild salt solution (0.1 percent). CAUTION: PERSONS WITH HEART PROBLEMS OR ON A LOW SODIUM DIET MUST NOT BE GIVEN SALT. Consult a doctor in such cases.

Q. What else helps?

A. Any method that increases air flow including fans, exhaust fans, or air blowers helps. Increasing air speed improves sweat evaporation as long as temperatures are below 95 degrees F. When temperatures are above 95, fans are less useful. And in dusty work areas, fans can be more trouble than they are worth.

Besides increasing air flow, other mechanical or physical methods can reduce heat. Very hot equipment can be isolated, for example, or reflective shields can be placed between a worker and the heat source.

Q. Can a change in work schedules make a difference?

A. When working in hot environments frequent short work periods alternating with short rest periods are better than long stretches of work and long breaks. Frequent rest periods give the body a chance to cool down. Work practices should be modified during an unusual rise in temperature or humidity. Nonessential jobs should be postponed; heavy work should be done in the coolest part of the day. Extra help or teams can reduce the amount of any individual worker's exposure.

Q. Is there anything else?

A. Rest areas that are air conditioned or cooler than the workplace go a long way in reducing the stress of work in a hot environment. Rest areas should be easily accessible. □

Maximum Exposure

(Based on Wet Globe Thermometer reading *only*)*

Exposure time	Desk Work	Moderate Work	Heavy Work
Continuous daily work	83.2	80.3	75.6
Intermittent work-rest			
3 hours	86.0	82.5	78.8
2 hours	87.3	83.9	80.3
1 hour	90.0	86.7	83.2
30 minutes	94.3	90.6	86.7
20 minutes	97.2	93.7	90.0

*Readings on a wet globe thermometer are lower than dry bulb readings.

Hot Environments

1980

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

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ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

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ABOUT THIS PAMPHLET

The purpose of this pamphlet is to give employers and employees an overview of the health hazards of work in hot environments, and to alert them to the precautions which should be taken to avoid excessive heat stress.

The following is general information only. It should not be considered as a substitute for any of the provisions of the Occupational Safety and Health Act of 1970 or for any regulations issued by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA).

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CONTENTS

NOISE CONTROL

A guide for
workers and employers

U.S. Department of Labor

Occupational Safety and
Health Administration

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PHILAPOSH factsheet

NOISE

the most common industrial health hazard

typical decibel ratings

Ordinary conversation	60	dB
Busy street traffic	75	dB
Office tabulating machines	80	dB
Linotype machines	88 to 91	dB
20 feet from subway train	90	dB
Folding machine, bindery	90	dB
Pneumatic diesel air compressor	90	dB
Rotogravure press, pressman's station	97	dB
Automatic screw machine	98 to 105	dB
Can manufacturing plant	100	dB
Newspaper printing press	102 to 108	dB
Wire rope stranding machine	102 to 108	dB
Caterpillar tractor, idling	104	dB
Weaving room	105	dB
Circular saw	105 to 116	dB
Drills, shovels & trucks operating	108	dB
Between two compressors	110	dB
Woodworking shop	110	dB
Drop hammer (depending on size)	110 to 135	dB
Punch press	112	dB
Sandblasting	112	dB

It is probably too noisy if 1) you must shout to be heard by someone standing within a few feet, 2) your ears ring or you have heard noises after being in a work area, 3) you have a temporary reduction in your hearing ability (your family may notice this first).

The unit that measures noise is the decibel (dB). An increase of 3 decibels means that the noise level is twice as loud. Decibels can be measured exactly with a sound level meter. It is easy to use and some unions are buying their own. After taking measurements you can figure out if your daily dose of noise is more than federal OSHA law allows.

what noise does to you

For 100 years it has been known that excessive noise causes temporary then permanent hearing loss due to damage of the "hair cells" inside the ear. Neither surgery or a hearing aid can remedy this damage. A victim will first notice that although he/she hears voices, he/she cannot understand the words: music sounds flat. Noise also causes blood vessels to contract, blood pressure to increase, pupils to dilate, and muscles become tense. Noise may contribute to diseases of the heart and nervous systems.

how to protect yourself

If your plant is too noisy, the company should give you a plan of how they will quiet the equipment and when. A guarantee could be written into the union contract. The company can run machines at lower speed, use plastic gears, erect baffles to deflect and absorb noise, isolate the noisy machines or enclose the noise producing parts.

Only while engineering solutions are being worked out are ear plugs or muffs acceptable. The company should provide a type that is both comfortable and effective. The protection offered by a good muff is generally greater and less variable between individuals than for earplugs. Earplugs can be worn only in healthy ear canals and even then discomfort or infection can result.

OSHA noise levels

DURATION OF EXPOSURE per day, in hours	SOUND LEVEL IN DECIBELS
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

NOISE
noise
NOISE

Wearing plugs or muffs in noise levels above 90 dB should not interfere with and may improve speech communications. However, you are the best judge of whether the devices hinder communication and could be a safety hazard.

Remember--OSHA law states that engineering controls, not ear plugs or ear muffs, are required to reduce noise.

Although not yet legally required, the company should provide audiometric (hearing) tests yearly. You should request the test results and see for yourself that your hearing is not being harmed. If you suspect that your hearing loss has been caused by your job, you may be eligible for Worker's Compensation.

It's also important to remember that the 90 decibel limit set by OSHA as the legal standard has been found not to prevent hearing loss. Thus, we must fight for lower noise levels at work and for a strong noise standard.

For further information:
Noise Control, A Workers' Manual, Dan MacLeod, United Auto Workers. $1.50
Available from PHILAPOSH

This factsheet was produced by the PHILAPOSH Health/Technical Committee. For more information, contact the Philadelphia Area Project on Occupational Safety and Health, Room 607, 1321 Arch Street, Phila, Pa. 19107 215-568-5188

EPARTMENT OF LABOR
EWS RELEASE
.OX 1149, JUNEAU, ALASKA 99802 (907) 465-2700
sheffield, *Governor*, Jim Robison, *Commissioner*, J. Allan MacKinnon, *Information Officer*

NOISE EXPOSURE STANDARDS AMENDMENTS PROPOSED

The Alaska Department of Labor is proposing to amend its recently adopted occupational noise exposure standards. The department expects to have these standards in place before the end of this year.

Under the revised hearing protection program, an employer will be allowed flexibility to find the most cost-effective means to provide hearing protection for those workers exposed to an 8-hour time-weighted average (TWA) of 85 decibels. All workers except those employed in construction, agriculture, and oil and gas-well drilling and servicing operations will be covered.

The revised program covers the following points:

MONITORING. The performance-oriented provisions allow employers to choose the monitoring method best suited to their individual situation, but must include all levels of noise between TWAs of 80 to 130 decibels. Area monitoring is allowed, but where such monitoring is inappropriate, representative personal sampling is required.

AUDIOMETRIC. Includes baseline audiograms, annual audiograms, training and follow-up procedures.

Training must be provided at least annually for employees exposed at or above the action level.

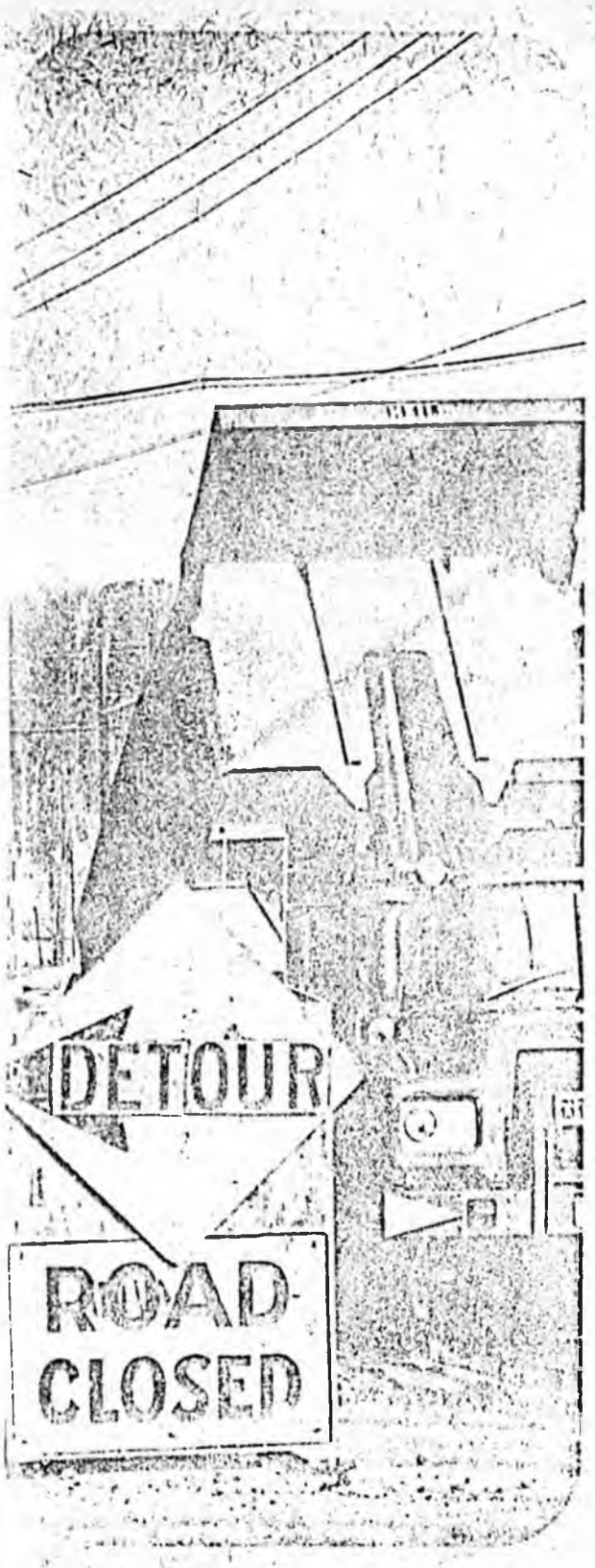
RECORDKEEPING. Requirements state that noise-exposure-measurement records must be kept for two years and audiometric test results for the duration of a worker's employment.

HEARING PROTECTORS. The revised program requires employers to make hearing protectors available to all workers exposed at or above the action level by paying for the protectors and offering a choice of protectors from a variety of suitable types. Further, employers will ensure the proper use of hearing protectors by employees.

Anyone interested in receiving a copy of the standards should contact the Division of Labor Standards and Safety, Occupational Safety and Health Section, P.O. Box 1149, Juneau, Alaska 99802.

DATE: July 22, 1983 FOR IMMEDIATE RELEASE

NO: 84-9



building specifications for new industrial plants, construction noise levels can be reduced. The same technique can be applied to apartment, office and other construction. Designers and specification writers can use less-noise-producing construction equipment and methods.

Another controllable factor in reducing construction noise is operation of the equipment itself. Just as motorcycle and sports car engines do not have to be "revved up" for efficient street use, big trucks, loaders, etc. do not have to be run at full power or at highest speed. They need not be banged around either; operators can and should control the noise output of their equipment.

Despite the anticipated manufacture of quieter products, most of the nation's urban centers will remain noisier than they need be until residents, like you, recognize that there is no such thing as "temporary" construction and you actively support the enactment and enforcement of effective noise control regulations in your community.

August, 1972

U.S. Environmental Protection Agency
Washington, D.C. 20460

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

noise from heavy construction

All over America, in large cities and small, new office buildings and apartment houses are going up, new highways are under construction, streets are being repaired, new homes are being built—construction activity envelops us and so does one of its by-products—noise.

Construction noise, especially in urban areas, today is a major environmental problem. Few of us recognize it as such, however.

Why? Because we look upon construction as something temporary, although it has become a permanent part of our modern world. No sooner are individual projects completed, than new ones begin; construction is never-ending and so is its noise.

Noise generated in construction and from other sources is certainly an annoyance, but, more important, it can impair our health. Continuous noise at high levels, is not only irritating, but it can damage our hearing and cause other ailments. More and more, people who work in construction or live in constantly noisy environments are experiencing gradual, but permanent hearing loss.

In the construction cycle, noise is usually the loudest in the ground-clearing and excavation phases. The intermediate foundation placement and erection operations generally are somewhat quieter, but again the finishing work tends to produce considerable noise.

The equipment used for heavy construction—earth movers which have high horsepower gasoline or diesel engines, large capacity air compressors, powerful rock drills and demolition tools, pile drivers, cement trucks—was designed to do as much work as possible, with little or no thought given to sound control.

Large portable compressors, for example, produce some of the most objectionable noise. Often as many as eight or nine are lined up along the curb, beside the sidewalk where people pass, and close to apartments, stores and offices, where people live and work. Sometimes the compressors, which produce about twice as much noise as a subway roaring into a station, remain in the vicinity for many months. These devices have become a target for noise control.

In open areas such equipment is not too objectionable because noise levels drop six decibels as the distance from the source doubles. But in large cities with narrow streets, noise bounces back and forth between buildings so the sound decreases little with distance.

Noise Can Be Lessened

At the present time, the most practical method of absorbing or containing noise within a compressor unit is to enclose it in a structure containing sound-insulation material, stiffeners and baffles. Using these techniques, noise levels have been reduced from approximately 105 decibels when measured at 3 feet to less than 90 (or about as loud as a heavy truck passing by, 50 feet away). Further reductions are possible.

In other construction equipment such as tractors, loaders, graders, etc., the major noise sources are the engines, engine exhausts, cooling fans, engine air inlets, transmission and drive chains, pumps, motors and valves and tires.

To reduce these noises, manufacturers are using modifications such as new muffler designs, engine enclosures, slower speed fans, hydraulic tank covers, fuel tank isolation, engine mounts, special floor mats, etc. Manufacturers estimate that these types of modifications will add 1-3 percent to the present costs.

Trucks also add to construction noise, large diesels are the biggest "contributors." In spite of problems in silencing this equipment, most manufacturers agree that they will be able to meet the operating noise level standards of 86 dbA required by the State of California for heavy trucks manufactured after January 1, 1973.

Quieter, new construction equipment, however, will not result in a dramatic, immediate noise reduction. An estimated 90 percent of the 519,000 units sold in the United States from 1960 through 1971 are still in use and an additional 100,000 units manufactured between 1955 and 1960 are still working. Attention, therefore, must be given to changing some construction activities.

One method is to regulate hours of operation; another is to consider the construction site rather than the specific equipment. For example, new, quieter equipment can be used in the cities and the older equipment in suburban or rural areas. To further reduce noise, sound-absorbing barriers also can be used on urban projects. Needed to speed the application of such control techniques, however, is community action to establish and enforce local ordinances and codes to reduce construction noise.

Control Technology Exists

Draglines and pile drivers used in excavation and foundation work; portable steam boilers; jackhammers and other demolition equipment; welding machines; power saws; pneumatic wrenches; drills; reamers; concrete mixers and dump trucks all add to the din of the environment.

Again, adequate basic technology already exists to effectively reduce noise from most of this equipment. Some examples are:

Pile Drivers. Some noise can be eliminated by replacing valves and using silencers on vents. Design changes in boilers, compressors and diesel drives are also possible. The traditional pounding, however, is eliminated in vibrator equipment, a relatively recent development, which is normally operated at resonant frequency and is unusually quiet since the only noises come from the motors and the hum of the vibrators. In addition, ground vibrations extend only a few feet away from the driver. An additional benefit is that pile driving with this new type of equipment is many times faster.

Hammers. Noise is generated by the impacting force and by the exhaust air vents. Pneumatic silencers, comparatively simple and cheap, can reduce noise levels; some air hammers already have silencers.

Riveting. Riveting sounds are in the high noise category and travel for long distances through massive steel structures. Dampening such noise is difficult, if not impossible. However, squeeze-riveting, welding or the use of high-strength bolts are possible alternatives.

Concrete Mixers. This equipment can be made less noisy by using a heavier mixing bucket or by using a sound-absorbing coating. Quieter operation can also be achieved by using plastic gears.

It has been demonstrated that when specific attention is given to noise during development of

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The decibel is the most commonly used measurement of sound. Some scientific opinion holds that continuous 8-hour-exposure to levels of 85 decibels as measured on the "A" scale of a standard noise meter can cause permanent hearing loss. There is individual variation, however, and this time/level combination cannot be considered inflexible. Moreover, annoyance which is really what bothers people most, sets in at levels much lower than 85 decibels and in a time frame of seconds.

International Association of Machinists and Aerospace Workers
Department of
SAFETY & HEALTH

1300 Connecticut Avenue, NW Washington, DC 20036 202/857-5262

NOISE

NOISE

I. Introduction

Hearing loss due to noise is America's number one nonfatal health problem. Noise can be a very subjective topic since it involves so many factors. Its most basic definition is unwanted sound or sound that is irritating to the ears. Sound is a result of a pressure oscillation (increases and decreases in atmospheric pressure due to a rapidly vibrating object). When referring to noise, we must be concerned with wavelength, frequency, sound speed, and amplitude:

1. Wavelength - This is the distance sound waves travel during a period of time.

2. Frequency - The number of variations in sound pressure per second. It is expressed in units called Hertz (Hz). A healthy young ear can detect sounds in the 20 - 20,000 Hz range. Speech occurs in the 250 - 3000 Hz range.

3. Sound speed - Dependent on temperature of air

4. Amplitude - Dependent on temperature and density of air.

There are three basic types of noise:

1. Wide band - Noise distributed across a broad range of frequencies. (Example: airplane noise)

2. Narrow band - Noise distributed across a narrow range of frequencies. (Example: circular saws)

3. Impulse - Noise that is present for short periods of time. (Example: firing of a gun)

The most common unit used for describing noise is the decibel. Since there are a wide range of sound pressures, a logarithmic scale was devised to simplify the expression of noise levels. On the decibel scale, 1 represents the faintest audible sound and 120 to 140 is generally considered to be the threshold of pain.

II. Effects of Noise

General Effects - May cause loss of hearing, disrupt speech communication and hearing, cause annoyance, and impair performance to some extent. Some definitions have been developed to assess type of hearing impairment.

1. Temporary Threshold Shift - Hearing loss, also called auditory fatigue, represents hearing loss which is recoverable after a period of time away from the noise source.

2. Permanent Threshold Shift Hearing Loss - Prolonged exposure to noise results in permanent hearing loss or impairment.

3. Speech Communication Interference - Noise not intensive enough to cause hearing damage, but may disrupt speech communication. While communication is necessary, the levels of acceptability may vary with the nature of work involved.

4. Annoyance - Different levels of noise and frequency may prove to be annoying while performing work tasks.

5. Noise can cause changes in heart beat and respiration, electrical activity of the brain, irritability, and nausea. As a result of this type effect, a stressful type of situation may be experienced by workers. Increased blood pressure has also been noted in workers exposed to excessive levels of noise.

III. Factors Influencing Noise-Induced Hearing Loss

1. Overall decibel level of noise exposure - If a noise exposure does not cause auditory fatigue, then such an exposure is not considered harmful to one's hearing sensitivity.

2. Another consideration is the frequency of the noise - High frequency noise is more harmful to a worker's hearing sensitivity.

3. The time distribution of the exposure is important - In general, intermittent noise exposure is less harmful than steady state noise. The ear is allowed to recover when exposed to intermittent noise.

4. Individual's own susceptibility to noise must be considered - Each invididual will react differently to the same noise levels encountered.

IV. Measurement of Noise

The basic instrument for the measurement of noise is type Type II Sound Level Meter (see diagram). The meter is a portable survey type instrument and consists of a microphone, an amplifier with calibrated volume control, and an indicating meter. Because of its design, noise can be expressed in decibels. There are three weighting networds (A,B,C) provided which are an attempt to duplicate the response of the human ear to various sounds. The weighting network used for most measurements is the A scale.

For personnel exposure, noise dosimeters are used to indicate the amount of exposure the worker may encounter during the shift. The dosimeters contain specialized electronic memory cells that present the exposure in percentages. This percentage can be related to the noise exposure to which the employee was subjected.

V. Control of Noise Sources

Noise control can be achieved with engineering controls, administrative controls, or personal protective equipment. The most desired choice would be tha. of engineering controls, or the design or installation of new equipment to minimize exposure. This eliminates any discomfort of the worker, and allows for normal and efficient operation of duties. There are various types of engineering controls with different degrees of complexities. The following is just a partial list of types of engineering controls:

1. Substitution of machines
2. Substitution of proceses
3. Maintenance of existing machines
4. Isolation of operation
5. Isolation of noise sources
6. Enclosures

The second most desirable method of noise control is by administrative means. These types of controls can be implemented by management in order to reduce the duration workers are exposed to noise. The following are examples of administrative controls:

1. Arrange work schedule to limit operator exposure
2. Increase workforce
3. Perform work around high noise levels when a minimum number of employees will be exposed.

The main disadvantage to administrative controls is that many industrial settings do not lend themselves to flexible work shifts or the operation is not a process which can be stopped or started easily.

The third and least desirable means of control is personal protective equipment. In most cases, this type of control is the one usually encountered due to economic appeal (least expensive control method). Control by personal protective equipment is in the form of ear plugs or ear muffs. Both type of devices have advantages and disadvantages. The application and length of exposure to noise will determine which protection is most suitable. Each employee has his own personal preference, and as long as there is proper attenuation of noise, each can be used effectively. The main disadvantage of ear protectors is the discomfort

that the wearer must endure. There also may be interference in communications with other employees in the area as a result of using ear protection.

If hearing protection is utilized, the type and style should be carefully considered in order that employees will receive the maximum protection afforded by them. All employees should be trained in the proper manner of wearing and maintaining the devices used. A great deal of caution must be used when ear protection is needed on a job requiring communication.

VI. Hearing Conservation Program

If workers are being exposed to excessive levels of noise, a hearing conservation program should be implemented. This type of program will ensure that employees will not suffer continuing deterioration of hearing. The program consists of noise surveys, provision of personal protective equipment, audiometric testing (process of testing for hearing ability or detecting deafness), documentation of results, and education of employees and management about the need of hearing conservation. For a program such as this to be effective, continuous monitoring by qualified individuals is required.

VII. Federal Regulations Concerning Noise

OSHA has a Federal standard concerning noise which can be found in Section 1910.95 of the General Industry Standards. It is not a very comprehensive standard, but does provide a table for permissible noise exposures. A reprint of Table 6-16 is as follows:

Duration per day, hours	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

Exposure to impulse noise should not exceed 140 dBA.

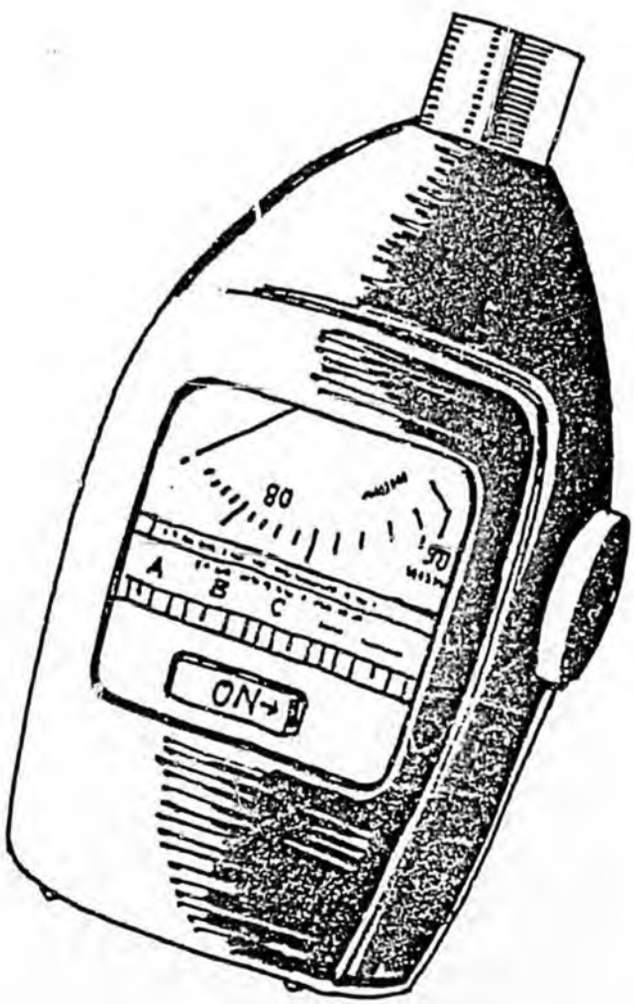
Recently, OSHA promulgated a hearing conservation amendment to Sec. 1910.95 similar to what is mentioned in VI. The amendment applies to establishments which have noise that exceeds 85 dBA for an 8-hour time-weighted average. The amendment does not require engineering controls or reduce the acceptable exposure level but does provide for extensive monitoring. Copies of the standard should be available at the workplace, and are available at the area OSHA office.

VIII. Conclusion

Everyone is aware of the problem that noise presents to the population. There is evidence available that the present standard may not be stringent enough to prevent hearing loss in the exposed populations. If noise is a problem at the workplace, a survey should be done by qualified personnel to locate the noise sources and recommendations made to alleviate the noise.

All employees should have annual audiometric tests to determine if there has been any change in hearing ability during the past year. With the proper education and protection, hearing loss due to noise should be reduced significantly.

One other concern associated with noise is the exposure to vibration. The effects of virbration on the body is not documented as well as the effects caused by noise. There can be a whole body type of an effect where the whole body mass is subjected to vibration, or segmental vibration can occur. This refers to vibration of a portion of the body. Certain physiological and psychological effects can also result from vibration. Vibration can be measured and controls implemented for its control. The subject of vibration is much more complex, but this brief introduction should make employees aware that noise and vibration are frequently associated with each other. If further information concerning vibration is required, inquires may be made to the Safety and Health Department.



B.2.f.

SAFETY RULES FOR LASER OPERATION ENUMERATED

Guidelines for the safe operation of lasers were outlined by Charles L. Cheever, Industrial Hygienist, Argonne National Laboratories (9700 Cass Ave., Argonne, Ill.) at a meeting of the Chicago Section of the American Industrial Hygiene Association on January 8, 1964. The recommendations he made are summarized as follows:

1. Limit the area in which a laser is used to those whose work requires access to the room, and indicate controlled area by use of signs on each door.

2. Provide an intense and distinctive audible signal to alert all personnel in the area of the imminent firing of the laser.

3. Equip all lasers with key-lock switches which permit removal of the key only when the circuit is open. Assign keys only to authorized personnel.

4. Remove all unnecessary shiny surfaces in the general direction of the beam to minimize the potential for specular reflections which may arise not only from mirrors and the front surfaces of lenses, but even from doorknobs, polished table tops or walls, and metal or glass containers. Provide laser safety glasses for reducing the intensity of reflections, but test the glasses periodically since some deteriorate with time and exposure.

5. Forbid personnel to look directly into a laser beam even while wearing optical absorbing lenses, or from a distance calculated to be safe.

6. Contain all lasers in a suitable shield; also shield the light source (pumping light) of the solid state laser to protect operating personnel from the brilliant flashes and the fragments from lamps which may explode.

7. Maintain cables, connectors, cabinets, and switches in proper working order to prevent electric shock and burns. Discharge capacitors before cleaning or repairing. Do not permit operators to leave equipment until all voltage is removed from the capacitors as indicated by a zero voltage reading on the meter. Provide interlocking covers over high voltage circuits to prevent access to energized components, and a tagout or lockout system to prevent connections from being made unless power supplies are disconnected. Ground all noncurrent carrying components.

8. When possible, operate the laser in a well-lighted room to avoid enlarging the pupils of the eyes of personnel and thus minimizing access to the retina.

9. Provide impervious, quick-removal type gloves, face shields and safety glasses as minimum protection for personnel who handle the liquid gases used as coolants for the crystals of pulsed lasers.

10. Remove all unshielded combustible material from the area in which the laser is employed since a laser beam can ignite paper at distances up to 20 feet.

11. Immediately report any incident involving persisting after-images of any light source to the Health Division or Medical Department.

C. 7

NIOSH

Current Intelligence Bulletin 38

MARCH 29, 1983

VIBRATION SYNDROME

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

CURRENT INTELLIGENCE BULLETIN #38

VIBRATION SYNDROME

March 29, 1983

In light of a recently completed, comprehensive study, conducted by the National Institute for Occupational Safety and Health (NIOSH), the Institute concludes that vibrating handtools can cause vibration syndrome, a condition also known as vibration white finger and as Raynaud's phenomenon of occupational origin. Vibration syndrome has adverse circulatory and neural effects in the fingers; the signs and symptoms include numbness, pain, and blanching (turning pale and ashen). Of particular concern is evidence of advanced stages of vibration syndrome after exposures as short as one year. NIOSH recommends that jobs be redesigned to minimize the use of vibrating handtools and that powered handtools be redesigned to minimize vibration. Where jobs cannot be redesigned to eliminate vibrating tools such as pneumatic hammers, gasoline chain saws, and other powered handtools, engineering controls, work practices, and administrative controls should be employed to minimize exposure.

PURPOSE OF BULLETIN

Occupational health and safety professionals, employers, and workers should be alerted to recent information on the potential hazards of vibrating handtools. A comprehensive study recently completed by NIOSH demonstrates the seriousness of vibration syndrome in workers and provides an accurate measure of the prevalence of vibration syndrome. The study suggests that vibration syndrome is severely underreported by workers and health professionals. Workers tend to underreport the syndrome because symptoms are intermittent and occur most frequently under conditions not

present in a doctor's office (e.g., early in the morning or when the hands are cold or wet). In addition, many workers are unfamiliar with the potential seriousness of vibration syndrome. Cases tend to be underreported by physicians because most have not been informed of how to distinguish the symptoms of Raynaud's phenomenon from other medical conditions where blanching or sensory loss occurs. Consequently, many doctors do not perform the appropriate clinical examination and interview to test for vibration syndrome.

Implementation of NIOSH's recommendations should reduce the incidence and severity of vibration syndrome. However, existing data are insufficient to recommend a safe duration and intensity of exposure or specific work practices that will prevent the occurrence of vibration syndrome. Through research, NIOSH is seeking additional information about the relationship between exposure duration and vibration syndrome, as well as effective control technologies to prevent vibration syndrome.

BACKGROUND

Raynaud's phenomenon was first described as "a condition, a local syncope [loss of blood circulation], where persons see one or more fingers becoming white and cold all at once" [1]. In 1 to 3% of the cases, these blanching attacks become progressively more severe over the years, leading to blue and cold fingers; even though the skin may become atrophic, ulcerated, or gangrenous. "Primary" Raynaud's phenomenon, originally described by Dr. Maurice Raynaud, occurs spontaneously in less than 15% of the general population [2]. The ratio of female to male patients is five to one [3]. "Secondary" Raynaud's phenomenon has the same signs and symptoms and progresses through the same stages of severity but may be correlated with a specific cause (i.e., other medical conditions, vinyl chloride, or vibrating handtools). Some medical conditions, particularly fractures, lacerations, costoclavicular syndrome, connective tissue diseases, vascular disorders such as Buerger's disease, generalized atherosclerosis, or a long history of high blood pressure, may result in the same signs and symptoms as primary Raynaud's phenomenon. This CIB is limited to a discussion of Secondary Raynaud's phenomenon resulting from the use of vibrating handtools, referred to as vibration syndrome.

Early stages of vibration syndrome are characterized by tingling or numbness in the fingers. Temporary tingling or numbness during or soon after use of a vibrating handtool is not considered vibration syndrome. To be diagnosed as vibration syndrome, these neurologic symptoms must be more persistent and occur without provocation by immediate exposure to vibration. Other symptoms of vibration syndrome include blanching, pain, and flushing. The symptoms usually appear suddenly, and are precipitated by exposure to cold. With continuing exposure to vibration, the signs and symptoms become more severe and the pathology may become irreversible.

The severity of vibration syndrome can be measured using a grading system developed by Taylor [4]. After a clinical observation and an interview, a worker can be placed into one of the categories in Table 1. Clinical aspects of vibration syndrome are discussed in the Appendix.

Table 1. Stages of Vibration Syndrome

Stage	Condition of Fingers	Work and Social Interference
00	No tingling, numbness, or blanching of fingers	No complaints
0T	Intermittent tingling	No interference with activities
0N	Intermittent numbness	"
TN	Intermittent tingling and numbness	"
01	Blanching of a fingertip with or without tingling and/or numbness	"
02	Blanching of one or more fingers beyond tips, usually during winter	Possible interference with nonwork activities; no interference at work
03	Extensive blanching of fingers; during summer and winter	Definite interference at work, at home, and with social activities; restriction of hobbies
04	Extensive blanching of most fingers; during summer and winter	Occupation usually changed because of severity of signs and symptoms

EXTENT OF EXPOSURE

Based on a 1974 study of occupational exposures to vibration, NIOSH estimates that 1.2 million workers in the United States are potentially exposed to hand-arm vibration (Table 2) [5]. These workers are potentially at risk of developing vibration syndrome.

Table 2. Workers Potentially Exposed to Hand-Arm Vibration

No. of Workers	Industry	Type of Tool
500,000	Construction	Handtools
200,000	Farming	Gasoline chain saws
14,000	Metal working	Handtools
54,000	Steel	Furnace cleaning using powered handtools
30,000	Lumber and wood	Gasoline chain saws
34,000	Furniture manufacturing	Handtools
100,000	Mining	Pneumatic drills
250,000	Truck and auto manufacturing	Handtools
64,000	Foundries	Handtools
Total 1,246,000		

Adapted from reference [5]

EVIDENCE OF HEALTH EFFECTS

Although individual workers reported symptoms of Raynaud's phenomenon and many published studies indicated that occupational exposure to vibration does cause vibration syndrome, there are few medical records of vibration syndrome. In 1979, the Bureau of Labor Statistic's Supplementary Data System contained fewer than 39 cases that might have been vibration syndrome [6]. To resolve the question of whether vibration syndrome is a rare disease or whether the small number of recorded cases is, in fact, due to underreporting NIOSH conducted a recently completed, comprehensive study designed to avoid problems noted in previously published studies [7].

NIOSH studied 385 workers exposed to hand-arm vibration from pneumatic chipping hammers and grinders at two foundries and a shipyard. Workers in the foundries and the shipyard who had never used vibrating handtools comprised the control group. Workers in the exposed groups were in the same work locations as the control workers, and were exposed to vibrating handtools while on the job.

A physician on the research team who had extensive experience in the diagnosis of vibration syndrome examined each worker in the double blind study. Based on clinical observation and interview, each worker was placed in one of the stages shown in Table 1. Neither the worker nor the physician was told if a worker was classified as exposed or control.

In the foundries, 47% of the exposed workers had advanced vibration syndrome (stage 1 or more severe); 19% of the exposed workers in the shipyard were similarly affected. Although no workers in the control group were found to have vibration syndrome, 83% of the exposed workers in the foundries and 64% of the exposed shipyard workers had discernable symptoms. Table 3 displays prevalence of vibration syndrome by stage among the workers.

Table 3. Prevalence of Vibration Syndrome by Stage in Foundry and Shipyard Populations

	Vibration Syndrome Stages	Controls Foundries and Shipyard N=63*		Exposed Workers Foundries N=147*		Exposed Workers Shipyard N=58*
Circulatory Symptoms (or combined symptoms)	03	0%		5%		5%
	02	0%		22%		5%
	01	0%		20%		9%
			Subtotal	47%	Subtotal	19%
Neurological Symptoms Alone	TN	0%		20%		17%
	ON	0%		7%		17%
	OT	0%		9%		11%
			Subtotal	36%	Subtotal	45%
No Symptoms	00	100%		17%		36%
Total		100%		100%		100%

*N = Number of workers

Adapted from Vibration White Finger Disease in U.S. Workers [7]

Workers with medical conditions that might produce signs and symptoms similar to Raynaud's phenomenon were excluded from both the control and exposed groups. Of studies performed in the United States, these prevalence rates are the best available evidence that link Raynaud's phenomenon with exposure to vibration. These data demonstrate the potential seriousness of vibration syndrome in foundries and shipyards and by implication in other workplaces where there are similar tools and operations.

There is a direct relationship between years exposed and severity of vibration syndrome. This relationship in foundry workers is demonstrated in Table 4. Vibration syndrome of stage 1 or greater severity was found in 31% of the workers exposed 1.5 years or less, 41% of the workers exposed 1.5 to 3 years, and 71% of the workers exposed more than 3 years. A similar relationship was observed among shipyard workers (Table 5).

Table 4. Exposure Duration and Severity of Health Effect for Foundry Workers Using Chipping Hammers*

Vibration Syndrome Stage	Exposure Duration (Years) and Prevalence of Symptoms			Percent of Total Workers at a Stage N=147**
	Less Than 1.5 N=56**	1.5-3.0 N=29**	More Than 3.0 N=52**	
02 and 03	11%	24%	50%	27%
01	20%	17%	21%	20%
0T, 0N, and TN	48%	48%	14%	36%
00	21%	11%	15%	17%
Total	100%	100%	100%	100%

*Chi square value 29.8 with p less than .00001
**N = Number of workers

Adapted from Vibration White Finger Disease in U.S. Workers [7]

Table 5. Exposure Duration and Severity of Health Effect for Shipyard Workers Using Chipping Hammers*

Vibration Syndrome Stage	Exposure Duration (Years) and Percent of Workers at a Stage			
	Less Than 5.0 N=22**	5.0-15.0 N=17**	More Than 15.0 N=19**	Percent of Total Workers at a Stage N=58**
TN, 01, 02, and 03	23%	29%	58%	35%
OT and ON	32%	18%	32%	28%
OO	45%	53%	10%	36%
Total	100%	100%	100%	100%

*Chi square value of 9.9 with p=.041
**N = Number of workers

Adapted from Vibration White Finger Disease in U.S. Workers [7]

NIOSH also analyzed the length of time between initial occupational exposure and the onset of symptoms. This is given for each stage in Table 6. The average time for the appearance of blanching, advanced vibration syndrome of stage 1 or greater severity, for foundry workers was 2 years, and for shipyard workers it was 17 years. There is no definitive explanation for this difference. One theory attributes the difference to variations in work practices.

Table 6. Latency Period of Vibration Syndrome for Workers in Foundries and Shipyards

	Foundries		Shipyards	
	Number of Workers	Average Latency (Years)	Number of Workers	Average Latency (Years)
Latency of Tingling for Workers with Stages 0T, TN, 01, 02, 03 (excludes 0N)	94	2	21	9
Latency of Numbness for Workers with Stages 0N, TN, 01, 02, 03 (excludes 0T)	80	2	26	12
Latency of Blanching for Workers with Stages 01, 02, 03	69	2	11	17

Adapted from Vibration Syndrome White Finger Disease in U.S. Workers [7]

Although the symptoms of vibration syndrome have also been associated with smoking and age, these associations were not seen in the study.

The results of the NIOSH study corroborate those of many published studies of Raynaud's phenomenon and vibration. In 1918, Hamilton studied workers who used pneumatic chipping hammers and drills in the limestone quarries of Indiana, and described "spastic anemia of the hands" [8]. Vibration syndrome was described in the 1930's and 1940's by Seyring, who studied workers in iron foundries [9]; by Hunt, who studied riveters who used pneumatic handtools [10]; by Telford et al., who studied workers who used electrically driven high-speed rotating handtools [11]; and by Agate and Druett, who examined casting workers who used grinding wheels [12]. Dart [13] reported vibration syndrome among 112 workers who used pneumatic and electric tools in the U.S. aircraft industry.

In 1960 Pecora et al. concluded that vibration syndrome "may have become an uncommon occupational disease approaching extinction in this country [the United States]" [14]. This finding is inconsistent, however, with those of researchers from many countries that have been published before

and since that report [15,16,17,18,19,20]. This may be due to the fact that Pecora et al. based their conclusions on the results of a questionnaire survey of occupational health physicians, a review of existing occupational health information and the results of an examination of some workers.

Ashe and coworkers reported on a small number of drillers from the hard rock mines of Saskatchewan, Canada, seven of whom were examined in the hospital [15,16]. In these clinical investigations, arteriography and biopsies were performed on the digital arteries of the fingers. In the worst cases, there was extensive damage to the digital artery with narrowing of the blood vessels. This investigation demonstrated that prolonged exposure to vibration could lead to extensive pathological damage to the digital arteries of the fingers.

In the 1960's and 1970's, vibration syndrome was also associated with gasoline-powered chain saws used in forestry work. For example, in Finland, Pyykko [17] found that the vibration of the two-stroke internal combustion engine (transmitted through the handles to the hands) was associated with vibration syndrome in 40% of the lumberjacks studied.

Other studies have been undertaken since the NIOSH study was initiated. In the United States, Taylor et al. [18] examined foundry workers who used pneumatic handtools; in Italy, Bovenzi et al. [19] studied shipyard workers; Kasamatsu et al. [20] studied Japanese chain saw operators; and Harada and Matsumoto [21] examined three groups of workers exposed to different kinds of vibration (rock drillers in a zinc mine, chipping-hammer operators in an iron foundry, and motorcycle mailmen). All studies found significant evidence of vibration syndrome.

The exact point at which vibration syndrome becomes irreversible has not been firmly established. Recently Taylor et al. reported the effect of reduced vibration levels on severity and prevalence of vibration syndrome [22]. After anti-vibration chain saws had been introduced in England, Taylor et al. found that the overall prevalence of vibration syndrome decreased. Vibration syndrome was less prevalent in workers who used only anti-vibration saws than among workers who used other types of saws. In addition, users of anti-vibration saws had an overall decrease in severity of the syndrome. The results of studies such as this have led to the redesign of other tools to reduce the degree of vibration. For example, the ARO 8316® pneumatic scaling hammer and the Vast Hardill VHB-80® pneumatic pavement breaker were specifically designed to reduce both vibration and noise levels.

Despite considerable research, little is known about the physiological basis of vibration syndrome or which specific vibration parameters, such as acceleration, frequency spectrum, or energy transferred to the hand, are the most necessary to control. The progressive stages of vibration syndrome arise from the cumulative effect of vibration-induced trauma to the hands from the regular, prolonged use of vibrating handtools in certain occupations.

Only recently have methods been developed to perform reproducible vibration measurements [23]. In the NIOSH study, acceleration levels were measured in three orthogonal directions [7]. To minimize distortion during measurement of acceleration, the lightest available accelerometers were selected and were tightly mounted to the vibrating tool. For tools with high acceleration rates, such as chippers, the accelerometer was mounted in a fixture which was welded to the chisel. Measuring devices were calibrated before and after each measurement.

Exposure Standards and Guides

The Occupational Safety and Health Administration (OSHA) has not promulgated any standards, nor has NIOSH published recommendations that addressed occupational vibration. Other countries have proposed such standards [24,25]; and the International Organization for Standardization (ISO) has proposed a draft standard for hand-arm vibration (ISO/DIS 5349-1982) [26]. The draft standard specifies methods for measuring and reporting hand-transmitted vibration exposure and attempts to relate these measurements to a limited amount of epidemiological data. The reader is referred to that document. However, due to the difficulty of measuring vibration exposure and the lack of a quantitative relationship between vibration levels and health effects, the ISO draft standard has yet to be accepted in the United States and several other countries. ISO has not yet proposed a final standard to replace the draft standard.

RECOMMENDATIONS

Based on the recent NIOSH study and other published studies, NIOSH concludes that occupational health professionals, workers, and employers should consider the seriousness of vibration syndrome. NIOSH recommends that engineering controls, medical surveillance, work practices, and personal protective equipment be used to help reduce exposure to vibrating handtools and to help identify vibration syndrome in its early stages among workers likely to be at risk.

Engineering Controls

The amount of exposure to vibration in many jobs can be reduced by proper job and production design. Where job redesign is not feasible, direct intervention by means of reducing tool vibration should be attempted.

Recommendation 1 Production lines should be engineered to minimize the need to use vibrating handtools. For example, quality controls on casting could be increased to reduce the average refinishing needed.

Recommendation 2 Tool manufacturers should modify and redesign tools to reduce hand-arm vibration. Tools with reduced vibration levels should be furnished to workers. Purchasers are encouraged to request suppliers to provide evidence that their equipment reduces vibration. More research is needed before a specific standard can be recommended for vibrating handtools. In the meantime, purchasers are encouraged to select tools that minimize vibration. Such information can be obtained from manufacturers' product or technical brochures.

Medical Surveillance and Worker Education

The number of vibration syndrome cases reported is small. Physicians have failed to diagnose the syndrome and workers tend not to report it. All workers who use vibrating handtools are at risk and should be examined for signs and symptoms of vibration syndrome. An examination is recommended because the severity of vibration syndrome appears to be directly related to the cumulative duration of exposure and because health effects can become irreversible.

Recommendation 3 More research is needed in order to specify an optimum surveillance program, but for the present, NIOSH recommends that a medical surveillance program be implemented and that it should be tailored to the degree that workers use vibrating handtools. It should include preplacement examination of all new workers and an initial examination of all present workers who use vibrating handtools. Work histories should be included in all examinations. Work histories should include any prior exposure to vibrating handtools. Medical records, including health and work histories, should be maintained throughout employment and for an extended period after termination of employment.

Recommendation 4 Workers using vibrating handtools and their employers should be informed of the symptoms of vibration syndrome.

Recommendation 5 Workers should see a physician promptly if they experience prolonged symptoms of tingling, numbness, or signs of blanched or blue fingers.

Recommendation 6 Health professionals, particularly occupational health physicians, should be trained in the appropriate clinical examination and interview necessary to diagnose vibration syndrome. (A special NIOSH VWF videotape has been prepared to aid in the diagnosis of vibration syndrome [31]).

Work Practices

Some tools, such as grinders, can cause greater vibration levels to impinge on the hand when wear is uneven or their alignment slips. While insufficient information is available to recommend a safe exposure duration, it is known that the severity of vibration syndrome is related to the extent and duration of continuous exposure to vibration.

Recommendation 7 Vibrating handtools should be carefully maintained according to manufacturers' recommendations.

Recommendation 8 Work schedules with a 10-minute break after each hour of continuous exposure may help reduce the severity of vibration syndrome. Research is needed to determine, however, whether another schedule of rest breaks on job rotation is more appropriate.

Recommendation 9 Workers are advised to:

a. Wear adequate clothing to keep the body temperature stable and normal, since a low body temperature reduces blood flow to the extremities and therefore may trigger an attack of vibration syndrome. Workers are also advised to keep hands warm and dry while on the job. When their hands become wet and chilled, workers should dry them and put on dry warm gloves before additional exposure to vibration More than one pair of gloves may be required on the job.

b. Let the tool do the work, grasping it as lightly as possible while working safely and maintaining tool control. The tool should rest on the workpiece or support as much as possible. The tighter the tool is held, the greater the vibration transmitted to the worker.

c. Substitute a manual tool or other processes where practical.

Personal Protective Equipment

Many types of gloves help maintain body warmth, and, in addition, some designs may attenuate vibration; however, this may be limited to only some of the higher frequencies found in vibrating handtools. Although gloves alone are not recommended as a method of reducing vibration transferred to the hands, they will help keep hands warm, and thus help reduce the severity of vibration syndrome.

Elliott L. Harris

for J. Donald Millar, M.D.
Assistant Surgeon General
Director

LAWS OF ALASKA

1983

Source

CSSB 79(Res)

Chapter No.

93

AN ACT

Relating to toxic and hazardous substances in the workplace; and providing for an effective date.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

THE ACT FOLLOWS ON PAGE 1, LINE 9

Approved by the Governor: July 25, 1983
Actual Effective Date: Sections 1, 3, and 4 take effect July 26, 1983; and Section 2 takes effect July 1, 1984

Chapter 93

AN ACT

Relating to toxic and hazardous substances in the workplace; and providing for an effective date.

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* Section 1. AS 18.60.030 is amended by adding new paragraphs to read:

(12) annually publish a list of toxic and hazardous substances;

(13) maintain a current set of OSHA form 20's or equivalent information for toxic and hazardous substances, and other information relevant to toxic and hazardous substances;

(14) assist employers, upon request, to identify and obtain information on toxic and hazardous substances and develop employee safety education programs.

* Sec. 2. AS 18.60 is amended by adding new sections to read:

Sec. 18.60.065. IMPORTATION OF TOXIC AND HAZARDOUS SUBSTANCES. Toxic and hazardous substances imported into the state shall be accompanied by a federal Occupational Safety and Health Administration (OSHA) form 20 or equivalent information. This requirement does not apply to a substance for which the in-state purchaser has already received the most current information.

Sec. 18.60.066. EMPLOYEE SAFETY EDUCATION PROGRAMS. (a) An employer shall conduct a safety education program for an employee before the employee performs a new work assignment that may result in the employee being exposed to a toxic or hazardous substance for which the employee has not received safety instruction as provided under (b)

of this section.

(b) An employee safety instruction program shall inform the employee of

(A) the location, properties, and known or suspected acute and chronic health effects of the hazardous or toxic substances to which the employee is exposed in the workplace;

(B) the nature of the operations that could result in exposure to hazardous or toxic substances, as well as any necessary handling or hygienic practices or precautions; and

(C) the location, purpose, proper use, and limitations of personal protective equipment used in the workplace.

Sec. 18.60.067. INFORMATION PROVIDED ON EMPLOYEE'S REQUEST. (a) An employer shall make available to an employee on request a copy of the most recent OSHA form 20 or equivalent written information for a toxic or hazardous substance to which the employee may be exposed. If the employer does not have the copy or information requested, the employer shall request a copy from the department or the manufacturer of the substance within three state government working days after receiving the request.

(b) If the copy or information requested under (a) of this section is not made available to the employee within 15 calendar days after the request is received, the employer shall take measures to assure that employees are not exposed to the substance to which the copy or information pertains until the copy or information is made available to the employee who made the request. This subsection applies only to substances for which an OSHA form 20 or equivalent information is required under OSHA regulations. This subsection does not alter, deny, or abrogate any right an employee may have under law to refuse to work under hazardous circumstances.

Sec. 18.60.068. POSTING OF INFORMATION IN WORKPLACE. (a) The department shall print and make available to employers posters that contain notice of the provisions of this chapter relating to toxic and hazardous substances.

(b) An employer whose employees are or may be exposed in the workplace to a toxic or hazardous substance shall display the following information in a manner designed to notify the employees:

(1) a poster printed by the department under (a) of this section; and

(2) an OSHA form 20 or equivalent information for each toxic or hazardous substance to which an employee may be exposed in the workplace

(A) under normal conditions of work; or

(B) during a reasonably foreseeable emergency, including equipment failure and rupture of containers.

(c) Instead of posting the information required under (b)(2) of this section, an employer may post a list of the chemical name and product name of each toxic or hazardous substance to which an employee may be exposed in the workplace, together with an identification of a location, in or near the workplace and accessible to employees, where an employee may inspect the information listed under (b)(2) of this section.

* Sec. 3. AS 18.60.105 is amended by adding new paragraphs to read:

(6) "be exposed" means to ingest, inhale, or absorb through the skin or eyes a substance, or fumes or other potentially harmful aspect of a substance;

(7) "OSHA" means the federal Occupational Safety and Health Administration;

(8) "toxic or hazardous substance" includes

(A) a chemical listed in 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, "General Industry Standards", Occupational Safety and Health Administration;

(B) a chemical listed in "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment", American Conference of Governmental Industrial Hygienists (Latest Edition);

(C) a substance for which an OSHA form 20 or equivalent information is required under OSHA regulations; and

(D) a substance determined by the department, in accordance with the Administrative Procedure Act (AS 44.62), to be a health hazard to an employee who is exposed to the substance, including a carcinogen, reproductive toxin, irritant, corrosive, sensitizer, hepatotoxin, nephrotoxin. neurotoxin, agent that acts on the hematopoictic system, agent that damages the lungs, a cutaneous hazard and an eye hazard;

(9) "toxic or hazardous substance" does not include

(A) substances that because of their physical state, volume, or concentration do not pose a health hazard upon exposure;

(B) substances that are goods, food, drugs, cosmetics, or tobacco products intended for personal consumption; or

(C) substances in transit;

(10) "transit" means conveyed in a sealed or unopened container by a mode of transportation.

* Sec. 4. AS 18.60.105 is amended by adding a new subsection to read:

(b) In AS 18.60.030(14), 18.60.065 - 18.60.068, and 18.60.105-(a)(9)

(1) "employee" means a person who works for an employer,

but not in a place used primarily as a personal residence;

(2) "employer" means a person, including the state and a political subdivision of the state, who has one or more employees working in a place not used primarily as a personal residence.

(3) "health hazard" means a substance capable of causing acute or chronic adverse effects to health;

(4) "workplace" means a place of employment other than a place used primarily as a personal residence.

* Sec. 5. Sections 1, 3, and 4 of this Act take effect immediately in accordance with AS 01.10.070(c).

* Sec. 6. Section 2 of this Act takes effect July 1, 1984.

Table 13-1. Categories of Workers Potentially Exposed to Radiation

- Aircraft workers
- Atomic energy plant workers
- Biologists
- Cathode ray tube makers
- Ceramic workers
- Chemists
- Dental assistants
- Dentists
- Dermatologists
- Drug makers
- Drug sterilizers
- Electron microscope makers
- Electron microscopists
- Electrostatic eliminator operators
- Embalmers
- Fire alarm makers
- Food preservers
- Food sterilizers
- Gas mantle makers
- High voltage television repairmen
- High voltage vacuum tube makers
- High voltage vacuum tube users
- Industrial fluoroscope operators
- Industrial radiographers
- Inspectors using and workers located near sealed gamma ray sources (cesium^{137}, cobalt^{60}, and iridium^{192})
- Klystron tube operators
- Liquid level gage operators
- Luminous dial painters
- Machinists, fabricated metal product
- Maintenance workers
- Military personnel
- Nurses
- Oil well loggers
- Ore assayers
- Pathologists
- Petroleum refinery workers
- Physicians
- Physicists
- Pipeline oil flow testers
- Pipeline weld radiographers
- Plasma torch operators
- Plastic technicians
- Prospectors
- Radar tube makers
- Radiologists
- Radium laboratory workers
- Radium refinery workers
- Research workers
- Television tube makers
- Thickness gage operators
- Thorium-aluminum alloy workers
- Thorium-magnesium alloy workers
- Thorium ore producers
- Tile glazers
- Uranium dye workers
- Uranium mill workers
- Uranium miners
- Veterinarians
- X-ray aides
- X-ray diffraction apparatus operators
- X-ray technicians
- X-ray tube makers

Source: M. M. Key et al. (Eds.). *Occupational Diseases: A Guide to Their Recognition.* Washington, D.C.: NIOSH, 1977. P. 471–472.

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International Association of Machinists and Aerospace Workers
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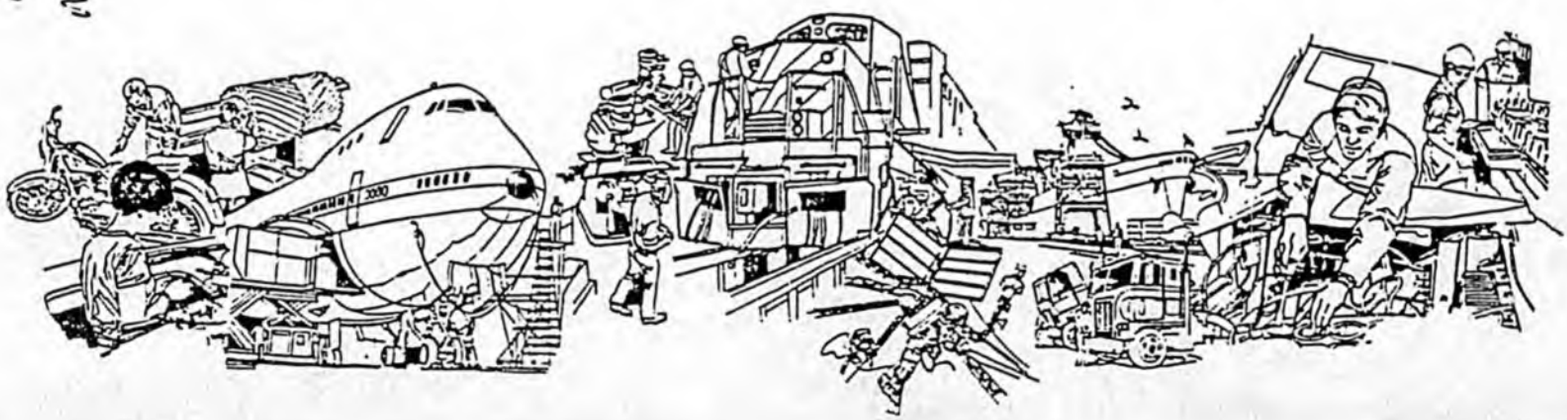
1300 Connecticut Avenue, NW Washington, DC 20036 202/857-5262

NONIONIZING RADIATION

March 15-6
May 3



NONIONIZING RADIATION

I. Introduction

Interest in the public health aspects of nonionizing radiation has increased due to the expanded production of electronic equipment which use or produce this type of radiation. Examples are microwave ovens, lasers, radar, radiofrequency sealers and infrared equipment.

Nonionizing radiation is designated as such due to the fact that it does not produce ionization of cells present in the body. More simply stated, nonionizing radiation does not possess enough energy to produce severe effects similar to ionizing radiation (x-rays, gamma radiation).

II. Types of nonionizing radiation and general mechanism of action on the body

There are several types of nonionizing radiation, each with their own wavelength and frequency to differentiate them:

1. Ultra violet radiation (UV)
2. Infrared radiation (IR)
3. Visible
4. Laser
5. Radiofrequency radiation (RF)
6. Microwave radiation

The general effect exerted on the body by nonionizing radiation is either whole body or localized heating of tissue. The body will absorb the energy produced and it in turn will be converted to heat. This heat in turn will cause the denaturation of protein within the cells and tissue. The eye is the primary organ at risk to nonionizing radiation with the skin also being affected. There is great concern at the present time over effects that are less noticeable. Many of these effects, usually resulting from exposure to RF or microwave exposure, range from immunological and behavioral changes to physiological and central nervous system effects. There is considerable discussion over the importance of these effects but many of the reports have not been substantiated. At the present time, the scientific community is doing research to determine and validate the above mentioned effects in regard to nonionizing radiation.

III. Nonionizing Radiation and Effects

The following table will provide information regarding the six types of radiation listed. The table is by no means intended to be comprehensive. Its main

function is to compile information in a form so as to allow for quick reference. Wavelengths are expressed in micrometers or microns which corresponds to 0.0000394 inches and frequency is expressed in megahertz which is one million cycles per second or hertz. These two properties of radiation expresses the length of the wave and the frequency the waves are being produced. There is some variation as to the exact frequency and wavelength exhibited by these types of radiation, but the ones listed are generally accepted.

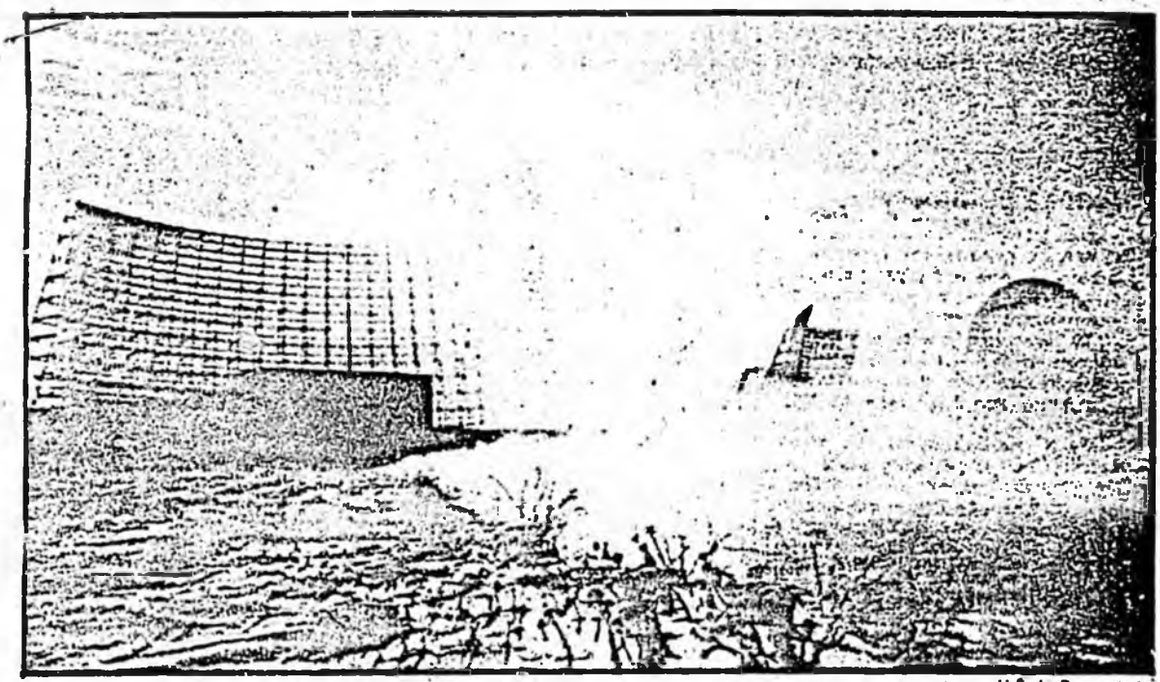
IV. Standards concerning Nonionizing Radiation

The Occupational Safety and Health Administration does have a standard regulating exposure to nonionizing radiation. It can be found in Section 1910.97 in the General Industry Standards. The standard only applies to radiofrequency and microwave radiation with no attention given to ultraviolet, infrared, visible, or lasers. Private agencies have listed recommended exposure limits to these different forms of radiation but none have been implemented into legal standards. There is a Radiation Control for Health and Safety Act which was enacted to set performance standards and control emissions from electronic products using this radiation. The Act ensures that products have been thoroughly tested before being marketed. Presently, there is some concern over the present OSHA standard as being too high, and as of now, action is being taken on the development of a new standard concerning radiofrequency waves and microwaves. In relation to other forms of nonionizing radiation, no definite action has been taken on the promulgation of new standards.

V. Summary

As can be seen from the information presented, exposure to nonionizing radiation is quite common. Of course, some exposure is dependent on the individual (exposure to UV via the sun), but in many cases excessive exposures in the workplace can be prevented. If employees are subjected to this type of radiation due to the work activity, it would be advisable to determine the extent of the exposure. Measurement of this radiation requires different types of instrumentation and should only be done by qualified personnel that are familiar with the devices. It would be advisable that each work location that uses nonionizing radiation have a surveillance program that is conducted in accordance to OSHA guidelines or some other consensus standard. This will ensure that employees are not subjected to hazardous levels of the radiation.

The range of health effects resulting from exposure to nonionizing radiation is still not completely understood. Employees should be aware of the problem if nonionizing radiation is used in their workplace, and inquiries as to the extent of their exposure should be initiated.



U.S. Air Force photo

Clear Air Force Station, part of the United States' ballistic missile early warning system.

After their exposure to microwaves at Clear, workers are looking for help

By RICHARD MAUER
Daily News reporter

CLEAR — On a normal day, the giant aluminum web dish of the Clear tracking radar is pointed at the heavens, casting two powerful microwave beams skyward. The invisible, 5 million watt searchlight probes space for operating satellites, orbiting junk or ballistic missiles aimed at North America.

But on Sept. 14, the tracker beams were cut off and its motor drives stilled. The only noise within the dome sheltering the tracker dish came from eight men at work.

Richard Eldridge and John Jessop were welding a cracked aluminum tube. Carl Keppler and William Emmons, civil service inspectors from California, inspected the work and checked the alignment of critical parts. Ronald Foster and Ed Forsling, two radar technicians, helped the others. Two electricians were installing floodlights beneath the dish.

Sometime after 3 that afternoon, strange things began to happen.

Eldridge, Jessop and Emmons couldn't understand why it was becoming so uncomfortably warm. The radome temperature had been about 60 when they walked in that morning.

Their scalps were especially annoying, as if they had worn hats all day in the summer sun.

Even odder were the stinging metal filings. The welders prepared the aluminum for welding with a grinding wheel, which threw off hot and biting bits of metal.

As Foster crawled around the tracker radar looking for a hole where a fallen bolt belonged, he also felt the strange warmth.

Keppler left his spot on top of the dish and came over to the others. His flashlight was hot to the touch. The bulb had burned out.

See Page A-10, WORKERS

ho suffered radiation at Clear look for answers and someone they can trust

10

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Anchorage Daily News Paul Brown

Ron Foster gets an eye test.

you give me the price of a coffin for a seven-year-old girl?" She couldn't figure out what the caller was talking about and hung up. The next night, the same person called, this time asking, "Could you give me the price of a coffin for a nine-year-old boy?"

Those were the ages and sexes of two of her children. Mrs. Jessop said she went to the FBI and alerted her children's teachers and school bus driver. She didn't tell her husband at first. He had enough on his mind, she said.

Neither William Emmons nor Carl Keppler, the two technical specialists from Sacramento, could be reached for comment.

Forsling has also been suffering pain, faint spells and numbness to his left side. Both Foster and Jessop said that in addition to headaches, they have trouble seeing backlighted objects like television.

Forsling, who never wore

ing Felec and its workmans' compensation insurance company to send them to non-Air Force physicians who specialize in their injuries.

But the workers got another setback. In a letter dated Feb. 1, the insurance company said that a recommended specialist, Dr. Charles Becker of San Francisco University, "chooses not to become involved in this particular case due to the political nature of the claim."

Dr. Herbert Pollack, a physician who led Project Pandora, a secret government study in the 1960s and 1970s into the effects of the Moscow Signal, downplayed the severity of the Clear accident in a telephone interview at his office in Palm Beach, Fla.

"The amount of damage one can expect in this particular situation is minimum, if any at all," he said.

Others are not so sure.

Dr. Hans-Arne Hannson, a clinical and laboratory researcher at the university in Goteborg, Sweden and a leading expert in microwave radiation, said in a telephone interview that it would be hard to assess the damage to the men because so little is known about microwave exposure. Accidents like the one at Clear "are only rarely known," Hannson said.

But research is slowly catching up, Hannson said. Technical improvements in equipment and methods have enabled researchers to detect minute changes in body chemistry caused by microwaves — changes that could have significant impact on a person as time goes on.

Hannson is now doing clinical studies for the Swedish

plete.

"The eye is really a disabled eye from that point on. You can't focus anymore," Zaret said.

Because additional exposure could cause cumulative and irreversible damage to the workers at Clear, Zaret said, they might be wise to avoid microwave radiation sources, whether at Clear or from leaking microwave ovens, computer video display terminals or even citizen's band radios.

Zaret examined Richard Eldridge in December and found swelling of the eye lens. He said it was too early to predict whether Eldridge would develop cataracts.

The delays that the Clear workers went through before receiving treatment may have had more than medical effects, Zaret said.

"Part of the problem with these fellows now is that they're so suspicious that they wouldn't feel a good doctor-patient relationship with any of the physicians being put forward by the military establishment or some of the (military) sponsored research scientists," Zaret said.

□

The Clear case has caught the interest of Alaska's congressional delegation. On Jan. 16, Rep. Don Young call for a full-scale investigation of safety procedures at Clear in a letter he sent to Verne Orr, the Air Force secretary.

Young said the Air Force and Felec "did not cooperate in good faith with the affected employees in evaluating and treating any injuries or physical damage that may have incurred."

Young's aide, William Sharrow, was unhappy with the

actions in the case.

"In December, Sen. Stevens and Sen. Murkowski both wrote the Air Force and asked that the victims get proper medical attention," said an aide to Stevens. "We got a letter back that was not satisfactory to either office."

Young has also called for a independent evaluation to measure how much radiation the workers were exposed to. He is not alone.

According to state documents, the Alaska Department of Labor requested the U.S. Occupational Safety and Health Administration office in Seattle to provide assistence in a new survey three times since Nov. 1. The request was repeated to Jim Lake, OSHA regional administrator in Seattle, when he visited Juneau Thursday on other matters.

Ray Jorgensen, chief industrial hygienist for the state labor department, said state investigators lack the equipment and experience for a survey. Though OSHA is usually "more than conducive to provide assistance," Jorgensen said, in this case the answer from Lake has so far been negative.

In an internal memo to Lake, Robert Curtis, senior industrial hygienist for OSHA's special health response team in Salt Lake City, suggested Jan. 12 that a second survey be done to allieviate the doubts expressed by the workers. The memo was obtained under the Freedom of Information Act.

In his memo, Curtis reported that Col. Roger Graham of Brooks Air Force Base had said the official Air Force position is to "discourage additional measurements." Curtis said

made up our minds that th Air Force is competent to han dle it. It wouldn't have made difference what kind of expo sure (the workers) had becaus the medical evaluation tha was done would take care o any situation. I don't know what we would buy by goin back in and doing a re-mea surement."

But Foster said Lake wrong. "It happens everyon is sick from this, and this going to be with us for the re of our lives. Every one of ou doctors is telling us an accu ate survey is important."

□

John Jessop, the welder, n ticed something very strang while working in an unde ground utility corridor ne the giant detection radar dishes at Clear. The discove has him nervous.

"I'm no expert, but I know what I've seen," Jessop sai "I've seen some very disturb ing, grossly deformed litt critters, shrews and re backed voles. I've seen the with crooked tails, crook legs, humps on their bac deformities in their heads, a some without even any eye They run around out here back of the screens."

Jessop said he talked abo the rodents in the meetin with Air Force personnel f lowing the accident. A doct from Eielson Air Force Ba seemed interested at the tim but so far no one has gone Clear to capture them.

After seeing what mic wave radiation may have do to the mice and feeling what already has done to him J sop is wondering what future holds.

BNA

OCCUPATIONAL SAFETY & HEALTH REPORTER

A weekly review of occupational safety and health developments

Volume 14, Number 16 | THE BUREAU OF NATIONAL AFFAIRS, INC. | September 20, 1984

HIGHLIGHTS OF CURRENT REPORT

THE ARSENIC STANDARD is upheld by the U.S. Court of Appeals for the Ninth Circuit, which finds that the secretary of labor did not abuse his discretion in refusing to reopen the rulemaking record to reconsider the standard's feasibility. Criticism by the smelting industry of studies relied on by the Occupational Safety and Health Administration in setting a 10 microgram exposure limit was "unpersuasive," the court finds (p. 331).

WALTER F. MONDALE, the Democratic candidate for President, charges that OSHA under the Reagan Administration "is more interested in maintaining friendly relations with business than it is with protecting workers." Mondale says that, if he is elected President, his first priority for OSHA will be to appoint "dedicated professionals who believe in the OSHA law" to direct the agency (p. 331).

THE HAZARD COMMUNICATION RULE issued by OSHA should cover all employees, Public Citizen asserts in a court brief filed in its challenge to the standard. OSHA's decision to apply the standard only to the manufacturing sector was "plainly motivated" by the desire to reduce the cost of compliance to employers, and "fails any test of rationality," the public interest organization contends (p. 332).

ORGANIZED LABOR'S MAIN PRIORITY for workplace safety and health is "turning Ronald Reagan out of office in 1984," United Steelworkers of America President Lynn R. Williams tells an AFL-CIO annual conference (p. 333) . . . Citing a cotton dust interim order given to Dan River, Inc., as a reflection of OSHA's policy of allowing "human experimentation," Rep. Bruce Vento (D-Minn) tells attendees at the conference to make this type of issue a part of the 1984 presidential campaign (p. 335).

A SHORT TERM EXPOSURE LIMIT for ethylene oxide is the subject of a request for information by OSHA. The agency asks for comment on the need for such a limit, and on the mixed responses the agency has received from a scientific peer review group on the issue (p. 334).

CRANE AND DERRICK RULES that would limit the use of such equipment for hoisting personnel to elevated work areas would entail first-year costs of about $5.8 million, but they also would result in savings that could range from $8.4 million to $12.5 million, according to data from an analysis presented at a hearing on the proposed standard (p. 334).

FISCAL 1985 FUNDING for OSHA would be provided under a continuing resolution approved by the House Appropriations Committee as a stopgap measure failing passage of a regular appropriations bill. The resolution would provide $219.6 million for OSHA, the same amount specified in the pending House appropriations bill (p. 336).

WORKERS IN OFFICES face potential hazards from indoor air pollution, stress, and low-level radiation, according to an Office of Technology Assessment report released by Rep. Mary Rose Oakar (D-Ohio). The report calls for more research on such risks, saying that, although the hazards may not be life-threatening, they still may be potentially disabling, and can be costly in terms of lost work time. Oakar criticizes the Reagan Administration for inadequately funding such research (p. 336).

A FINDING OF CIVIL CONTEMPT is made by the U.S. District Court for the District of Nebraska in the case of a steel foundry which refused to permit entry by OSHA inspectors, despite the fact that the compliance officers presented valid search warrants. The court rejects an argument by the company that OSHA failed to show probable cause in seeking to conduct a safety and health inspection at the facility (p. 337).

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A safety bulletin, prepared by the company in April 1983, observed that the threshold limit value for trichlorotrifluoroethane is 1,000 ppm, that concentrations above 2,500 ppm could cause central nervous system depression, and that concentrations above 5,000 ppm could cause cardiac sensitization. In addition, a safety bulletin setting forth specific rules as to the amount of trichlorotrifluoroethane that could be used in a tracked vehicle was never posted for employees or enforced by supervisors or safety personnel, the plaintiffs' statement emphasized. Despite these safety bulletins, management took no action regarding the use of Gensolv D at the Center Line plant.

A solvent distribution test conducted by General Dynamics following the accident indicated that substantial fluid remains trapped in the vehicle after flushing in the manner used. A simulation test designed to duplicate the events that occurred Nov. 14 and 15 indicated that the fluorocarbon vapor concentration at Lee's breathing zone probably increased to more than 30,000 ppm when the air filtering system was automatically activated, the plaintiffs contended.

Based on the facts in evidence there was prior knowledge by key supervisory personnel of incidents regarding employee exposure to trichlorotrifluoroethane as well as knowledge of a safety bulletin that contained specific rules limiting the amount of the trichlorotrifluoroethane that can be used in tracked vehicles, according to the plaintiffs. A failure to communicate the hazards of misuse of the solvent and failure to communicate the rules as to use of the solvent as contained in the safety bulletins resulted in the death of Lee, they asserted. For these reasons, the plaintiffs argued that General Dynamics should be bound over for trial on the charge of involuntary manslaughter and willful violation of the Michigan Occupational Safety and Health Act.

Theodore Klimaszewski, assistant attorney general for Michigan, told BNA that oral argument in the case is scheduled for Sept. 26. Judge Kennedy will decide at that point whether to bind the company over for trial.

Meetings

STRATEGIES FOR CANCER PREVENTION IN THE WORKPLACE SUBJECT OF SYMPOSIUM

Strategies for the prevention of cancer in the workplace will be the subject of the second annual Symposium on Recent Advances in Occupational Cancer, scheduled to be held Dec. 7-8 in San Francisco, Calif.

Among the topics to be discussed are workplace risk assessment, current legal and policy issues in cancer prevention, phenoxyherbicides and other pesticides in the etiology of cancer, occupational skin cancers, formaldehyde in insulation and pathology, and ethylene dibromide risks in farming and food products, according to the agenda for the meeting.

Sponsors for the symposium are the American Cancer Society, San Francisco unit, Region IX, National Institute for Occupational Safety and Health; Northern California Occupational Health Center, and Extended Programs in Medical Education, University of California School of Medicine, San Francisco.

For further information, contact Extended Programs in Medical Education, Registration Office, 1456 Ninth Ave., San Francisco, Calif. 94122; tel. (415) 666-5808.

Research

EVALUATION OF INDUSTRIAL LOW-BACK INJURY SUBJECT OF STUDY BY NIOSH SAFETY DIVISION

A procedure for the objective evaluation of industrial low-back injury is in the early stages of development at the National Institute for Occupational Safety and Health, BNA was told Sept. 12.

The "evaluation tool" would be used to more strictly classify various low-back disorders that now are combined into the general category of "sprains and strains," according to Roger Nelson, NIOSH Division of Safety Research, the project officer for the study.

NIOSH's ultimate intent is that, as these disorders are better defined, the task that led to a specific injury can be examined, and measures can be taken to prevent such an injury from occurring again, Nelson remarked.

A preliminary meeting on the protocol for the study was held last February, and a follow-up peer review session was scheduled for Sept. 20 in Morgantown, W.Va. The protocol will be examined by a 12-member peer review group providing a "broad representation" from industry, insurance, ergonomics, physical therapy, and other relevant fields, Nelson said.

"We want a valid, reliable tool for evaluating the patient," the NIOSH researcher commented. At present, the draft evaluation procedure is composed of "universal tests and measurements," but it could be changed later if any of these tests are found to be unreliable after further study, he told BNA.

Another goal in developing the evaluation procedure, he added, is to keep the tests "simple," so that the procedure can be used by small practitioners.

Further information on the project is available from Roger Nelson, Ph.D., NIOSH Division of Safety Research, 944 Chestnut Ridge Road, Morgantown, W.Va. 26505; tel. (304) 291-4454, or FTS 923-4454.

Research

PARAMETERS FOR REPRODUCTIVE STUDY TO BE SUBJECT OF OCT. 11 REVIEW SESSION

Details of a planned study of human semen characteristics will be reviewed at a meeting scheduled for Oct. 11 in Cincinnati, Ohio, the National Institute for Occupational Safety and Health announced (49 FR 36018).

Participants will discuss the semen characteristics that should be studied in a longitudinal study design, the Sept. 13 notice indicated. Comments and suggestions from industry, labor, academia, other government agencies, and the public are invited, NIOSH stated.

The meeting is scheduled to take place from 8 a.m. to 4:30 p.m. at the Auditorium, Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

For further information, contact Steven M. Schrader, Ph.D., NIOSH Division of Biomedical and Behavioral Science, at the same address, tel. (513) 684-8357, or FTS 684-8357.

Radiation

URGENT NEED TO EXAMINE POTENTIAL RISKS FROM NON-IONIZING RADIATION SEEN BY ILO

GENEVA, Switzerland — (By a BNA Special Correspondent) — There is an urgent and growing need for a new look

to be taken at the potential health hazards of non-ionizing radiation, which has become both a blessing and a curse in modern society, the International Labor Office asserted.

The radiation is a blessing because the use of devices emitting electromagnetic rays promotes scientific progress, increases industrial productivity, facilitates communications, and, when used in medical treatment, helps save lives, a new ILO pamphlet, "Occupational Hazards from Non-Ionizing Electromagnetic Radiation," said.

However, as their use becomes more common, rays from such devices can have adverse effects on the skin, eyes, and in some cases the central nervous systems of workers who operate the equipment, the report stated.

One of the widest applications of microwave and radiofrequency technology is in communications and broadcasting, the pamphlet pointed out. Broadcast transmitters may constitute a health risk to maintenance crews servicing equipment on the towers while the transmitters are operating. In addition, personnel working inside broadcasting towers and near cables and waveguides that feed antennas also may be exposed to harmful levels of radiation, the report said.

Personal exposure to radiation from microwave ovens in the home normally is small, the pamphlet also noted, because of a rapid decrease of the power density with increasing distance from the source. But overexposure to radiation from industrial microwave ovens, which are more powerful, should be minimized to protect workers against excessive leakages which could cause eye lesions, it added.

Radiofrequency Heaters

Heaters using radiofrequency energy are used widely in industries producing cars, furniture, glass fiber, sealing rubber, and textiles. Devices that are poorly designed or have unshielded applicators can give off stray electromagnetic energy that could be a health hazard — an important one since most of the operators of heaters are women of childbearing age, the pamphlet contended. It said, however, that further clarification is needed regarding the effects this type of radiation has on the fetus.

Some video display terminals generate electromagnetic radiation which is strongest close to the screen and drops rapidly at a distance, the pamphlet continued. At 20 to 30 centimeters from the screen, the potentially harmful emission is either not detectable, or, at worst, is far below the most stringent exposure levels in force anywhere in the world, it said.

Serious and painful ultraviolet-induced eye and skin irritations sometimes are experienced by unprotected workers exposed to direct radiation from other types of non-ionizing radiation devices, germicidal and arc lamps, the ILO report remarked.

Ultraviolet or "quartz" lamps are used for germicidal control in hospital corridors, intensive care wards, operating rooms, and biological laboratory hoods. In an operating room with a quartz-memory discharge lamp mounted in open ceiling fixtures, protective rubber clothing is essential for all personnel, the report stated.

Regarding optic radiation from welding arcs, the report called for control measures to be adopted to limit this exposure, coupled with the mandatory use of personal protective equipment.

In printing plants and other graphic arts facilities, arc lamps and tungsten halogen lamps are used for making negatives and photo-offset plates. ILO said that large camera units should be located well away from work and traffic areas, and employees should be warned against looking directly at exposed lamps.

Risk of Laser Damage

Increasing use of lasers in such areas as satellite communications, controlled fusion research, surveying, surgery, holography, and automatic supermarket checkout systems has brought increased risk of damage from laser beams, the report warned. Damage caused to the eye by laser radiation is often irreversible, and although skin irritation and its biological consequences are considered repairable, excessive exposure can cause depigmentation, severe burns, and possible injuries to underlying organs, the publication said.

Prevention of undue exposure requires the use of enclosures, shielding, and personal protective equipment such as eye protection with proper filters, and reliance on distance to reduce the intensity of radiation. However, the report cautioned that distance cannot be used as a means of controlling exposure to laser beams.

Workers should be made aware of potential hazards, and warning notices should be posted as a constant reminder that danger exists, the pamphlet suggested. Further, it said, sources of non-ionizing radiation may have secondary hazards against which safeguards also must be provided.

"Given the complexity of identifying and assessing the non-ionizing radiation hazards in order to effect control measures, an inter-disciplinary approach is called for to coordinate preventive action at the national level," the report concluded. "There is also need for international cooperation to set new standards and harmonize those which already exist."

For further information on the publication, contact the International Labor Office, Route des Morillons 4, Geneva 1202 Switzerland.

Publications

CASE CONTROL STUDY OF MELANOMA AMONG LIVERMORE WORKERS PUBLISHED

A follow-up report to a 1980 case control study of malignant melanoma among employees of Lawrence Livermore National Laboratory in Livermore, Calif., is available from the California Public Health Foundation.

The 1980 study found a higher than expected incidence of malignant melanoma among employees of the laboratory during the period 1972-77 (Current Report, May 1, 1980, p. 1112). The follow-up investigation was designed to search for "the reason or reasons for that previously established excess," the new report stated.

Seven factors were found to be "significantly associated" with the melanoma cases, and five of these further were determined to be independent of non-occupational factors, the report indicated. These included exposure to radioactive materials, work at a non-nuclear weapons testing site near the laboratory, exposure to volatile photographic chemicals, presence at a Pacific test site at the time of a nuclear explosion, and duties as a chemist.

The sixth factor, exposure to fumes from high explosives, appeared to be largely an indirect measure of two other risk factors, the report stated. The seventh, involving work location at a building constructed in 1969, appeared to exert its effect primarily among persons who, due to constitutional factors, were more susceptible to malignant melonoma than other persons.

Results of the investigation are presented in six sections in the report. The sections provide a description of the

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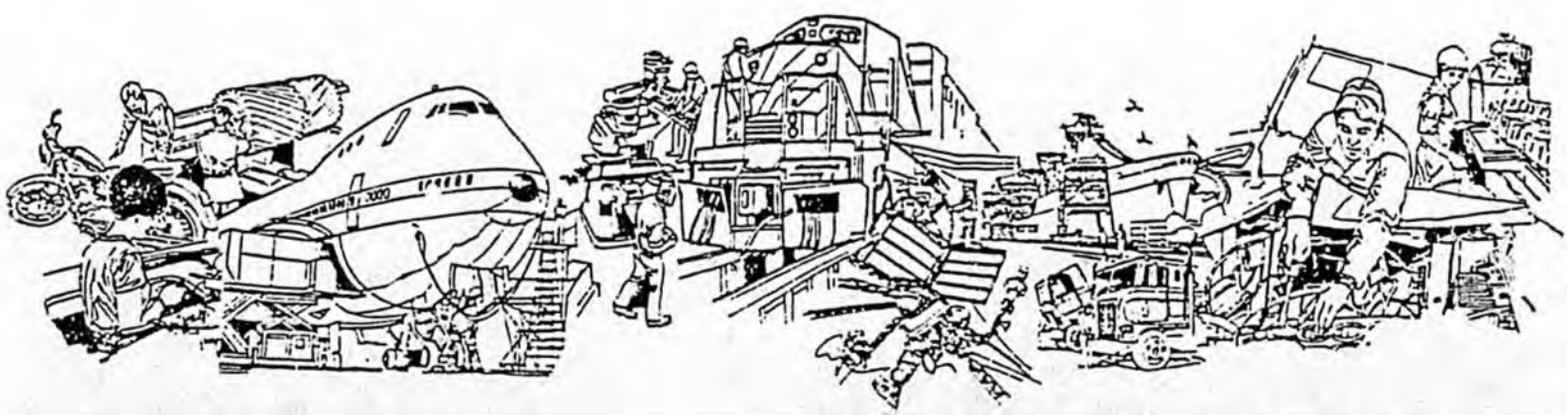
International Association of Machinists and Aerospace Workers
Department of
SAFETY & HEALTH

1300 Connecticut Avenue, NW Washington, DC 20036 202/857-5262

IONIZING RADIATION



IONIZING RADIATION

The potential for occupational illness arising from the use of radiant energy has become a more important problem with the increasing use of radiation and radioactive materials in laboratory investigation and in industry.

Properties (Ionizing Radiation)

Ionizing radiation has always been a part of our natural environment. Since the discovery of x-rays and radioactivity, it has become a part of the industrial environment of many workers.

Ionizing radiations are produced naturally by the decay of radioactive elements. They are artificially induced by such devices as x-ray machines and high energy motivators, or accelerators.

By general definition an ion is an atom or group of atoms carrying a positive or negative electric charge as a result of having lost or gained one or more electrons. An ion may also be considered a free electron or other charged subatomic particle. Radiation affects humans by ionizing--that is, altering the electrical charge of--the atoms and molecules comprising body cells.

Radioactivity, natural or artificial, is the emission of radiation resulting from spontaneous or induced disintegration of atomic nuclei. The radiations that result from these nuclear changes are basically alpha rays, beta rays, and gamma rays.

Different types of ionizing radiation i.e., alpha, beta, gamma, vary in their penetrative powers as well as the number of ions they produce in passing through matter. This is important because the biological effects of radiation vary with ion density produced in the body.

The electromagnetic (EM) waves of radiation consist of electromagnetic forces. When these forces are disturbed, EM radiation results. Known EM radiations are grouped into a spectrum according to their frequency and/or wavelength.

The radiation spectrum is a continuum of frequencies or wavelengths (non-ionized) ranging from below radio frequencies, to microwave, infrared, visible, ultraviolet, and above ionizing radiation. The amount of energy absorbed by workers varies considerably over this range.

The safety, health, and control problems associated with this range of magnitudes are great. No other area of human research has such a wide range of hazards which must be considered, classified, and regulated.

Occupational Exposures

Entry of radiation into the body during occupational exposures is principally through inhalation of particles or gases. Ingestion and skin absorption can be important exposure routes as well.

Implantation under the skin may occur as a result of accidental skin puncture or laceration. Once inside the body, the radioactive agents are absorbed, metabolized, and distributed through the tissues and organs depending on the chemical properties of the elements. Their effects on organs or tissues depend on the type and energy of the radiation and amount of time in the body.

The impact of external radiation depends on the penetrating ability of the particular type of radiation.

Penetrating radiation with x-rays and gamma-rays is widely used in industrial radiography for flaw detection (welding cracks, defects in reinforced concrete), for thickness gauging (production line control of paper, aluminum, copper, tinplate, plastics, glass, rubber), for density gauging (H/C ratios in analysis of hydrocarbons such as fuel oils, conduit pipe contents), and for liquid level gauges (measurement of height of molten metals).

Reflection of radiation is used for measurement of thickness of coatings over base metal. Self-luminescent markers are widely used for instrument panels and faces.

Ionization of the air by alpha particles to eliminate static electricity is one of the more recent industrial uses of radioactivity.

A number of radioisotope batteries have been developed for production of electric current. Radioisotopes have been used as tracers in detection of metal wear (such as piston rings).

The term "non-ionizing radiation" refers to regions of the electromagnetic (EM) spectrum where the energies of emitted photons, or units of radiant energy are insufficient to ionize other atomic matter. The transparent tissues of the eye,

the tastes, and the central nervous system display a very high sensitivity to the thermal effects of ultraviolet and visible portions of the spectrum. Similarly, organs which possess [illegible]ed electrical activity, such as the heart, brain, and nervous system may be influenced by radiofrequency radiation.

Occupational Hazards

Biological damage is related to the kind of radiation, the total dose received, and the rate of irradiation. The units used to express radiation dosages have been changed over the years. This has resulted as industry has come to appreciate the widely different degrees of adverse biological effect of various kinds of radiation.

The basic physical unit for dosage is the roentgen, or rem. It is the unit used to express human biological doses as a result of exposure to one or many types of ionizing radiation. The current annual permissible dose of body exposure in the United States is 5 rem per year with 3 rem permitted within a period of 13 weeks.

The effects from occupational exposure to ionizing radiation are usually localized, leading to burns and radiodermititis (rashes, skin aberrations). Acute radiation syndrome (ARS) occurs rarely. This type (ARS) involves whole body exposure typically exceeding 100 rems given in a very short time. In this severe case, symptoms are nausea, vomiting, diarrhea, weakness and shock. Death may result from severe bone marrow depression with ARS exposure.

The mechanism by which radiation causes cancer is not completely understood. It is currently believed that it involves damage to the genes. In addition to controlling every aspect of an individual's hereditary characteristics, genes also control cellular activities and cellular rates of division.

Radiation can collide with the regulatory gene controlling the cell's rate of division, with possible cell destruction. Or the other hand, the cell may continue to function normally for a number of years. Later, however, instead of dividing to produce two new cells, the irradiated cell may produce many identically damaged cells uncontrollably. This growth is called cancer.

Accepted Levels of Exposure

National exposure limits have been set at 5 rems per year with a 3 rem permissible level over a 13 week period.

However, developing research led by the IAM's medical consultant, Dr. Thomas Mancuso and consultants Dr. Alice Stewart, doctor and epidemiologist from Birmingham, England, and George Kneale, statistician from Oxford, now

suggest that the permissible levels of low-level radiation should be reduced tenfold to .5 rems per year. The arguments are based on long-term research not yet completed.

Prevention of Radiation Poisoning

Protection against unnecessary exposure requires the use of shielding appropriate to the intensity and type of radiation, protective clothing, properly filtered eye protection, enclosed dry boxes (also known as glove boxes), appropriate ventilation with high-efficiency filters interposed in the duct work, and the presence of safety showers in case of external contamination.

Measurement of the amount of radiation a person may receive is done through use of a variety of film badges, pocket dosimeters, and other devices. This may include permanently installed radiation monitors with signaling devices when radiation levels exceed a critical point.

Further studies are continuing, but caution is our byword.

RA569

Fairbanks News Miner 17 Sept 71

Drop in radiation level at Anaktuvuk Pass

A 50 per cent decrease in radiation level among residents of Anaktuvuk Pass has been recorded this year, U.S. Sen. Ted Stevens said Thursday.

The decrease in radiation levels was reported by the Atomic Energy Commission whose scientists have been studying the effects of fallout on Alaskans since 1964. In a letter to Stevens, the AEC's director of biology and medicine reported that the 1971 summer measurements—made July 27-31—showed a level of 50 per cent lower than those of the previous summer.

In addition to testing 74 residents of Anaktuvuk Pass by age groups, the AEC scientists sampled caribou flesh, lichen and plants. The scientists said they expected the radiation level to be even lower when the next testing session is held in the winter. The researchers who conducted the studies were from Pacific Northwest Laboratories.

They tested the residents in the following age groups: adults, minors 15-20 years old and children under 15. They reported that although able-bodied men of the village had been fire fighters and had eaten commercially processed foods which would account for a drop in the radiation levels, the lower levels were also found in women and children.

THINK HYPOTHERMIA

If you are outdoors for recreation, you presumably do not intend to jeopardize your life.

Hypothermia may be a new word to you, but it's the *only* word that describes the rapid, progressive mental and physical collapse accompanying the chilling of the inner core of the human body.

Hypothermia is caused by exposure to cold, aggravated by wet, wind, and exhaustion. It is the #1 killer of outdoor recreationists.

- **TAKE HEED OF "HYPOTHERMIA WEATHER."**
- **WATCH CAREFULLY FOR WARNING SYMPTOMS.**
- **CHOOSE EQUIPMENT WITH HYPOTHERMIA IN MIND.**
- ***THINK HYPOTHERMIA.***

NOTES ON EQUIPMENT

Choose rainclothes that are proof against *wind-driven* rain and cover head, neck, body, and legs. Polyurethane coated nylon is best. The coatings won't last forever. Inspect carefully and test under a cold shower before you leave home. Ponchos are poor protection in wind.

Take woolen clothing for hypothermia weather: 2-piece woolen underwear...or...long wool pants and sweater or shirt. Include a knit cap that can protect neck and chin. Cotton underwear is worse than useless when wet.

A stormproof tent gives best shelter. Take plastic sheeting and nylon twine for rigging additional foul-weather shelter.

Carry trail food...nuts, jerky, and candy...and keep nibbling during hypothermia weather.

Take a gas stove or a plumber's candle, flammable paste, or other reliable firestarter.

- **DON'T WAIT FOR AN EMERGENCY. *USE* THESE ITEMS TO AVOID OR MINIMIZE EXPOSURE.**

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FOUR LINES OF DEFENSE AGAINST HYPOTHERMIA

From the motion picture
...BY NATURE'S RULES

SAFECO MOUNTAIN RESCUE

OLD KILLS IN TWO DISTINCT STEPS

STEP ONE: EXPOSURE AND EXHAUSTION

The moment your body begins to *lose heat* faster than it produces it, you are under-going exposure. Two things happen:

1. You voluntarily *exercise to stay warm.*
2. Your body makes involuntary adjustments to preserve *normal temperature in the vital organs.*

Either response drains your energy reserves. The only way to stop the drain is to reduce the degree of exposure . . .

- **THE TIME TO PREVENT HYPOTHERMIA IS DURING THE PERIOD OF EXPOSURE AND GRADUAL EXHAUSTION.**

STEP TWO: HYPOTHERMIA

If exposure continues until your energy reserves are exhausted:

1. Cold reaches the brain depriving you of judgement and reasoning power. *You will not realize this is happening.*
2. You will lose control of your hands.

This is hypothermia. Your internal temperature is sliding downward. Without treatment, this slide leads to stupor, collapse, and death.

OUR FIRST LINE OF DEFENSE: VOID EXPOSURE

1. STAY DRY. When clothes get wet, they lose about 90% of their insulating value. Wool loses less, cotton, down, and synthetics lose more.
2. BEWARE THE WIND. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. *Wind refrigerates wet clothes* by evaporating moisture from the surface. WIND MULTIPLIES THE PROBLEMS OF STAYING DRY.
3. UNDERSTAND COLD. Most hypothermia cases develop in air temperatures between 30 and 50 degrees. Most outdoorsmen simply can't believe such temperatures can be dangerous. They fatally underestimate the danger of being wet at such temperatures.
   - 50 degree *water* is unbearably cold. The cold that kills is *cold water* running down neck and legs, *cold water* held against the body by sopping clothes, *cold water* flushing body heat from the surface of the clothes.
   - DON'T ASK, "HOW COLD IS THE AIR?" ASK INSTEAD, "HOW COLD IS THE WATER AGAINST MY BODY?"
4. USE YOUR CLOTHES. Put on raingear *before* you get wet. Put on wool clothes *before* you start shivering.

YOUR SECOND LINE OF DEFENSE: TERMINATE EXPOSURE

If you cannot stay dry and warm under existing weather conditions, using the clothes you have with you, *terminate exposure.*

1. BE BRAVE ENOUGH TO GIVE UP REACHING THE PEAK OR GETTING THE FISH OR WHATEVER YOU HAD IN MIND.
2. Get out of the *wind and rain.* Build a fire. Concentrate on making your camp or bivouac as secure and comfortable as possible.

NEVER IGNORE SHIVERING

Persistent or violent shivering is clear warning that you are on the verge of hypothermia. MAKE CAMP.

FORESTALL EXHAUSTION

Make camp while you still have a reserve of energy. Allow for the fact that exposure greatly reduces your normal endurance.

You may think you are doing fine when the fact that you are exercising is the only thing preventing your going into hypothermia. If exhaustion forces you to stop, however briefly:

1. Your rate of body heat production instantly drops by 50% or more.
2. Violent, incapacitating shivering may begin immediately.
3. You may slip into hypothermia in a matter of minutes.

APPOINT A FOUL-WEATHER LEADER

Make the best-protected member of your party responsible for calling a halt before the least protected member becomes exhausted or goes into violent shivering.

YOUR THIRD LINE OF DEFENSE: DETECT HYPOTHERMIA

If your party is exposed to wind, cold, and wet THINK HYPOTHERMIA. Watch yourself and others for symptoms.

1. Uncontrollable fits of shivering.
2. Vague, slow, slurred speech.
3. Memory lapses. Incoherence.
4. Immobile, fumbling hands.
5. Frequent stumbling. Lurching gait.
6. Drowsiness (to sleep is to die.)
7. Apparent exhaustion. Inability to get up after a rest.

YOUR FOURTH AND LAST LINE OF DEFENSE: TREATMENT

The victim may deny he's in trouble. Believe the symptoms, not the patient. Even mild symptoms demand immediate, drastic treatment.

1. Get the victim out of the wind and rain.
2. Strip off *all* wet clothes.
3. If the patient is only mildly impaired:
   a. Give him warm drinks.
   b. Get him into dry clothes and a warm sleeping bag. Well-wrapped, warm (not hot) rocks or canteens will hasten recovery.
4. If the patient is semi-conscious or worse:
   a. Try to keep him awake. Give warm drinks.
   b. Leave him stripped. Put him in a sleeping bag with another person (also stripped). If you have a double bag, put the victim between *two* warmth donors. *Skin to skin contact* is the most effective treatment.
5. Build a fire to warm the camp.