HEALTH & SAFETY PLAN

phone: (907)344-5560 | fax: (907)344-5360 | PO Box 112627, Anchorage, AK 99511 | www.hwatt.com

EMERGENCY ACTION PLAN

ADDENDUM TO SITE SAFETY PLAN

In the event of an emergency evacuation HWS Employees shall follow the following procedures:

1. If possible, all HWS employees will gather at the job-trailer and report to the Project Superintendent that they are leaving the job-site.
2. If the emergency requires immediate evacuation where delay puts people at risk, employees shall telephone the Project Manager, as soon as practical after they have reached a safe place, or by cell phone as soon as possible, to report their status in the evacuation.
3. Key Personnel are (updated to name Project Manager & Superintendent w/each new job):
    a. President: Glenn Watts - (907)360-0999
    b. Vice President: Tim DeLand - (907)841-0483
    c. Secretary/Treasurer: Bo Scott - (907)223-6847

Subcontractor Employees shall follow the following procedures:

4. If possible, all Subcontractor employees will report to their respective Project Superintendents or Foremen before they leave the job-site.
5. If the emergency requires immediate evacuation where delay puts people at risk, employees shall telephone their respective company's home office as soon as practical after they have reached a safe place, or by cell phone as soon as possible, to report their status in the evacuation.

END

P.O. Box 112627 – Anchorage, Alaska 99511 – (907) 344-5560 Fax (907) 344-5360

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1.0 INTRODUCTION

THIS DOCUMENT IS THE BASIS OF THE MASTER SAFETY PLAN AND WILL BE CUSTOMIZED AS NECESSARY FOR EACH TASK ORDER. THE ONSITE SUPERINTENDENT WILL ALSO ADMINISTER THE CONTRACTORS SAFETY AND PREVENTION PROGRAM.

2.0 HEALTH AND SAFETY PERSONNEL

2.1 Site Superintendent

The site superintendent is **Determined w/each new job**. His responsibility is to manage the execution of all on-site activities and to insure safe practices are strictly adhered to. **Determined w/each new job** will conduct weekly (tail-gate) safety meetings.

2.2 Quality Control Manager

Determined w/each new job is the project quality control manager and will be responsible for reviewing safety concerns with the site superintendent.

2.3 Site Workers

All site workers are responsible for following safety and health rules and regulations, following company policies, and adhering to the HSP. Site workers will be instructed to immediately report unsafe conditions, accidents, and injuries to the project superintendent. Site workers are required to attend the project superintendent's weekly safety meeting.

3.0 HAZARD ASSESSMENT

3.1 General Information

Potential hazard inherent to site activities are identified for the purpose of developing and describing strategies for hazard control. The hazard analyses are based on the physical hazards for each site activity. A job safety analysis is presented in Table 3-1. The job safety analysis presents the hazards and types of controls for each of the specific activities.

3.2 Chemical Hazards

Chemical hazards may be encountered during particular phases of this project. Material Safety Data Sheets (MSDS), with appropriate procedures for site workers are available by FAX from H. Watt & Scotts main office. Should site conditions change and a need for decontamination and disposal procedures become necessary, the hazard analysis will be revised to include the required systems.

3.3 Physical Hazards

The potential physical hazards associated with this project include noise, heavy equipment operation, trenches, fall hazards, and heat/cold stress (see Table 3-1 and Appendix C for more information).

3.3.1 Noise

Certain operations may exhibit high noise levels. Personnel will wear hearing protection as required.

3.3.2 Heavy Equipment Operation

Heavy equipment operation involves the use of excavators, backhoes, forklifts, and heavy trucks. Hazards involve potential collisions with other equipment or workers, the spilling of materials, or accidental vehicle fires. Employees will be made aware of the potential dangers of working around heavy equipment. All heavy equipment will be equipped with back up alarms.

3.3.3 Trenches

Trench excavation involves the use of heavy equipment. When an open excavation reaches a depth of 6 feet, a fall hazard is created. All equipment will be kept a safe distance from the edge of any trench.

3.3.4 Fall Hazards

Fall Hazards on this project include both falling personnel and equipment. Workers will wear hard hats and safety harnesses as required by the project superintendent. Equipment will be kept secure when not in use. Personnel will not work directly underneath other workers and/or unsecured tools, equipment, or materials.

3.4 Hazard Analysis

The job safety analysis (Table 3-1) presents the hazards to be associated with on-site activities. Controls are presented when the chance of the hazard occurring can be reduced or eliminated.

TABLE 3-1Hazard Analysis

Activity;	Hazards	Controls
1) Site Mobilization 2) Demobilization 3) Working around heavy equipment	Struck by moving Equipment	• Be aware of surroundings • Stay in the view of the equipment Operator
Working around Heavy Equipment	Noise	Wear hearing protection
Material handling	Lifting injuries	• Use proper lifting techniques • Use a mechanical advantage • Get help when load is to heavy

Office work	Slips, trips & falls	Keep passages clear of material
Working outside	Cold/Heat stress	• Use appropriate clothing • Protect skin from wind, rain or sun • Warm up if extremities become numb • Keep dry • Use the buddy system
	Falls	• Wear safety harnesses when necessary • Use extreme care when climbing ladders
	Falling Tools and Equipment	• Wear hard hats • All tools will be kept away from areas where they could potentially fall.
Motor vehicle travel	Vehicle accidents	• Wear available seat belts • Obey traffic rules • Drive defensively • Use headlights
	Employee hit by truck or excavator	• Back-up alarms on all heavy equip. • Designated traffic routes
Handling hammers, Drills, Other tools	Cuts, Abrasions, Bruises, punctures	• Protect hands with gloves • Maintain caution when using
Wiring, elect. Work	Electrocution, shock	• No work performed unless positive current is off • Proper elect. Shut-down/lock out • Use appropriate PPE and tools
Operating heavy equipment	Crushing, noise	Rollover protection, training, seat belts, and hearing protection, where appropriate
Trenches	Cave-in of trench	• Maintain safe distance when not working in trench • Only certified trench workers in the trench • Support personal will be on hand at all times • Inspect daily
	Workers exposed to material falling into trench	• Keep all material and equipment at least 1 meter from edge of trench
	Workers exposed to traffic	• Wear warning vests • Stand away from moving vehicles • Equipment will have back-up alarms
Install Plumbing	Solder torch burns	• Wear appropriate hand/eye protection

4.0 SITE CONTROL

4.1 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) will be provided when hazard control methods are determined to be impractical or inadequate to protect the worker. By providing for the proper selection, training, use, and maintenance of PPE, worker exposure to hazardous agents can be minimized. The site hazards specific to this project regarding PPE are those associated with:

- Heavy equipment
- Excavations
- Slips/trips/falls
- Heat stress/cold stress
- Noise

4.2.1 Personal Protective Equipment

Workers will be responsible to inspect their equipment for cracks, holes, and proper fit. If any abnormalities are found, the worker shall report the defect to the SHSO. Personal protective equipment shall include:

- Hard hats at all times.
- Safety glasses at all times.
- Hearing protection as required or where appropriate
- Rain gear as required.
- Steel-toed foot protection at all times

If site conditions change or new information becomes available, the project superintendent will modify PPE requirements to address the change in site conditions.

TABLE 4.1 PPE LIMITATIONS

Hard Hat	Hard hats will not be painted nor have holes drilled into them. Damaged hard hats will be replaced.
Safety Glasses	Damaged or scratched glasses will not be used. Glasses with polycarbonate lenses are preferred.
Hearing Protection	Earplugs and muffs have to be inserted or cover the ears as specified by the manufacturer.
Gloves	If using gloves see that they are in good condition.
Overalls/Coveralls	May not be used as a chemical barrier and will not prevent all punctures or cuts.
Rain Gear	May cause workers to be off balance or awkward and may limit peripheral vision.

4.2 Communications

A variety of communications systems will be used for on-site and off-site communication. These include telephones, computers (e-mail) hand signals, and posting information.

4.2.1 Telephones

In case of site emergencies, workers are instructed to remove themselves from danger, make a quick assessment of conditions, and notify the site superintendent. The workers should immediately leave a dangerous situation, inform fellow workers, and report to their immediate supervisors. Supervisors will contact the emergency personnel required to handle the emergency condition. The emergency number is 911.

4.2.2 Posting Emergency Information

Emergency phone numbers will be posted in the H. Watt & Scott, Inc. work space.

5.0 GENERAL INFORMATION

5.1 CPR/First Aid Training

Project specific training will include:

- The project superintendent will have a current CPR/First Aid Training card.

5.2 Hazard Communication

The State of Alaska requires that the chemical and physical hazards of a job be communicated to workers. Material Safety Data Sheets (MSDS) will be available to workers for each hazardous agent they might encounter. MSDS sheets are located at H. Watt & Scott's main office and will be faxed to the job site as needed. Any hazardous materials that might expose the worker will be discussed prior to the work beginning.

5.3 Record Keeping and Reporting

Health and safety records are maintained at H. Watt & Scott's main office to fulfill all OSHA, worker compensation, and insurance record keeping requirements.

5.3.1. Injury and Illness Record Keeping and Reporting Requirements

- The superintendent will be notified immediately of any accidents. The superintendent will deploy the proper equipment and personnel to control or assist the accident as required.

- Accident Report: An Accident Report (Appendix D) will be filled out in the event of an on-site accident. This report will be submitted to the PM within 24 hours of the incident.
- OSHA No. 200 "Log and Summary of Occupational Injury and Illness": This log is maintained at the main office of H. Watt & Scott. Each recorded injury or illness is entered in the log within 6 days after notice that a recorded case has occurred. (29 CFR 1904.2)
- OSHA No. 101 "Supplemental Report of Occupational Injury and Illness". A copy of this report (or insurance claim report) must be available within 7 days after receiving notice that a recorded case has occurred (29 CFR 1904.4).
- OSHA Fatality and Multiple Injury Notification: The nearest OSHA office must be contacted within 8 hours of being notified of an occupational fatality or multiple injuries (29 CFR 1904.8)

6.0 STANDING SITE ORDERS

Standing orders for the job site include, but are not limited to, those listed below. Others may be established on an as-needed basis throughout the job. Violations of standing orders may be grounds for disciplinary action, including immediate termination.

- Observe all site security and company personnel rules.
- No eating, chewing, or smoking in restricted/exclusion areas.
- Alcohol consumption is not permitted.
- Observe all company operating procedures and safety rules.
- Use assigned personal protective equipment as described.
- Immediately report all accidents, injuries, exposures, and illnesses.
- Report fuel leaks and spills in accordance with any spill prevention and response directives.

7.0 EMERGENCY PROCEDURES

In the event of a site emergency, immediate action will be taken to protect life, property, and the environment. The following paragraphs describe the response systems, and the line of communications required.

7.1 Medical Emergencies

Injured workers requiring immediate medical attention will be sent or driven to the nearest medical center of their choice for treatment unless it is an emergency. In the case of an emergency, 911 will be called. Emergency medical personnel will determine where to transport the patient. If a worker needs first aid care, supervisors with first-aid/CPR training will be called to assist the injured party. A worker should make no rescue attempt when she/he is the only available contact

for assistance. First aid gear will be stored in the H. Watt & Scott equipment locker at the work site.

7.2 Fire Response

To report a fire, call 911. In the event of a fire or explosion, the project superintendent should be summoned immediately if on-site or contacted by phone.

- Call the base or local fire department. Employees are not trained firefighters and will fight fires only to the extent of discharge of fire extinguishers.
- Remove or isolate flammable or other materials that may distribute to the fire.

7.3 Environmental Emergencies

The site superintendent if necessary will assess environmental emergencies such as leaks or spills, the site superintendent will notify the fire department.

7.3.1 Spill Prevention Program

All appropriate state and federal agencies will be properly notified in the event of a spill. The site superintendent will direct any needed spill response. All leaks and spills will be immediately reported to the site superintendent for purposes of completing reports and for informing the necessary agencies. Any regulatory agency contacts are to be made through the site superintendent.

7.4 Evacuation

In the event of an emergency situation:

- Solicit the aid of the site superintendent or the nearest employee. Have the individual call for help. Notify the site superintendent and give the exact location of the evacuated area. Direct all personnel in the affected area to evacuate and assemble upwind in a designated safe area.
- Establish the safety of all personnel and direct the administration of first aid as appropriate.
- Shut down all combustion equipment.
- Provide emergency equipment as appropriate.

7.5 Emergency Information

Emergency information will be posted at the H. Watt & Scott equipment locker.

Organization/Personnel	**Phone Number**
• Emergency Response	911
• Fire Department	911
• Police/ Security Police	911
• Project Manager Determined w/each new job	(907) 344-6606
• Project Coordinator: Determined w/each new job	(907) 344-6659
• Site Superintendent Determined w/each new job	(907) 227-0815
• Quality Control Manager Determined w/each new job	(907) 344-6606
• On-site Office number N/A	

7.6 Adverse Weather

In the event of adverse weather, the site superintendent will determine if work can continue without sacrificing the health and safety of field workers. Some of the items to be considered prior to determining if work should continue are:

- Extreme cold and wind
- Heave precipitation
- Limited visibility
- Electrical Storm
- Potential for accidents
- Volcanic action
- Earthquake

APPENDIX A

Tab 1

SITE MAP

IN THIS SECTION:

- Map of Location

APPENDIX B

Tab 2

Medical Facility Location Map

IN THIS SECTION:

- Map to Providence
- Map to AK Regional
- Map to Nearest Walk-in Clinic

APPENDIX C

Physical Agent Data Sheets [PADS]

IN THIS SECTION:

- Data Sheets for Cold Stress, Hypothermia, and Frostbite

Alaska Department of Labor and Workforce Development
Labor Standards and Safety
3301 Eagle Street/PO Box 107022
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(907) 269-4955

PHYSICAL AGENT DATA SHEET

COLD STRESS

HYPOTHERMIA

FROSTBITE

Alaska Department of Labor and Workforce Development
Labor Standards and Safety
3301 Eagle Street/PO Box 107022
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(907) 269-4955

Physical Agent Data Sheet

HYPOTHERMIA

Hypothermia is a temperature-related disorder. Therefore it is necessary to understand human physiology as it pertains to temperature stress.

Man is considered a tropical animal. Normal functioning of the human animal requires a body temperature of 37 degrees Celsius (98.6 degrees Fahrenheit). The body can self-compensate for small upward or downward variations in temperature through the activation of built-in thermoregulatory system, controlled by temperature sensors in the skin. The response to an upward variation in body temperature is the initiation of perspiration, which moves moisture from the body tissues to the body surface. When the moisture reaches the surface it evaporates, carrying with it a quantity of heat. The response to downward variation in body temperature is shivering, which is the body's attempt to generate heat. Shivering is an involuntary contraction and expansion of muscle tissue occurring on a large scale. This muscle action creates heat through friction.

THE DISORDER

Hypothermia is defined as a core temperature of the body less than 35 degrees Celsius (95 degrees Fahrenheit). Hypothermia is also considered the clinical state of sub-normal temperature when the body is unable to generate sufficient heat to efficiently maintain functions.

Many variables contribute to the development of hypothermia. Age, health, nutrition, body size, exhaustion, exposure, duration of exposure, wind, temperature, and wetness of body or clothes, medication and intoxicants (alcohol) may decrease heat production or increase heat loss.

The healthy individual's compensatory responses to heat loss via conduction, convection, radiation, evaporation and respiration may be overwhelmed by exposure. Medication may also interfere with heat generation or regulation. Children will have different symptoms than adults depending on the severity of the cold.

Definitions:

Conduction: Direct transfer of heat by contact with a cooler object
Convection: Cool air moving across the surface of the body, heat is transferred to the cool air warming the air.
Radiation: Heat radiated outward from the warm body to the cooler environment.
Evaporation: The process of losing heat from the body by vaporization of water from the body surface.
Respiration: Inspired air raised to body temperature that is then exhaled.

Each of these causes of heat loss can play a large or small role in the development of hypothermia, depending on clothing, head cover, wind, weather, etc.

Once hypothermia develops, two body compartments, the shell (skin) and the core (the remainder of the body) share the heat deficit. The skin constitutes about 10% of a 150 pound mass.

Hypothermia can be recognized as impending, mild, moderate and severe. Below is a brief description of the various stages:

> Impending: Person's core temperature has decreased to 96.8 degrees Fahrenheit (36 degrees C). Individual will increase exercise in an attempt to warm up. The skin may become pale, numb and waxy. Muscles can become tense and shivering may begin. Fatigue and weakness may begin to show.
>
> Mild: Core temperature has dropped to 93.2 degrees Fahrenheit (34 degrees C). Intense, uncontrolled shivering has begun. The individual may still be alert and able to help self; however, movements become less coordinated and the coldness is causing some pain and discomfort.
>
> Moderate: Core temperature has dropped to 87.7 degrees Fahrenheit (31 degrees C). Shivering slows or stops completely, mental confusion and apathy set in. Speech is slow and slurred. Breathing becomes slow and shallow followed by with drowsiness.
>
> Severe: Core temperature is below 87.7 degrees Fahrenheit (31 degrees C). Skin may have a blue-gray color; iris of the eyes may be dilated, may appear drunk, denies problems and may refuse help. This leads to a gradual loss of consciousness. There may be little or no breathing, lack of response to verbal or painful stimuli and may appear dead.

(Temperatures used in above descriptions are approximate. Symptoms may start at different temperatures depending on the individual and circumstances.)

Treatment Preface

Always act on the fact that **"no one is dead until warm and dead."**

Think ABCD – Airway, Breathing, Circulation and Degrees.

In sudden exposure to cold water there is a greater chance for resuscitation with sudden submersion and with prolonged exposure to cold water. Quick onset of hypothermia, easy to reverse. Slow onset, the harder to reverse the process.

The sole consensus regarding prehospital treatment is that all patients at some point should be rewarmed. Core first then extremities. The best way to rewarm the core is by warm air and warm IV solutions.

Initial management principles emphasize prevention of further heat loss, rewarnimg as soon as is safely possible at a "successful" rate and rewarming the core before the shell, in an attempt to avoid inducing lethal side effects during rewarming. This treatment goal is important, since hypothermia itself may not be fatal above 77 degrees Fahrenheit (25 degrees C) core temperature.

The person must be handled very carefully and gently and not be allowed to exercise, as muscular action can pump cold blood to the heart.

Cold blood going to the heart can cause ventricular fibrillation

Hypothermia causes several reactions within the body as it tries to protect itself and retain its heat. The most important of these is vasoconstriction, which halts blood flow to the extremities in order to conserve heat in the core of the body.

Treatment of Hypothermia

Be able to recognize the symptoms of hypothermia in yourself and others. The victim may deny he/she is in trouble. Even mild symptoms demand attention:

Impending: Seek or build a shelter to get the person out of the cold, windy, wet environment.
Start a fire or get a cookstove going to provide warmth. Provide the person with a hot drink (no alcohol, coffee or tea). Insulate the person with extra clothes.

Mild: Remove or insulate the patient from the cold ground, protect from the wind, eliminate evaporative heat loss with a vapor barrier. Keep the head and neck covered, remove to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through breathing. Provide the person with a warm, sweetened drink (no alcohol, coffee or tea) and some high-energy food. Limited exercise may help to generate some internal heat, but it depletes energy reserves.

Moderate: Remove the person from the cold environment, keeping the head and neck covered. Apply mild heat (comfortable to your elbow) to the head, neck chest, armpits and groin of the patient. Use hot water bottles, wrapped Thermo-pads, or warm moist towels. Do not place the hot water bottles next to the skin, wrap in cloth first. Offer sips of warm, sweetened liquids (no alcohol, coffee or tea) if the patient is fully conscious, beginning to rewarm and is able to swallow. Patient should be seen by a physician ASAP.

Severe: Place person in a prewarmed sleeping bag with one or two other people. Skin to skin contact in the areas of the chest (ribs) and neck is effective. Exhale warm air near the patient's nose and mouth, or introduce steam into the area. Keep the patient awake. Apply mild heat, with the aim of stopping temperature drop, not rewarming. If patient has lost consciousness be very gentle, as the heart is extremely sensitive. Check for pulse at the carotid artery. If there is any breathing or pulse, no matter how faint, do not give CPR but keep a very close watch for changes in breathing and heart beat (vital signs). If no pulse can be found begin CPR immediately, stopping only when the heart begins to beat or the person applying CPR cannot carry on any longer without endangering themselves.

In all of the above, it is imperative that the victim be removed out of the wet and windy weather, remove all wet clothing, and put the victim into dry clothing and a warm sleeping bag.

Recent research has concluded that the safest and most effective method of treating hypothermia is through inhalation rewarming. Equipment is available; however, out in the field, alternative methods which have been described must be used where equipment is lacking.

Alaska Department of Labor and Workforce Development
Labor Standards and Safety
301 Eagle Street, PO Box 107022
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(907) 269-4955

Physical Agent Data Sheet

FROSTBITE

GENERAL INFORMATION

Frostbite is the freezing of some part of the body. Fingers, toes, and even whole arms and legs can be lost as a result of frostbite. Injuries can happen at home, in the cities and also in more isolated areas of the State.

In extreme cold it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and head are major areas of heat loss, but keeping enough blood flowing to the hands and feet is the key to preventing frostbite. The trunk and the head should be warm enough so that the brain is able to command the blood vessels in the hands and feet to open up and keep the extremities warm.

ESSENTIAL CLOTHING

This includes thermal underwear, insulated footwear or mukluks with liners; double mittens and a parka, preferably down-filled with a good ruff. A parka that can be opened at the neck to allow heat to escape will prevent overheating and sweating. Quilted or skin pants are necessary if no warm shelter is immediately available. Tight cloths, especially tight gloves or tight boots should not be worn. The tightness interferes with good circulation in the hands and feet. If there is a reduction in blood flow to these areas, then the possibility of frostbite increases as the extremity cools down.

FACTORS LEADING TO FROSTBITE

Tall thin persons are more likely to get frostbite than those of stocky build.

People in poor physical condition are more susceptible than those in good health.

Certain diseases slow down the blood flow in the hands and feet especially in elderly people.

Heavy smokers often have poor circulation in the vital organs and decreased circulation in the arms and legs.

Children and elderly people who cannot produce large amounts of body heat for long periods of time can experience a lowering of deep body temperature and frostbite.

Alcohol causes the blood vessels to dilate (become larger). This leads to a false sense of warmth. This also leads to faster loss of heat from the body because of dilation of blood vessels. More important, people act with poor judgment after drinking.

Don't touch cold metal with bare or wet hands. You will freeze to the metal and tear the skin if pulled away without proper thawing with warm water, heat or urine.

Be careful when handling gasoline, kerosene or liquids other than water. Contact with bare skin in cold temperatures can cause instant frostbite.

> *Frostbite is more likely to occur when you are injured, frightened or careless*.

HOW TO RECOGNIZE FROSTBITE

Exposed parts of the body should be inspected routinely. This is done best with a partner. Just before freezing, the skin, especially the face with its many blood vessels, becomes bright red. Then small patches of white appear, as freezing actually occurs.

The loss of the sensations of touch, pressure and pain may occur without awareness of any numbness or other sensations. Therefore, it is important to test these sensations often. Wear clothing that is not restrictive but loose.

There may be no pain associated with frostbite if the freezing or temperature change is slow. Only if there is a rapid change in temperature does the body register pain.

The skin becomes less elastic. This is best noted in the finger pads. If touched or squeezed the pads will remain pitted. Any further cooling will result in frostbite.

Serious freezing is most common in the feet, followed by the hands and then the head (nose, ears). This is because of the poorer circulation in the feet and hands. Also with the poorer circulation there is in conjunction less sensation to these areas. Exposed head areas are less likely to freeze because of a better blood supply.

EARLY TREATMENT OF FROSTBITE

Early rewarming.

Thawing and refreezing should always be avoided.

Limbs should be rewarmed in stirred water just above normal body temperature (100 – 105 degrees Fahrenheit). Always use a thermometer to get accurate temperatures. Never try to thaw in cold water or snow. Since feeling is lost, fires, stoves, exhaust pipes, etc., should never be used. Serious damage to the skin could result.

Rewarming is an acutely painful experience and medication to alleviate pain should be given if available. After thawing, a deep aching pain may persist for several days, depending upon severity of the injury. Pain is a good sign; this tells us that the nerves are still alive and functioning.

A dull purple color, swelling and/or blistering of the extremity after thawing indicate a more serious injury and require medical attention.

SUMMARY

Poor circulation and poor production of body heat will lower resistance to frostbite.

Most cases of frostbite occur as a result of lack of knowledge, careless preparation, unavoidable accident, or the effects of alcohol on judgment. Forethought can prevent injury.

If freezing does occur, proper rewarming in warm water will give maximum benefit. The injured limb should be handled gently and a medical judgment made of the extent of injury and the need for further treatment.

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Heat Stress

Description

Heat stress is caused by working in hot environments like laundries, bakeries, or around boilers or incinerators. Four environmental factors affect the amount of heat stress felt by employees in hot work areas: temperature, humidity, radiant heat (such as from the sun or a furnace), and air velocity. How well or how poorly an individual reacts to heat stress is dependent on personal characteristics such as age, weight, fitness, medical condition, and acclimatization.

The body has several methods of maintaining the proper internal body temperature. When internal body temperature increases, the circulatory system reacts by increasing the amount of blood flow to the skin so the extra heat can by given off.

Sweating is another means the body uses to maintain stable internal temperatures. When sweat evaporates, cooling results. However, sweating is effective only if the humidity level is low enough to permit evaporation and if the fluids and salts lost are replaced.

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Health Effects—Heat Disorders

Heat stroke, the most serious health problem for workers in hot environments is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include: mental confusion, delirium, loss of consciousness,

convulsions or coma; a body temperature of 106 degrees Fahrenheit or higher; and hot dry skin which may be red, mottled or bluish. Victims of heat stroke will die unless treated promptly. While medical help should be called, the victim must be removed immediately to a cool area and his/her clothing soaked with cool water. He/she should be fanned vigorously to increase cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

Heat exhaustion develops as a result of loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt, or both. The worker with heat exhaustion still sweats, but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher. Treatment is usually simple: the victim should rest in a cool place and drink salted liquids. Salt tablets are not recommended. Severe cases involving victims who vomit or lose consciousness may require longer treatment under medical supervision.

Heat cramps, painful spasms of the bone muscles, are caused when workers drink large quantities of water but fail to replace their bodies' salt loss. Tired muscles, those used for performing the work, are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking salted liqids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Fainting may be a problem for the worker unacclimatized to a hot environment who simply stands still in the heat. Victims usually recover quickly after a brief period of lying down. Moving around, rather that standing still, will usually reduce the possibility of fainting.

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance or even results in temporary total disability. It can be prevented by showering, resting in a cool place, and allowing the skin to dry.

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Medical Conditions Aggravated By Exposure to Heat

Persons with heart or circulatory diseases or those who are on "low salt" diets should consult with their physicians prior to working in hot environments.

Preventing Heat Disorders

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or water are present in the work area, or when the workplace itself is outdoors

and exposed to varying warm weather conditions.

Acclimatization

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

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Lessening Stressful Conditions

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often make it possible to isolate workers from the heat source (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest

cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

Postponement of nonessential tasks

Permit only those workers acclimatized to heat to perform the more strenuous tasks, or

Provide additional workers to perform the task keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

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Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general, the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

Opening windows in hot work areas,

Using fans, or

Using other methods of creating airflow such as exhaust ventilation or air blowers.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76 degrees Fahrenheit appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

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Drinking Water

In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced.

Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 or 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided, never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets should not be used. CAUTION: PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

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Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body's ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. The advantage of wearing clothing, however, may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, the wearing of clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally-conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected to a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

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Recommended Exposure Limits

These Threshold Limit Values (TLVS) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs shown in Table I are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38 degrees Celsius (100.4 degrees Fahrenheit).

Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

Outdoors with solar load: WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

Indoors or Outdoors with no solar load: WBGT = 0.7 NWB + 0.3 GT

Where: WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet Bulb Temperature
DB = Dry Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry bulb thermometer.

Higher heat exposures that shown in Table I are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant at work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38.0 degrees Celsius (100.4 degrees Fahrenheit).

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Table 1
Permissible Heat Exposure Threshold Limit Values
(Values are given in degrees Centigrade WBGT (Fahrenheit)]

	Work Load		
Work- Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous work	30.0 (86.0)	26.7 (80.1)	25.0 (77.0)

75% Work, 25% Rest/Hour	30.6 (87.1)	28.0 (82.4)	25.9 (78.6)
50% Work, 50% Rest/Hour	31.4 (88.5)	29.4 (85.0)	27.9 (82.2)
25% Work, 75% Rest/Hour	32.2 (90.0)	31.1 (88.0)	30.0 (86.0)

References

1. "Working in Hot Environments," US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, 1986.

2. "Threshold Limit Values and Biological Exposure Indices for 1986 - 1987," American Conference of Governmental Industrial, Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211-4438.

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Labor and Workforce Development || Job Seeker || Employer || Worker

Labor Standards & Safety Division
Alaska Department of Labor & Workforce Development
Occupational Safety and Health

Revised: September 2004

Physical Agent Data Sheet (PADS)
- Ionizing Radiation

Description

Ionizing Radiation is the name given to a band of energy on the electromagnetic spectrum. X-rays and radioactive substances are examples of ionizing radiation. In order to understand the difference between ionizing and non-ionizing radiation it is necessary to review the structure of an atom.

All matter is made up of atoms. Molecules are collections of atoms hooked together in various combinations and shapes. An atom is the smallest unit of an element (like helium, oxygen or carbon) that still has all the properties of that element. Atoms are so small they cannot be seen with even the most powerful microscope.

All atoms are made up of three major subatomic particles: protons, neutrons, and electrons. Protons and neutrons make up the nucleus or center of the atom. Protons have a positive electric charge but neutrons have no electric charge. Electrons circle the nucleus and have a negative charge. In the neutral atom the negative charges of the electrons exactly balance the positive charges of the protons in the nucleus. If an atom has too many or too few electrons in orbit to balance the charge of the protons, the atom is called an ion.

The number of protons in the nucleus of an atom determines which element it is. Isotopes of the same element have the same number of protons but varying numbers of neutrons. The helium atom ($^{4}He_{2}$) has two protons and two neutrons in the nucleus. The carbon atom ($^{12}C_{6}$) has six protons and six neutrons in the nucleus. An example of

an unstable isotope of carbon is carbon-14 ($^{14}C_6$). The superscript indicates the atomic weight while the subscript number indicates the number of protons. If the atom has too many or too few neutrons for the number of protons, the atom may be unstable. If unstable the nucleus will give off bursts of energy (radiation) in an attempt to become stable.

These bursts of energy or disintegrations may be in the form of alpha particles (two protons and two neutrons - positively charged), beta particles (a negatively-charged electron), x-rays, or gamma rays (types of high energy electromagnetic waves). If these charged particles or waves interact with another atom, they have enough energy to knock an electron out of its orbit, creating an ion. That is why this type of radiation is called ionizing radiation.

Other forms of energy, like visible light, radio waves, and infrared light, do not have enough power to knock electrons out of their orbits so they are called non-ionizing radiation.

Amounts of ionizing radiation can be expressed in several different units. A **roentgen** (R) is an amount of x-rays or gamma radiation that causes a specified amount of ionization among the atoms and molecules in a cubic centimeter of air. Another unit is the **rad**, which applies to all ionizing radiation. It is a measure of the amount of energy absorbed from radiation in a specific volume of material.

A third unit, which is more useful and used more commonly, is the **REM** (Roentgen Equivalent Man). Measuring radiation in rems or millirems (one thousandth of a rem) allows direct comparison of the biological effects of different types of radiation. Alpha particles, beta particles, and x-rays or gamma radiation, differ in their ability to cause damage in tissues due to their differences in ionizing and penetrating ability. Alpha particles are 20 times more damaging in tissue then the same amount of x-rays. Measuring radiation in rems takes this difference into account so that one rem of alpha radiation in tissues has the same effect as one rem of beta radiation or one rem of x-rays. A rem is a relatively large quantity of radiation so most human exposures are measured in millirems. An easy way to remember the difference between these units is that a roentgen is a measure of how much you are exposed to, the rad is how much you absorb, and the rem is how much damage it does.

All people receive ionizing radiation from naturally occurring sources. Depending on where you live, most people receive an exposure in the range of 100 millirems per year from cosmic radiation from outer space and from naturally occurring isotopes (excluding radon) in the ground, air, food, and water. Radon is estimated to add another 200 millirems per year to our background. Medical and dental uses of x-rays can also contribute to a person's yearly radiation exposure. A typical well-conducted chest x-ray involves an exposure of 30 milliroentgens.

OCCUPATIONS WITH EXPOSURE TO IONIZING RADIATION

With the use of radioactive isotopes in industry and the increasing use of x-ray sources, ionizing radiation exposures may occur in a wide variety of occupations. The following examples show the diversity of occupations potentially exposed to ionizing radiation.

Aircraft workers	Military personnel
Atomic energy plant workers	Nuclear medicine workers with exposure to energetic radiation from selected radioisotopes (e.g. technetium-99m, iodine-131, tritium-3, etc.)
Biologists	Nurses
Cathode ray tube makers	Oil well loggers
Ceramic workers	Ore assayers
Chemists	Pathologists
Density testers	Petroleum refinery workers
Dental assistants	Physicians
Dentists	Physicists
Dermatologists	Pipeline oil flow testers
Drug makers	Pipeline weld radiographers
Drug sterilizers	Plasma torch operators
Electron microscope makers	Plastic technicians
Electron microscopists	Prospectors
Electrostatic eliminator operators	Radar tube makers
Embalmers	Radiologists
Fire alarm makers	Radium laboratory workers
Food preservers	Radium refinery workers
Food sterilizers	Research workers
Gas mantle makers	Television tube makers
High voltage television repairmen	Thickness gauge operators
High voltage vacuum tube makers	Thorium-aluminum alloy workers
High voltage vacuum tube users	Thorium-magnesium alloy workers
Industrial fluoroscope operators	Thorium ore producers
Industrial radiographers	Tile glaziers
Inspectors using, and workers in proximity to, sealed gamma ray Uranium sources (e.g. cesium-137, cobalt-60, and iridium-192)	Uranium dye workers
Klystron tube operators	Uranium mill workers
Liquid level gauge operators	Veterinarians
Luminous dial painters	X-ray technicians / aides
Machinists	X-ray diffraction apparatus operators
	X-ray tube makers, fabricated metal product

Health Effects
The health risks and effects of exposure to ionizing radiation are dependent on the type of radiation (alpha, beta, gamma or x-ray), the energy, the dose rate, the quantity, and the body part exposed.

Alpha particles, due to their relatively large size and mass, do not travel very far in air (a few centimeters) and cannot pass through skin or even a sheet of paper. Alpha radiation is only hazardous if inhaled or ingested. It is the most damaging to tissue if it is inhaled or ingested. Beta particles are more penetrating than alpha; a thin sheet of aluminum will stop beta radiation, but beta radiation is not as damaging to tissue.

X-rays (and gamma rays) are the most penetrating and least damaging to tissue. Their penetrating capability makes them useful for medical diagnoses.

Some body parts are more sensitive to damage from ionizing radiation than other body parts. The reproductive and blood-forming organs and the eyes are the most sensitive while the extremities such as arms, hands, and feet are less sensitive.

The quantity of ionizing radiation to which a person is exposed is the greatest factor in the risk and severity of a radiation-related injury. Information on the health effects of a single large dose of ionizing radiation is readily available from studies of the casualties and survivors of the atomic explosions in Hiroshima and Nagasaki, from studies of people exposed to radioactive fallout from the early atom bomb testing and from accidents involving ionizing radiation.

Health effects of a single acute dose of whole body radiation.	
Dose	**Acute Effects**
less than 25 rems	No detectable effect
25 - 50 rems	Drop in white blood cell count, no serious injury
50 - 100 rems	Possible injury and sickness; no disability
100 - 200 rems	Acute radiation sickness (nausea, vomiting, diarrhea, weakness, shock, skin sores, hair loss); possible disability
200 - 400 rems	Acute radiation sickness; disability certain, possible death without treatment
400 - 500 rems	50% death rate without treatment
> 600 rems	100% death rate

Occupational exposure to ionizing radiation is usually limited to a small area of the body such as the hands, resulting in reddening of the skin or dermatitis. Whole body radiation and acute radiation sickness occurs very rarely in occupational settings.

The health effects of long-term exposure to low levels of ionizing radiation are less easily studied and documented. The concern about possible health effects, cancer and genetic effects in particular, from low level radiation stems from the known health effects of high doses of radiation and the assumption that the degree of risk is directly related to the degree of exposure. It is assumed (not proven) for safety sake, that any exposure to radiation above natural background levels contributes to small increases in the risk of developing cancer. Reducing exposure to the lowest level possible will, therefore, reduce the risk to the lowest level possible.

Emergency Procedures

The following emergency procedures were developed for medical facilities but can be generally applied to any workplace where radioactive substances are used.

Initial report: All incidents involving environmental contamination should be reported first to the Alaska Department of Environmental Conservation Area Response Team (SOSC).

Southeast Alaska:	Bob Mattson (Juneau) Bob_mattson@dec.state.ak.us	907-465-5349
Central Alaska:	Gary Folley (Soldotna) Gary_folley@dec.state.ak.us	907-262-5210 ext 234
Northern Alaska:	Ed Meggert (Fairbanks) Ed_meggert@dec.state.ak.us	907-451-2124
Secondary report:	Doug Dasher (Fairbanks) Doug_dasher@dec.state.ak.us	907-451-2172

A. Spills

Accidental spillage of radioactive material is rare, but cannot be prevented absolutely, and may occur in any laboratory, in any hall or passageway traversed by messengers transporting such material.

Except for a major accident to a shipping container or a serious spill in the hot laboratory, the amount of radioactive material involved in a spill will usually be small and the radiation from it will not constitute a serious hazard. The real danger is the spread of the contamination on shoes or other contaminated garments. The following is a general outline of the procedure to be followed in the event of a spill.

- Confine the spill immediately by dropping paper towels or other absorbent material onto it.

- Put on waterproof gloves.

- Check shoes for visible signs of contamination. If it appears
- possible that they are contaminated, remove shoes when leaving the contaminated region.

- If fans, ventilators, or air conditioners are operating in the area, they should be shut off. Preferably this should be done by someone not involved in the spill and therefore not likely to spread contamination.

- Mark off or isolate in some way the entire suspect area and police it to be sure that no one walks through it.

- **CALL THE RADIATION PROTECTION SUPERVISOR (RPS)** (aka Radiological Safety Officer) designated by the employer. If the number is not posted in a convenient place, and you do not know it, call the company telephone operator, report an emergency and ask the operator to find the supervisor.

- In general, inexperienced personnel should not attempt to clean up a spill. It is better to wait a little while for the RPS than to risk spreading the contamination by erroneous procedures. If the spilled material is covered and bystanders are kept a few feet away, there is little or no danger from the radiation.

- If any of the spilled material has splashed onto a person or clothing, immediate steps should be taken to remove it. Laboratory coats or outer garments should be taken off and left in the contaminated area. Hands or other skin areas should be washed thoroughly with soap. If it is certain that shoes or feet are not contaminated, it is permissible to walk to a washing facility, which subsequently, however, must be treated as a contaminated area until cleared by the RPS. If there is doubt about contamination of the feet, a washbowl and soap should be brought to the suspect area for cleaning them.

- The RPS should bring decontamination materials and a survey meter, and the clean-up operation will proceed under the supervision of the RPS.

- If the RPS is not immediately available, or cleanup must proceed without him or her, one person should do the work. This person should put on waterproof

gloves, shoe covers and a surgical facemask if it is available. He will then take up the spilled material with absorbent paper, which must be handled with forceps or tongs, and deposit it immediately in a waterproof container. After as much as possible has been removed in this way, the surface should be washed with damp, not wet, rags held in forceps, always working toward the center of the contaminated area rather than away from it.

- A survey meter should have been obtained from the office of the RPS, and careful monitoring carried out during this procedure, on area and personnel. Preferably, the meter should be operated by someone not involved in the spill, so that the instrument is not likely to be contaminated.

- Reduction of counting rate to five times background, over an area of 1 or 2 square feet or to ten times background over a few square inches is usually satisfactory, especially for short-lived nuclides. Eventually, the RPS should check the area and give it clearance.

- When the operation is finished, gloves and other protective garments should be carefully checked for residual contamination. If any is found, the garments should be left with the other contaminated material for ultimate clearance or disposal by the RPS.

B. Loss of a Sealed Source

The following is a general outline of the procedure to be followed in the event of loss of a sealed source:

- Call the Radiation Protection Supervisor (RPS).

- If all sources are supposed to have been removed from the patient, he or she should be checked with a survey meter to make sure that none has inadvertently been left behind.

- Try to make sure that all bandages, linen, and bedding have been kept in the patient's room. If this is not the case, try to stop them on the way to the laundry or the incinerator.

- Check all this material, a little at a time. Then check the room, to be sure the source is not on the floor or furniture.

- Check the drain tap of any accessible plumbing facility.

- Check the incinerator.

- Check all barrels of ashes or garbage. The more active the source, the easier it should be to find it.

C. A Ruptured or Broken Sealed Source

- Shut off all fans and ventilators.
- Drop damp towels on the suspect material; throw nothing away.
- Call the Radiation Protection Supervisor. The RPS will remove the questionable material and check the area for contamination.
- If possible, evacuate the room. If not, keep all personnel several feet from the suspect material until the RPS arrives.

D. A Major Calamity: Fire, Earthquake, A Massive Spill

- Call the Radiation Protection Supervisor.
- Report the incident to the Alaska Department of Environmental Conservation Area Response Team (SOSC)
- Prevent access to suspect areas, or removal of anything from them. Shut off ventilating system; close drains if possible.
- Do not try to do anything until the RPS arrives. The RPS must be given complete charge.
- If for any reason the RPS cannot take charge, wait for the Alaska Department of Environmental Conservation Area Response Team (SOSC) or follow their instructions.

Medical Treatment

Medical treatment of a person who has been accidentally over exposed to ionizing radiation will depend on the dose. Exposures less than 25 rems generally do not require treatment. The treatment will also depend on whether the source of the radiation is outside the body such as from x-ray equipment or a gamma emitter, or from inside the body such as when a radioactive dust is inhaled or ingested.

When the source of radiation is outside the body, and treatment is considered necessary, it is started after the entire radiation dose has been received. The dose cannot be lessened, therefore the objective of the treatment is to lessen the acute effects of radiation sickness, prevent secondary infections and provide transfusions to supplement weakened and damaged blood cells.

When the source of the radiation (the emitter) has been inhaled or swallowed, radiation exposure will continue and the goal of treatment is to reduce the quantity of the emitter in the body. This may be accomplished by speeding up the excretion of the emitter by chelating therapy. A chelating agent is a chemical which binds with radioactive heavy metals enabling the body to excrete them faster. Chelating therapy is effective for internal emitters which are soluble in body fluids. Insoluble emitting substances which have been inhaled can be removed to some extent by bronchopulmonary lavage, a procedure which rinses out the lung's air sacs and airways.

Safety Procedures and Control Measures

The specific aspects, equipment, and procedures of a workplace radiation safety program will depend on the nature of the source, the type of radiation emitted, and the circumstances of its use. Only general concepts of protection and control can be covered in a data sheet of this scope. The National Council on Radiation Protection and Measurements (NCRP) offers recommendations for specific uses of radiation emitting substances and equipment. Publications from NCRP are available from their website: http://www.ncrp.com

Restricted Access: Only authorized trained personnel should be allowed in work areas where radiation emitting substances or equipment are used. Signs and warning notices using the standard radiation symbol must be posted.

Shielding: The selection of materials and designs for shielding will depend on the type of radiation, the use factor of the equipment, occupancy times, and workload.

Ventilation: Operations that routinely produce airborne contamination should utilize engineered containment and ventilation systems to prevent airborne releases. Appropriate respirators may be used but only when effective engineering controls are not feasible.

Radiation Monitoring: Radiation survey equipment appropriate for the type of radiation to be measured must be maintained and used to evaluate exposure conditions for employees. Working areas must be monitored at a frequency that will ensure safe working conditions. Individuals working in most industrial settings and many medical facilities must wear appropriate radiation monitoring devices to measure actual occupational exposures. Records of results for area and personal monitoring must be maintained.

Licensing and Registration: All by-product radioactive material and special nuclear material must be licensed by the Nuclear Regulatory Commission, and conditions of that license must be met by the user. Radioactive materials not under the jurisdiction of the Nuclear Regulatory commission and all x-ray sources must be registered with the

Alaska Department of Health and Social Services (H&SS), Radiological Health program. Use must meet requirements of the Alaska Radiation Protection Regulations, H&SS, in addition to the Occupational Safety and Health regulations of the Alaska Department of Labor & Workforce Development and the Environmental regulations of the Department of Environmental Conservation. The NRC and the state may conduct inspections of licensees and registrants to ensure compliance.

Consultation: Radiological Health is a program within the Department of Health and Social Services, State Public Health Laboratories. This program is responsible for safe use of radiation sources within the State of Alaska. Under Alaska statute, the program is responsible for Radiation Protection including the development of policies for evaluating radiation hazards, conducting surveys/investigations and training. This includes measurement and safe use of radiation, reviewing plans and shielding specifications for radiation sources, inspecting facilities where radiation sources are used, and contracting with other agencies where a cooperative effort is required in order to address radiation hazards. These responsibilities include both ionizing and non-ionizing sources, and radiation producing devices as well as radioactive materials. The main office is in Anchorage, however radon related activities are conducted out of the University of Alaska Fairbanks.

Contact: Clyde E. Pearce, RHS
Telephone: (907) 334-2107
Facsimile: (907) 334-2161
E-mail: clyde_pearce@health.state.ak.us

Emergency Response: Environmental surveys and disaster response to radiation in the environment are the responsibility of the Department of Environmental Conservation.

Initial report: All incidents involving environmental contamination should be reported first to the Alaska Department of Environmental Conservation Area Response Team (SOSC).

Southeast Alaska:	Bob Mattson (Juneau) Bob_mattson@dec.state.ak.us	907-465-5349
Central Alaska:	Gary Folley (Soldotna) Gary_folley@dec.state.ak.us	907-262-5210 ext 234
Northern Alaska:	Ed Meggert (Fairbanks) Ed_meggert@dec.state.ak.us	907-451-2124
Secondary report:	Doug Dasher (Fairbanks) Doug_dasher@dec.state.ak.us	907-451-2172

Personal Protective Equipment
Respirators used for protection against airborne contamination should be approved by the National Institute of Occupational Safety and Health (NIOSH). If air-purifying respirators are used, only high efficiency (HEPA) cartridges approved for dusts, fumes, mists, and radionuclides or radon daughters (progeny) may be used. A good respirator program must include consideration of respirator type, fit, maintenance, testing, and training.

Protective clothing must be provided if the potential for skin or clothing contamination exists. Selection must be based on the nature of the contaminant (liquid or dry material) and the type of radiation emitted. Appropriate methods of laundering or disposal are also required. Contaminated clothing must not be taken home.

Permissible Exposure Limit
The US DOL Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910.1096, adopted by reference by the State of Alaska under Alaska Administrative Code 8 AAC 61.1010(b), state that:

. . . (b) Exposure of individuals to radiation in restricted areas.

(1) No employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table 1-18.

Table 1-18 **Rems per calendar quarter**	
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4
Hands and forearms; feet and ankles	18 3/4
Skin of whole body	7 1/2

(2) An employer may permit an individual in a restricted area to receive doses to the whole body greater that those permitted under 29 CFR 1910.1096 (b) (1) so long as:

(A) During any calendar quarter the dose to the whole body shall not exceed three rems; and

(B) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed five (N-18) rems, where "N" equals the individual's age in years at his last birthday; and

(C) The employer maintains adequate past and current exposure records that show that the addition of such a dose will not cause the individual to exceed the amount authorized in this form. "Dose to the whole body" shall be deemed to include any dose to the whole body, gonad, active blood forming organs, head and trunk, or lens of the eye.

(3) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table 1-18.

These regulations (29 CFR 1910.1096) also cover definitions, exposure to airborne radioactive material, precautionary measures and personal monitoring, caution signs, labels and symbols, evacuation warnings, instruction of personnel, waste disposal, notification of incidents, reports of overexposure, records and disclosure.

References and Resources

1. Occupational Diseases - A Guide to Their Recognition, DHEW (NIOSH) Publication No. 77-181. 1978.

2. Radiation Protection for Medical and Allied Health Personnel, National Council on Radiation Protection and Measurements (NCRP) Report No. 48. 1986. Access NCRP publications at: http://www.ncrp.com

3. Cralley, Lewis J. and Cralley, Lester V. Patty's Industrial Hygiene and Toxicology Volume III, pg. 359 - 404, John Wiley and Sons, Inc. 1979.

4. OSHA General Industry Regulations, 29 CFR 1910, as amended, and adopted by the State of Alaska in Alaska Administrative Code, 8 AAC 61.1010(b) under the authority of AS 18.60.030, and specifically 29 CFR 1910.1096

   http://www.osha.gov/pls/oshaweb/owastand.display_standard_group?p_toc_level=1&p_part_number=1910

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Lasers

Other PADS:
Cold Stress
Hand-Arm Vibration
Heat
Ionizing Radiation (PDF)
Lasers
Noise
Radio Waves
Ultraviolet Radiation

Hazards Health Hazards
Electrical Hazards
Chemical Hazards
Safety Classifications of lasers

Safety Precautions
Emergency Procedures
Permissible Exposure Limits

Description

A laser is a device which produces a concentrated beam of electromagnetic energy. The beam of energy can be in the form of visible light or in the form of invisible infrared or ultraviolet radiation.

Lasers differ in many ways, but there are certain characteristics which all lasers have in common. For all lasers, the production of the concentrated beam of energy requires three basic processes. First, an energy source is applied to a solid, gaseous or liquid substance called the lasing material. The lasing material then produces radiation having a specific wavelength. Then by using mirrors, lenses and shutters, the light or infrared waves or ultraviolet rays are magnified and focused to produce the laser beam.

Lasers may be different from one another in several specific ways. The basic categories are:

1. Type of lasing material used.

   The lasing material may be solid, like ruby crystals or glass; may be a gas or mixture of gases, such as carbon dioxide or a helium-neon mixture; or liquid containing special dyes.

2. Source of energy applied.

   The energy applied to the lasing material may come from a powerful light source, electric current, or a chemical reaction.

3. Continuous or pulsed emission of the laser beam.

   The energy applied to the lasing material may be continuous or applied on pulses. Some lasers can produce hundreds of thousands of pulses per second.

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Hazards

The hazards related to the use of lasers vary depending on the type of laser, the power of the laser, the purpose and manner in which the laser is used, and the safety features of the laser.

Health Hazards

Eye injuries are the most serious danger from laser beams. The cornea of the eye is like a glass window that allows light to enter the eye. It is located in the very front part of the eyeball. The cornea is very sensitive and injuries to the cornea can be very painful. most injuries to the cornea heal without permanent damage. If the deep layers of the cornea are affected, permanent injuries can occur. The types of eye injuries which occur from improper use of lasers depend on the wavelengths of the laser beams. Laser injuries to the cornea are usually caused by lasers having short wavelengths in the ultraviolet and long wavelengths in the infrared ranges.

The lens of the eye is located toward the front of the eyeball but behind the cornea. Injuries to the lens can result in loss of transparency of the lens. The lens becomes cloudy and then blocks some of the light rays entering the eye, thus making it hard to create clear images on the retina. When the lens of the eye becomes cloudy, it is called a cataract.

While damage to the cornea usually heals completely in a day or two, damage to the lens almost always persists. Very slight damage to the lens may go unnoticed, but repeated minimal damage can add up to serious damage later on. Damage to the lens may not cause problems until many years after the injuries to the lens occurred. Lens damage is most likely to occur with certain lasers that produce beams in the near-ultraviolet and near-infrared wavelength range.

The retina of the eye is the surface upon which visual images are produced. It is located in the back of the eyeball. Certain lasers in the wavelength ranges of visible light and near-infrared wavelength ranges can burn permanent blind spots in the retina causing partially or totally obscured vision.

Skin burns may also occur from the use of lasers but are less likely to occur and are less serious than eye injuries. When skin is exposed to a potentially dangerous laser beam, a person will usually feel the heat and remove the exposed part of the body from the path of the laser beam.

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Electrical Hazards

Some lasers require high voltage power supplies and some workers have received electrical shock because of carelessness while working around these power supplies. Almost all laser power supplies under certain circumstances, could possible cause electrical shock or electrocution. Following the general safety standards for other electrical or electronic equipment provides protection against the dangers of electrical shock or electrocution.

Chemical Hazards

Laser welding or cutting of metals will cause formation of many of the same metal oxides and other fumes that are produced in conventional welding processes. Explosions can occur when ice collects in valves or connectors in lasers which require very cold liquids, such as liquid nitrogen.

Lasers are commonly used in the workplace to perform the following functions:

Welding and machining
Surgery
Communication: via fiber optic technology
Shock hardening, glazing, drilling
Cutting textiles
Leveling and alignment of building sites

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Safety Classifications of Lasers

For safety purposes, lasers are divided into Classes I, II, III, and IV; Class I being least hazardous and Class IV most hazardous. Almost all reported eye injuries have been from Class IV lasers.

Almost all lasers that produce visible light beams are so bright that they can produce eye injuries. Therefore, to reduce risk of health hazards to the eye, many are designed in a way, such as enclosing the laser beam in a box, which prevents direct eye exposure to the beam.

Any laser which by itself is in Class II, III, or IV may be reclassified to a lower risk category if the laser beam is enclosed in such a way to decrease the risk of hazardous exposure to people.

Class I lasers are considered entirely safe even if used improperly. Class I lasers do not require any warning labeling. Some more hazardous lasers may be placed in the Class I category when they are part of a consumer or office machine which shields the user from the hazards of the laser beam. These machines, however, must have some type of warnings which are visible if the shields are removed.

Class II lasers are often referred to as "low-power" or "low-risk" lasers. These lasers are hazardous only when someone stares directly into the laser beam even though the beam hurts the eyes. Class II lasers require warnings to avoid staring directly into the beam.

Class III lasers are Moderate Risk or Medium Power lasers. They can produce eye injuries when the laser beams are viewed directly or when a sharp reflection is viewed directly. Class III is subdivided into Class IIIA and IIIB. Class IIIA is considered to be hazardous only when the laser beam is collected and focused by optical instruments, for example when surveyors look into a laser beam with a telescope-like instrument. Class IIIA lasers require warnings to prevent such hazardous practices. These lasers can cause serious eye injuries before someone who accidentally looks directly into the beam has a chance to blink.

Class IV lasers produce beams that when reflected, even if it is not a sharp reflection, may cause serious eye and skin injuries, and where the beam may be a fire hazard. It is critical that the dangers of Class IV lasers are clearly marked with warning signs.

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Safety Precautions

Class I Controls

No user safety rules are necessary.

Class II Controls

1. Never permit a person to continuously stare into the laser source if exposure levels exceed the applicable permissible exposure level for the duration of intended staring.
2. Never point the laser at an individual's eye unless a useful purpose exists and the exposure level and duration will not exceed the permissible limit.

Class III Controls

1. Do not aim the laser at an individual's eye.
2. Permit only experienced personnel to operate the laser.
3. Enclose as much of the beam path as possible. Even a transparent enclosure will prevent individuals from placing their head or

reflecting objects within the beam path. Terminations should be used at the end of the useful path of the direct and any secondary beams.

4. Shutters, polarizers and optical filters should be placed at the laser exit port to reduce the beam power to the minimal useful level.
5. Control spectators.
6. A warning light or buzzer should indicate laser operation. This is especially needed if the beam is not visible, e.g., for infrared lasers.
7. Do not permit laser tracking of nontarget vehicles or aircraft.
8. Operate the laser only in a restricted area, for example, in a closed room without windows, and place a warning sign on the door.
9. Place the laser beam path well above or well below the eye level of any sitting or standing observers whenever possible. The laser should be mounted firmly to assure that the beam travels only along its intended path.
10. Always use proper laser eye protection if a potential hazard exists for the direct beam or a specular reflection.
11. A key switch should be installed to minimize tampering by unauthorized individuals.
12. The beam or its specular reflection should never be directly viewed with optical instruments such as binoculars or telescopes without sufficient protective filters.
13. Remove all unnecessary mirror-like surfaces from within the vicinity of the laser beam path.

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Class IV Controls

Fortunately, these high-power lasers are seldom used outside of research laboratories and restricted industrial environments where personnel access is carefully controlled.

These lasers should only be operated within a localized enclosure, or in a controlled workplace, or where the beam is directed into outer space. If a complete local enclosure is not possible, laser operation indoors should be in a light-tight room with interlocked entrances to assure that the laser cannot emit while a door is open.

1. Eye protection is needed for all individuals working within the controlled area. If the laser beam irradiance is sufficient to be a serious skin or fire hazard, a suitable shielding should be used between the laser beam and any personnel.
2. Remote firing with video monitoring or other remote (safe) viewing techniques should be chosen when feasible.
3. Outdoor high-power laser devices such as satellite laser transmission systems and laser radar (LIDAR) should have positive stops on the azimuth and elevation transverse to assure that the beam cannot intercept occupied areas or nontarget aircraft.
4. Beam shutters, beam polarizers, and beam filters should always be used to limit use to authorized personnel only. The flashlamps in optical pump systems should be shielded to eliminate any direct viewing.
5. Backstops should be diffusely reflecting-fire resistant target materials where feasible. Safety enclosures should be used around microwelding and microdrilling work pieces to contain hazardous reflections from the work area. Microscopic viewing systems used to study the work piece should ensure against hazardous levels of reflection of laser irradiation back through the optics.

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Emergency Procedures

Anyone who is suspected of having a laser-related eye injury should be examined as soon as possible by an ophthalmologist, a physician who specializes in the care of eye injuries and diseases.

Laser-related skin burns should be treated as any other skin burns. Cold water should be applied immediately to the burn area for first and second degree burns (reddened skin or blistering skin). Third degree burns (open wound) should be covered with a sterile dressing and the person taken to a medical facility. Never put ointments, creams or butter on burns.

Permissible Exposure Limits

Lasers used in construction shall comply with the Alaska Construction Code, Section 05.040(e):

Nonionizing radiation

1. Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.
2. Proof of qualification of the laser equipment operator shall be available and in posession of operator at all times.
3. The employer shall provide antilaser eye protection as specified in section 50 of this subchapter for employees working in areas where a potential exposure to direct or reflected laser light greater than 5 milliwatts exist.
4. Areas in which lasers are used shall be posted with standard laser warning placards.
5. Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. The laser shall be turned off whenever the laser is left unattended.
6. Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the lasers.
7. The laser beam shall not be directed at employees.
8. Under conditions of rain, snow, fog or dust the use of laser systems is prohibited.
9. Laser equipment shall bear a label to indicate maximum output.
10. Employees shall not be exposed to light intensities above:
    a. Direct staring: one microwatt per square centimeter.
    b. Incidental observing: two and one-half watts per square centimeter.
    c. Diffused reflected light: two and one-half watts per square centimeter.
11. Laser units in operation shall be set up above the heads of the employees.

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References

1. Sliney, D. & Walbarsht, M., Safety with Lasers and Other Optical Sources. Plenum Press, New

York, NY 10013.

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Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Noise

Other PADS:
Cold Stress
Hand-Arm Vibration
Heat
Ionizing Radiation (PDF)
Lasers
Noise
Radio Waves
Ultraviolet Radiation

Description
Health Effects
Hearing
Other Effects
Permissible Exposure Limit
Protective Measures

Description

Sound is created when a vibrating source (like a bell, motor or a stereo speaker) sends sound waves through the air to your ear. Every sound has two aspects: its pitch (frequency) and its loudness (intensity). On a stereo, frequency is determined by the bass/treble control. Intensity is determined by the volume control. Noise (unwanted sound) is usually made up of many frequencies. The disturbing and harmful effects of noise depend both on the loudness and the frequency of the tones making up noise.

Loudness is measured in units called decibels (dB). A conversational voice is about 65 dB. A shout is 90 dB or greater.

Frequency is measured in units called Hertz (Hz). The frequency of a locomotive horn is about 250 Hz. The frequency of a table saw is about 4,000 Hz.

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Health Effects

Excessive noise can destroy the ability to hear, and may also put stress of other parts of the body, including the heart.

For most effects of noise, there is no cure, so that prevention of excessive noise exposure is the only way to avoid health damage.

Hearing

The damage done by noise depends mainly on how loud it is and

on the length of exposure. The frequency or pitch can also have some effect, since high-pitched sounds are more damaging than low-pitched sounds.

Noise may tire out the inner ear, causing temporary hearing loss. After a period of time away from the noise hearing may be restored. Some workers who suffer temporary hearing loss may find that by the time their hearing returns to normal, it is time for another work shift so, in that sense, the problem is "permanent."

With continual noise exposure, the ear will lose its ability to recover from temporary hearing loss, and the damage will become permanent. Permanent hearing loss results from the destruction of cells in the inner ear, cells which can never be replaced or repaired. Such damage can be caused by long-term exposure to loud noise or, in some cases" by brief exposures to very loud noises.

Normally, workplace noise first affects the ability to hear high frequency (high-pitched) sounds. This means that even though a person can still hear some noise, speech or other sounds may be unclear or distorted.

Workers suffering from noise-induced hearing loss may also experience continual ringing in their ears, called "tinnitus." At this time, there is no cure for tinnitus, although some doctors are experimenting with treatment.

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Other Effects

Although research on the effects of noise is not complete, it appears that noise can cause quickened pulse rate, increased blood pressure and a narrowing of the blood vessels over a long period of time, these may place an added burden on the heart.

Noise may also put stress on other parts of the body by causing the abnormal secretion of hormones and tensing of the muscles.

Workers exposed to noise sometimes complain of nervousness, sleeplessness and fatigue. Excessive noise exposure also can reduce job performance and may cause high rates of absenteeism.

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Permissible Exposure Limit

The Action level for noise is an average noise level of 85 dB for an eight-hour day. When employees are exposed to noise levels, which exceed the Permissible Exposure Limit, the employer must install or use engineering or administrative controls to lower the noise levels. While these controls are being designed or installed employees must wear hearing protection. If the controls still do not reduce noise exposures to below 90 dB, hearing protection must continue to be worn.

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Protective Measures

Suitable hearing protectors (earplugs or muffs) must be made available at no cost to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Employees must be given the opportunity to select from three different types of appropriate hearing protectors.

Hearing tests (audiometric exams) must be given to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Hearing tests will show whether employees are experiencing any hearing losses. Hearing tests are also useful in showing how well the earplugs and earmuffs are working. Hearing tests must be given annually.

Employees should also receive training in the effects of noise on hearing, an explanation of the hearing tests, and instruction on the proper fitting and care of earplugs or muffs.

Noise away from work can also cause hearing loss. Hearing protectors should be worn when operating noisy equipment or tools such as chain saws, brush cutters, power lawn mowers, or when using firearms.

Refer to Alaska Administrative Code, Occupational Health and Environmental Control 04.0104 for specific regulations on Noise Exposure and Hearing Conservation Programs.

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Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Radio Frequency/Microwave Radiation

Other PADS:
Cold Stress
Hand-Arm Vibration
Heat
Ionizing Radiation (PDF)
Lasers
Noise
Radio Waves
Ultraviolet Radiation

- Health Hazards
- Safety and Health Precautions
- Permissible Exposure Limits
- Microwave Ovens

Description

Radiofrequency and microwave radiation are both forms of energy called electromagnetic radiation. Sunshine contains three other forms of electromagnetic radiation: ultraviolet rays, infrared (heat) waves, and visible light waves.

These forms of energy are transmitted by waves. The distance between wave peaks is the "wavelength." The number of wave peaks passing a given point in one second is the "frequency."

Radiofrequency or radiowaves have a range of frequencies and wavelengths. Very High Frequency (VHF) radiowaves are used for TV and FM radio. Medium Frequency (MF) radiowaves are used for AM radio. Radiofrequency is used in heat sealers and glue driers.

Microwaves are actually just radiowaves of higher frequencies. Microwaves are used for radar and satellite communications, for telephone and TV transmissions, for microwave ovens, and for diathermy in medical clinics.

Electromagnetic radiation can interact with objects (or people) in three different ways. The energy waves can pass through an object without being changed, like light through a window. It can be reflected, like light off a mirror, or it can be absorbed and cause the object to heat up, like a sidewalk in the sun.

The health hazards of electromagnetic radiation are related only to the absorption of energy. The effects of absorbed energy depend on many different factors such as its wavelength and frequency, its intensity and duration. Different materials also absorb energy differently.

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Health Hazards

When microwaves or radiowaves are absorbed by body tissues, localized or spot heating can occur. The increased temperature can damage tissues, especially those with poor temperature control such as the lens of the eye.

Cataracts, clouding of the lens of the eye, may occur at the very high energy levels encountered close to radiating radar antennas. Heat damage to tissues is caused by high levels of exposure for short periods of time.

The health effects of low levels of exposure to radiowaves or microwaves for long periods of time are much harder to find and to prove. Some scientific studies show health effects from long-term, lowlevel exposure, other studies do not.

The following list includes health effects which some researchers suspect may be related to excessive radiofrequency/microwave exposure:

- Psychological changes, e.g., insomnia, irritability, mood swings,
- depression
- Headaches
- Nervous system abnormalities
- Hormonal changes
- Miscarriages and birth defects
- Male Infertility
- Altered immunity
- Leukemia

Of course, many of these health effects are relatively common, and most people having these problems have NOT had excessive exposure to radiofrequency/microwave radiation.

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Safety and Health Precautions

Employers who have people working around devices which produce radiofrequency/microwave radiation need to be sure that those devices are properly shielded to prevent leakage of radiation. Safety information regarding proper use and shielding of those devices can usually be obtained from owner/operators manuals, manufacturers, and the Alaska Department of Labor Occupational Safety and Health Section.

Radiofrequency sealers and heaters have been among the major sources of employee exposure to radiofrequency/microwave radiation. When these machines are used, employees should use mechanical or electrical devices that allow them to stay as far away form the source of radiation as possible. Whenever possible, these sealers should be turned off when not being used. Maintenance and adjustment of this type of equipment should be performed only by trained technicians and only when the machines are turned off.

Warnings should be posted to keep everyone away from the source of radiation except for those workers who are absolutely essential to performing the job.

People who are regularly exposed to significant levels of radiofrequency/microwave radiation should have preemployment and annual physical exams. The doctors should pay careful attention to the eyes to look for cataracts, to the nervous system for any abnormalities to the blood, to detect any early evidence of leukemia, and to the reproductive system to detect any abnormalities. Information concerning the frequency and intensity of the radiation exposures and duration of exposures should be provided to the physician.

In work areas where there is known or suspected to be significant amounts of radiofrequency/microwave radiation present, specialists should measure the amounts of radiation present. If excessive radiofrequency/microwave radiation is detected, modifications in the workplace should be made to reduce radiation exposure of workers. Afterwards, additional measurements should be made to determine if the radiation exposure has been reduced.

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Permissible Exposure Limits

The State of Alaska's permissible exposure limit is specified in Article I of Subchapter 4, Occupational Health and Environmental Control Code [04.0106 (a)], Alaska Occupational Safety and Health Standards. For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm (milliwatts per square centimeter) as averaged over any possible six-minute period.

Further information can be obtained from the Alaska Department of Labor, Occupational Safety and Health Section.

Microwave Cooking Ovens

Microwave ovens used for heating food, when used in accordance with manufacturer's instructions, do not expose personnel to microwave radiation.

Microwave ovens do not need to be included in an employer's Hazard Communication program.

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Physical Agent Data Sheet (PADS) - Ultraviolet Radiation

Description

Ultraviolet (UV) is the name for a band of energy on the electromagnetic spectrum that lies between visible light and x-rays. UV has some of the properties of visible light and other properties of the x-rays. Like visible light, some UV is actually visible but most is invisible like x-rays. UV, like light, cannot penetrate very far into most solids. Some UV, like x-rays, can ionize atoms or molecules which visible light cannot do.

Common sources of UV include the sun (especially when reflected by water, snow or ice), sun tanning lamps, mercury discharge lamps, welding arcs, plasma torches, and some lasers.

Health Hazards

The nature and seriousness of UV injuries depend on the length of exposure, the intensity of the UV, the type or wavelength of UV, the sensitivity of the individual, and the presence of certain chemicals (photosensitizers).

Skin

UV from the sun causes sunburns and skin cancer. UV from other sources can also cause skin burns varying in degree from mild reddening of the skin (first degree burns) to more severe and painful blistering (second degree burns). Long-term skin exposure to UV can cause actinic skin (a dry, brown, inelastic wrinkled skin) and skin cancer. Fair skinned individuals are more likely to develop both sunburns and skin cancer.

Some drugs, such as the antibiotic tetracycline, can cause skin burns from UV to happen faster and to be more severe. Products containing coal tar can also cause this reaction. These substances are called photosensitizers.

UV exposure may trigger cold sores (Herpes Simplex) in some individuals.

Eyes

When UV is absorbed by the eyes and eyelids, it can cause keratoconjunctivitis or "welders' flash." This is a very painful condition that feels like grit in the eyes and may make the eyes water and very sensitive to light. The condition usually occurs 6-12 hours after exposure and may last 6-24 hours. The painful injury may make a person unwilling or unable to open his/her eyes during this time period, but most discomfort is gone within 48 hours with no lasting injury. The maximum sensitivity of the eye occurs at a UV wavelength of 270 manometers. Cataracts or clouding of the lens of the eye can occur during high exposures to wavelengths in the range of 295-300 nanometers.

Skin Safety and Health Precautions

Skin burns from high, short-term exposure to UV and skin cancer from long-term exposure can be prevented by covering exposed skin with clothing and protective equipment such as gloves and face shields.* Barrier creams or lotions with sun protection factors (SPF) of 15-18 will also help prevent skin burns.

* Welders' helmets should provide protection for the neck area as well as the face and eyes.

Eyes

Tinted goggles and/or face shields should be worn to prevent burns of the cornea and eyelids. Selection of the appropriate degree of tint should be based on the anticipated wavelength and intensity of the UV source. (see Table 1)

Table 1
Shade No. 3.0: is for glare of reflected sunlight from snow, water, sand, etc.; stray light from cutting and welding, metal pouring and work around furnaces and foundries; and soldering (for goggles or spectacles with side shields worn under helmets in arc welding operations, particularly gas-shielded arc welding operations).
Shade Nos. 4.0 and 5.0: are for light acetylene cutting and welding; light electric spot welding.
Shade Nos. 6.0 and 7.0: are for gas cutting, medium gas welding, and non-gas-shielded arc welding using current values up to 30 amperes.
Shade Nos. 8.0 and 9.0: are for heavy gas cutting and nongas-shielded arc welding and cutting using current values from 30 to

75 amperes.
Shade Nos. 10.0 and 11.0: are for arc welding and cutting using current values from 75 to 200 amperes.
Shade Nos. 12.0 and 13.0: are for arc welding and cutting using current values from 200 to 400 amperes.
Shade No. 14.0: is for arc welding and cutting using current values over 400 amperes (including carbon arc welding and cutting), and for atomic hydrogen welding.
NOTE: ordinary window glass, 1/811 in thickness, is sufficient protection for the eyes and skin against the ultraviolet radiation from ordinary sources such as sunlight. In cases of extremely intense sources of ultraviolet and visible radiation, it is not adequate.

In sunny conditions on water, snow and ice, extra precautions should be taken to protect against reflected sunlight. Sunglasses with side shields should be worn. When applying protective ointments or lotions, special attention should be paid to the nose, lips, underside of the chin, and tops of the ears.

In workplaces, operations such as welding which produce high levels of UV should be performed behind enclosures or barriers to absorb the radiation and shield nearby workers.

UV sources like mercury discharge lamps should be operated only with all safety devices in place and in accordance with manufacturer's instructions.

First Aid Procedures

Skin burns: immediate application of cold (cold water, ice, cold clean cloths) to the affected area will reduce the severity and relieve pain associated with first and second degree burns. Do not apply any burn ointments, creams, or butter to skin burns.

Eyes: place sterile dressings over the eyes of a person suffering from UV burns of the eyes and seek medical attention.

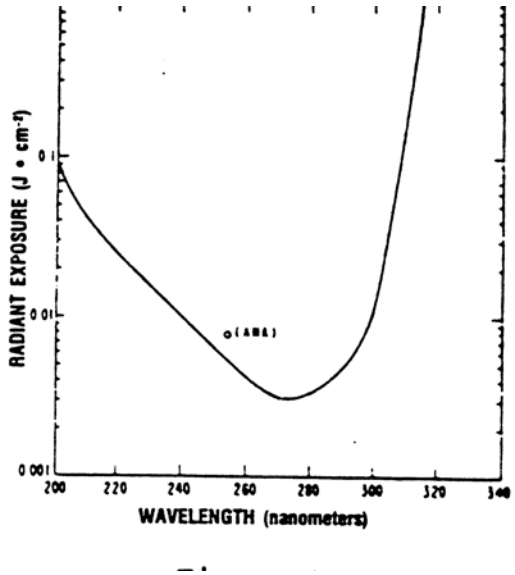
Recommended Exposure Limits[2]

The following section is very technical and is included for the use of safety and health professionals who have the skills and equipment to measure UV levels.

These threshold limit values (TLVS) refer to ultraviolet radiation in the spectral region between 200 and 400 nm and represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse

effect. These values for exposure of the eye or skin apply to ultraviolet radiation from arcs, gas and vapor discharges, flourescent and incandescent sources, and solar radiation, but do not apply to ultraviolet lasers. These values do not apply to ultraviolet radiation exposure of photosensitive individuals or of individuals concomitantly exposed to photosensitizing agents. These values should be used as guides in the control of exposure to continuous sources where the exposure duration shall not be less that 0.1 sec (Figure 1).

Figure 1



These values should be used as guides in the control of exposure to ultraviolet sources and should not be regarded as a fine line between safe and dangerous levels.

Recommended Values

The threshold limit value for occupational exposure to ultraviolet radiation incident upon skin or eye where irradiance values are known and exposure time is controlled are as follows:

1. For the near ultraviolet spectral region (320 to 400 nm), total radiance incident upon the unprotected skin or eye should not exceed 1 mW/cm for periods greated than 110 seconds (approximately 16 minutes) and for exposure times less than 10 seconds should not exceed one J/cm.

2. For the actinic ultraviolet spectral region (200 to 315 nm), radiant exposure incident upon the unprotected skin or eye should not exceed the values given in Table 2 within an 8-hour period.

Table 2
Relative Spectral Effectiveness by Wavelength*

Wavelength (nm)	TLV (mJ/cm^2)	Relative Special Effectiveness S□
200	100	0.03
210	40	0.075
220	25	0.12
230	16	0.19
240	10	0.30
250	7	0.43
254	6	0.5
260	4.6	0.65
270	3.0	1.0
280	3.4	0.88
290	4.7	0.64
300	10	0.30
305	50	0.60
310	200	0.015
315	1000	0.003

* See Laser TLVS.

3. To determine the effective irradiance of a broadband source weighted against the peak of the spectral effectiveness curve (270 nm), the following weighting formula should be used:

$$E_{eff} = \Sigma\, E\lambda\, S\lambda\, \Delta\, \lambda$$

where:

E_{eff} = effective irradinace relative to a monochromatic source at 270 nm in W/cm^2 [J/ (s cm^2)]

$E\lambda$ = spectral irradiance in W/(cm nm)

$S\lambda$ = relative spectral effectiveness (unitless)

$\Delta\lambda$ = band width in manometers

4. Permissible exposure time in seconds for exposure to actinic ultraviolet radiation incident upon the unprotected skin or eye may be computed by dividing 0.003 J/cm^2 by E_{eff} in W/cm^2. The exposure time may also be determined using Table 3 which provides exposure times corresponding to effective irradiances in μ W/cm^2.

Table 3
Permissible Ultraviolet Exposures

Duration of Exposure Per Day	Effective Irradiance E_{eff} (W/cm^2)
8 hrs	0.1
4 hrs	0.2
2 hrs	0.4
1 hr	0.8
30 min	1.7
15 min	3.3
10 min	5.0
5 min	10.0
1 min	50.0
30 sec	100.0
10 sec	300.0
1 sec	3,000.0
0.5 sec	6,000.0
0.1 sec	30,000.0

5. All the preceding TLVs for ultraviolet energy apply to sources which subtend an angle less than 80 degrees. Sources which subtend a greater angle need to be measured only over an angle of 80 degrees.

Conditioned (tanned) individuals can tolerate skin exposure in excess of the TLV without erythemal effects. However, such conditioning may not protect persons against cancer.

Reference

1. Sunlight and Man. Fitzpatrick et all Eds. University of Tokyo Press, Tokyo, Japan (1974).

2. Threshold Limit Values and Biological Exposures Indices for 1986 - 1987. American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, Ohio 45211-4438.

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Hand-Arm Vibration

Description

Hand-arm vibration is caused by the use of vibrating hand-held tools, such as pneumatic jack hammers, drills, gas powered chain saws, and electrical tools such as grinders. The nature of these tools involves vibration (a rapid back and forth type of motion) which is transmitted from the tool to the hands and arms of the person holding the tool.

Health Hazards

Vibration Syndrome and Vibration-Induced White Finger (VWF) are the major health hazards related to the use of vibrating tools. Carpal Tunnel Syndrome is another health problem that has been linked in one study to the use of smaller hand-held vibrating tools.

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Vibration Syndrome

Vibration Syndrome is a group of symptoms related to the use of vibrating tools and includes -some or all of the following: muscle weakness, muscle fatigue, pain in the arms and shoulders, and vibration-induced white finger. Many researchers believe that other symptoms--headaches, irritability, depression, forgetfulness, and sleeping problems--should also be included in descriptions of Vibration Syndrome.

Vibration-Induced White Finger

Vibration-Induced White Finger (VWF), also known as "Dead Finger" or "Dead Hand" is the result of impaired circulation (poor blood supply in the

fingers, caused by the prolonged use of vibrating tools. VWF may appear after only several months on the job, or may not appear until twenty to forty years on the job.

The harmful health effects of vibrating tools are related to the length of time that a worker has been using vibrating tools and to the frequency of the vibration (how fast the tool goes back and forth). The longer a person uses a vibrating tool, and the faster the tool vibrates, the greater the risk of health effects. The length of the initial symptom-free period of vibration exposure (i.e., from first exposure to the first appearance of a white finger) is known as the latent interval. It is related to the intensity of the vibration - the shorter the latent period, the more severe the resulting VWF if vibration exposure continues.

Temporary tingling or numbness during or soon after use of a vibrating hand tool is not considered to be VWF, however tingling and numbness in the fingers lasting more than an hour after finishing work may indicate early stages of VWF. Table 1 lists the stages that Vibration White Finger may progress through if exposure continues.

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Table 1
Stages of Vibration White Finger
(Taylor-Pelmear System)

Stage	Condition of Fingers	Work & Social Interference
00	No tingling, numbness or blanching of fingers	No complaints
OT	Intermittent tingling	No interference with activities
ON	Intermittent numbness	No interference with activities
TN	Intermittent tingling and numbness	No interference with activities
1	Blanching of a fingertip with or without tingling and/or numbness	No interference with activities
2	Blanching of one or more fingers beyond tips, usually during winter	Possible interference with activities outside work, no interference at work
3	Extensive blanching of fingers; frequent episodes in both summer and winter	Definite interference at work, at home, and with social activities; restriction of hobbies
4	Extensive blanching of most fingers; frequent episodes in both summer and winter	Occupation usually changed because of severity of signs and symptoms

The technical name for VWF is Raynaud's Syndrome of Occupational Origin. Raynaud's Syndrome may also occur in people who do not use vibrating hand-held tools. Several different kinds of medical illnesses can cause Raynaud's Syndrome. Raynaud's Syndrome also appears in some people who are otherwise entirely healthy.

It is important that people with Raynaud's Syndrome avoid the extensive use of vibrating tools because they can develop the most severe complications of VWF very quickly.

Many of the symptoms of Vibration Syndrome will disappear shortly after a worker stops using the types of tools which transmit vibration to the hands and arms. Fatigue and muscular pain in the arms and shoulders will generally disappear. In the early stages, if a worker stops using vibrating tools, VWF will not get any worse and may get slightly better.

Carpal Tunnel Syndrome

Carpal Tunnel Syndrome (CTS) is a group of symptoms in the hand which arise from pressure on one of the nerves which passes through the palm side of the wrist. The early symptoms are similar to the early symptoms of white finger and consist of tingling in the fingers. For the most part only the thumb, index, and middle fingers are affected in CTS. Later, symptoms can progress to numbness. Pain in the wrist and fingers may also develop. CTS may occur in people using small hand tools like pneumatic screwdrivers. Carpal Tunnel Syndrome also occurs among people having repetitive motion of the wrist or fingers, such as using a cash register, or picking fish from a net; or with forceful motion of the wrist, such as in using a wrench. Pinching or flexing with the wrist bent upwards, downwards, or sideways increases the occurrence of CTS.

The symptoms of CTS are frequently worse at night and a person may be awakened from sleep by pain or the feeling of pins and needles in fingers, hand or wrist.

Carpal Tunnel Syndrome may improve if diagnosed in the early stages and exposure to the type of activity which caused it is stopped. In moderate cases most of the symptoms of CTS can be relieved by a surgical operation which relieves the pressure on the nerve which causes the CTS symptoms. If the surgery is performed too late, only some of the symptoms may be relieved. In very severe cases the symptoms are irreversible and may include weakness of the hand due to loss of muscle function.

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Preventing Hand-Arm Vibration Diseases

Job Modification to Reduce Vibration Exposure

Wherever possible, jobs should be redesigned to minimize the use of hand-held vibrating tools. Where job redesign is not feasible, ways to reduce tool vibration should be found. Where practical, substitute a manual tool for a vibrating tool. Whenever possible, high vibration tools should be replaced by improved, low vibration tools designed to absorb vibration before it reaches the handgrip.

Determine vibration exposure times and introduce work breaks to avoid constant, continued vibration exposure. A worker who is using a vibrating tool continuously should take a 10 minute break after each hour of using the tool.

Medical Evaluation

Workers whose occupations place them at risk for developing VWF should have pre-employment physicals and thereafter should be checked at least annually by doctors who know about the diagnosis and treatment of VWF. Diagnostic tests which can be used include plethysmography, arteriography, skin thermography, and sensory tests,, such as two point discrimination depth sense, pinprick touch and temperature sensation. X-rays may also be useful.

Workers that have a past history of abnormalities in blood circulation and especially workers who have Raynaudis Syndrome should not be permitted to use vibrating hand-held tools. Workers who have moderate to severe symptoms of VWF should be reassigned to work which removes them from further direct exposure to vibrating tools.

If workers develop symptoms of tingling or numbness, or if their fingers occasionally become white or blue, or painful especially when cold, they should be examined by a doctor who knows about the diagnosis and treatment of VWF and CTS.

Work Practices

Workers using vibrating hand-held tools should wear multiple layers of warm gloves and should wear anti-vibration gloves whenever possible. Before starting the job, warm the hands. This is especially important when it is cold. workers using vibrating tools should not allow the hands to become chilled. If the hands of a worker using vibrating tools become wet or chilled, he should dry them and put on dry, warm gloves before resuming exposure to vibration. Workers exposed to cold should dress adequately to keep the whole body warm because low body temperature can make a worker more susceptible to VWF.

A worker using a vibrating hand-held tool should let the tool do the work by grasping it as lightly as possible, consistent with safe work practice. The tighter the tool is held, the more vibration is transmitted to the fingers and hand. The tool should rest on a support or on the workpiece as much as possible. The tool should be operated only when necessary and at the minimum speed (and impact force) to reduce vibration exposure.

Tools should be regularly maintained to keep vibration to a minimum. Keeping chisels and chainsaws sharp, for example, will reduce vibration. Using new grinder wheels will also reduce vibration.

Education

Employees who use or will be using vibrating hand-held tools should receive training about the hazards of vibration and they should be taught how to minimize the ill effects of vibration.

Smokers are much more susceptible to VWF that non-smokers, and the VWF in smokers is usually more severe, therefore workers who use vibrating hand-held tools should not smoke.

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Recommended Exposure Limits

Table 2 contains the American Conference of Governmental Industrial Hygienists (ACGIH) recommendations on the limits for exposure of the hand to vibration.

Table 2
Threshold Limit Values for Exposure of the Hand to Vibration in Either X_h, Y_h, Z_h, Directions

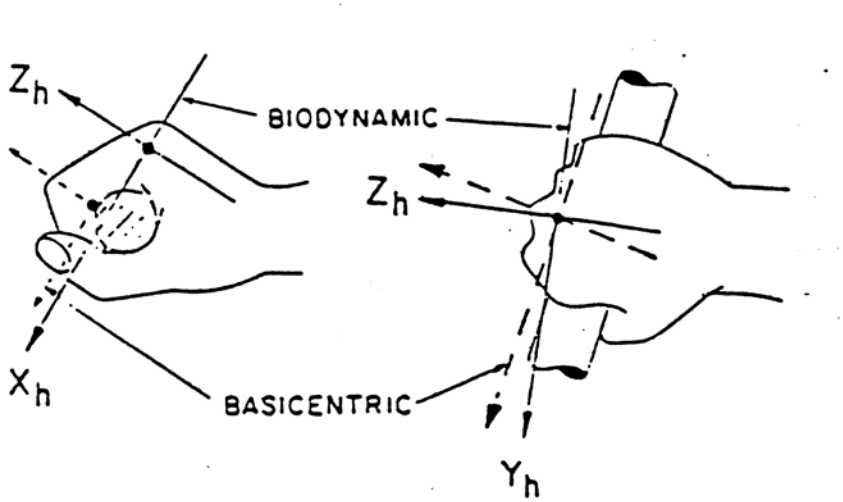
Total Daily Exposure Duration[a]	Values of the Dominant,[b] Frequency-Weighted, rms, Component Acceleration Which Shall Not be Exceeded a_k, (a_{keg})	
	m/s^2	g^c
4 hours and less than 8	4	0.40
2 hours and less than 4	6	0.61
1 hour and less than 2	8	0.81
less than 1 hour	12	1.22

[a] The total time vibration enters the hand per day, whether continuously or intermittently.

[b] Usually one axis of vibration is dominant over the remaining two axes. If one or more vibration axes exceeds the Total Daily Exposure then the TLV has

been exceeded.

[c] g = 9.81 m/s . d



Biodynamic and basicentric coordinate systems for the hand, showing the directions of the acceleration components (ISO 5349 and ANSI S3.34-1986).

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Labor Standards and Safety || Labor and Workforce Development
Job Seeker || Employer || Worker

APPENDIX D

Accident Report Form

IN THIS SECTION:

- Employee's Accident Report Form

ALASKA DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
Division of Workers' Compensation
P.O. Box 115512, Juneau AK 99811-5512

EMPLOYEE REPORT OF OCCUPATIONAL INJURY OR ILLNESS TO EMPLOYER

EMPLOYEE: All questions with an asterisk (*) must be completed

1. Employee Name Last* | First* | Middle | Suffix

2. Mailing Address & Telephone Number*

City* | State* | Zip Code*

Country, if outside the United States | Telephone No.

3. Date of Birth*

4. Date of Death

5. Social Security Number*

6. Gender Code ☐ F ☐ M ☐ U

7. Marital Status ☐ M-Married ☐ S-Separated ☐ U-Unmarried ☐ K-Unknown

8. Number of Dependents

9. Date of Injury / Illness*

10. Time of Injury / Illness

11. Did Injury / Illness Occur on Employer's Premises? ☐ Y-Yes ☐ N-No

12. Explain where injury / illness occurred

13. Employer Name*

14. Describe Nature of Injury / Illness* (i.e., sprain, laceration, etc.)

15. Describe Part of Body Affected*

16. Describe How the Injury / Illness Happened

17. Injury / Illness Due to Machine/Product Failure? DROP DOWN

18. Mechanical Guard/Safeguards Provided? DROP DOWN

19. List Any Machine/Substance/Object Causing Injury / Illness

20. If Machine What Part?

21. Witness Name | Witness Business Phone Number

22. Attending Physician Name & Contact Information

23. Hospital Name & Contact Information

24. Initial Treatment*

☐ 0-No Medical Treatment
☐ 1-Minor On-site Remedies by Employer Medical Staff
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25. Employee Authorization to Release Medical Records*

To all health care providers:

You are authorized to provide my employer (named in box 13), its workers' compensation liability insurance company, and its claims adjuster information concerning any health care advice, testing, treatment, or supplies provided to me for the injury or illness described above in box 16. This information will be used to evaluate my entitlement to receive benefits, including payment of medical benefits, under the Alaska Workers' Compensation Act. This authorization is valid for a one-year period from the date of my signature (box 23). I know I have a right to receive a copy of this authorization and agree a photographic copy of this authorization is as valid as the original.

Employee Signature:

26. If Employee Unavailable for Signature, Explain Circumstances in this Space

27. Date Signed

WARNING TO EMPLOYEES AND EMPLOYERS: AS 23.30.250 imposes civil penalties for fraud as well as certain false or misleading statements and acts. Criminal penalties for theft by deception (including fines and incarceration) apply to knowingly made false statements, claims, or employee misclassifications.

ORIGINAL TO EMPLOYER IMMEDIATELY

COPY TO EMPLOYEE

EMPLOYER: File the complete First Report of Injury (FROI), form 07-6101, with the Alaska Division of Workers' Compensation by electronic data interchange (EDI), or by mail, within 10 days of receiving this report, per AS 23.30.070(a).

Instructions for
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TO THE EMPLOYEE

You must complete and sign this form. Keep a copy of the completed form for your records, and immediately give this form to your employer. You should notify your employer immediately, but no later than 30 days after your injury occurred or illness began.

The employer will notify their insurer, their claims administrator, and the Division of Workers' Compensation of your injury.

After obtaining medical treatment, tell your health care provider's office to submit the required "Physician's Report" (8 AAC 45.086) to your employer.

You will not be paid compensation for lost wages for the first three (3) days off work unless your disability lasts more than 28 days. The first installment of compensation becomes due on the 14th day after the employer has knowledge of the injury, illness or disease. After the first payment, you should get a check every two (2) weeks while you are disabled. If you have not received payment within 21 days from the date you were injured or became ill, contact the insurer or adjuster first. If you have any questions or problems, contact the Division of Workers' Compensation office nearest you (contact information listed below). If you are off work for three (3) or more days, you will need to provide additional information to your employer's claims adjuster regarding your wages, marital status, and number of dependents.

If you believe your work-related injury or illness will keep you from returning to your job at the time of injury, you may need retraining. The training benefits to which you may be entitled, and how you go about getting them, depend on your date of injury. If you are off work for 45 days, contact the division office in Anchorage to learn more about your rights for reemployment benefits. You may also refer to the Reemployment Benefits section of the "Workers' Compensation and You" brochure available at the Division's internet web page:

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(907) 451-2889

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1111 W 8th St, Rm 305, Juneau AK 99801
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1. Employee Name Last* | First* | Middle | Suffix

2. Mailing Address & Telephone Number*

City* | State* | Zip Code*

Country, if outside the United States | Telephone No.

3. Date of Birth*

4. Date of Death

5. Social Security Number*

6. Gender Code ☐ F ☐ M ☐ U

7. Marital Status ☐ M-Married ☐ S-Separated ☐ U-Unmarried ☐ K-Unknown

8. Number of Dependents

9. Date of Injury / Illness*

10. Time of Injury / Illness

11. Did Injury / Illness Occur on Employer's Premises? ☐ Y-Yes ☐ N-No

12. Explain where injury / illness occurred

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21. Witness Name | Witness Business Phone Number

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☐ 0-No Medical Treatment
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TO THE EMPLOYER

The information on this form (07-6100) and the information on form 07-6101 must be submitted to the Division of Workers' Compensation immediately and in no case later than **ten (10) days** after you have knowledge that your employee has been injured, or claims to have been injured or become ill while working for you.

Failure to file these reports within the required time may subject you and/or your insurer to a penalty equal to 20 percent of the amount of compensation due to the injured worker.

Alaska Division of Worker's Compensation Offices

Anchorage:
3301 Eagle Street, Suite 304
Anchorage, AK 99503-4149
(907) 269-4980

Fairbanks:
675 Seventh Avenue, Station K
Fairbanks, AK 99701-4531
(907) 451-2889

Juneau:
1111 W 8th St, Rm 305, Juneau AK 99801
PO Box 115512, Juneau AK 99811-5512
(907) 465-2790

APPENDIX E

Stairway & Ladder Safety

IN THIS SECTION:

- OSHA Pamphlet: Stairways and Ladders – A Guide to OSHA Rules

OSHA Occupational Safety and Health Administration

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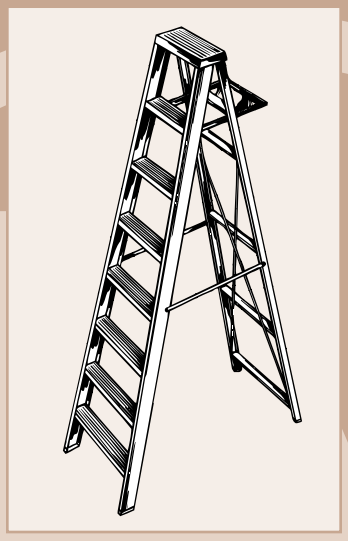
Stairways and Ladders

A Guide to OSHA Rules



OSHA 3124-12R 2003

This informational booklet provides a general overview of a particular topic related to OSHA standards. It does not alter or determine compliance responsibilities in OSHA standards or the *Occupational Safety and Health Act of 1970*. Because interpretations and enforcement policy may change over time, you should consult current OSHA administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the Courts for additional guidance on OSHA compliance requirements.

This information is available to sensory impaired individuals upon request.
Voice phone: (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

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Stairways and Ladders: A Guide to OSHA Rules

U.S. Department of Labor

Occupational Safety and Health Administration

OSHA 3124-12R
2003

Contents

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Introduction

Working on and around stairways and ladders is hazardous. Stairways and ladders are major sources of injuries and fatalities among construction workers for example, and many of the injuries are serious enough to require time off the job. OSHA rules apply to all stairways and ladders used in construction, alteration, repair, painting, decorating and demolition of worksites covered by OSHA's construction safety and health standards.

General Requirements

These rules specify when employers must provide stairways and ladders. In general, the standards require the following:

- When there is a break in elevation of 19 inches (48 cm) or more and no ramp, runway, embankment or personnel hoist is available, employers must provide a stairway or ladder at all worker points of access.
- When there is only one point of access between levels, employers must keep it clear of obstacles to permit free passage by workers. If free passage becomes restricted, employers must provide a second point of access and ensure that workers use it.
- When there are more than two points of access between levels, employers must ensure that at least one point of access remains clear.

In addition, employers must install all stairway and ladder fall protection systems required by these rules and ensure that their worksite meets all requirements of the stairway and ladder rules before employees use stairways or ladders. See 29 *CFR* 1926.1050-1060 for the details of the standard.

Note: The standard does not apply to ladders specifically manufactured for scaffold access and egress, but does apply to job-made and manufactured portable ladders intended for general purpose use. Rules for ladders used on or with scaffolds are addressed in 29 *CFR* 1926.451 Subpart L.

All Ladders

The following rules apply to *all ladders:*

- Maintain ladders free of oil, grease and other slipping hazards.
- Do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity.
- Use ladders only for their designed purpose.
- Use ladders only on stable and level surfaces unless secured to prevent accidental movement.
- Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Do not use slip-resistant feet as a substitute for exercising care when placing, lashing or holding a ladder upon slippery surfaces.
- Secure ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic to prevent accidental movement. Or use a barricade to keep traffic or activity away from the ladder.
- Keep areas clear around the top and bottom of ladders.
- Do not move, shift or extend ladders while in use.
- Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment.
- Face the ladder when moving up or down.
- Use at least one hand to grasp the ladder when climbing.
- Do not carry objects or loads that could cause loss of balance and falling.

In addition, the following general requirements apply to all ladders, including ladders built at the jobsite:

- *Double-cleated ladders* or two or more ladders must be provided when ladders are the only way to enter or exit a work area where 25 or more employees work or when a ladder serves simultaneous two-way traffic.
- Ladder rungs, cleats and steps must be parallel, level and uniformly spaced when the ladder is in position for use.
- Rungs, cleats and steps of *portable and fixed ladders* (except as provided below) must not be spaced less than 10 inches (25 cm) apart, nor more than 14 inches (36 cm) apart, along the ladder's side rails.
- Rungs, cleats and steps of *step stools* must not be less than 8 inches (20 cm) apart, nor more than 12 inches (31 cm) apart, between center lines of the rungs, cleats and steps.
- Rungs, cleats and steps at the base section of *extension trestle ladders* must not be less than 8 inches (20 cm) nor more than 18 inches (46 cm) apart, between center lines of the rungs, cleats and steps. The rung spacing on the extension section must not be less than 6 inches (15 cm) nor more than 12 inches (31 cm).
- Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.
- When splicing side rails, the resulting side rail must be equivalent in strength to a one-piece side rail made of the same material.
- Two or more separate ladders used to reach an elevated work area must be offset with a platform or landing between the ladders, except when portable ladders are used to gain access to fixed ladders.
- Ladder components must be surfaced to prevent snagging of clothing and injury from punctures or lacerations.

- *Wood ladders* must not be coated with any opaque covering except for identification or warning labels, which may be placed only on one face of a side rail.

Note: A competent person must inspect ladders for visible defects periodically and after any incident that could affect their safe use.

Specific Types of Ladders

- Do not use *single-rail ladders.*
- Use *non-self-supporting ladders* at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.
- Use *wooden ladders* built at the jobsite with spliced side rails at an angle where the horizontal distance is one-eighth of the working length of the ladder.

In addition, the top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.

Stepladders

- Do not use the top or top step of a stepladder as a step.
- Do not use cross bracing on the rear section of stepladders for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Metal spreader or locking devices must be provided on stepladders to hold the front and back sections in an open position when ladders are being used.

Portable Ladders

The minimum clear distance between side rails for all portable ladders must be 11.5 inches (29 cm).

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In addition, the rungs and steps of portable metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.

Non-self-supporting and self-supporting portable ladders must support at least four times the maximum intended load; extra heavy-duty type 1A metal or plastic ladders must sustain 3.3 times the maximum intended load. To determine whether a self-supporting ladder can sustain a certain load, apply the load to the ladder in a downward vertical direction with the ladder placed at a horizontal angle of 75.5 degrees.

When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet (.9 m) above the upper landing surface. When such an extension is not possible, the ladder must be secured and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its supports.

Fixed Ladders

If the total length of the climb on a fixed ladder equals or exceeds 24 feet (7.3 m), the ladder must be equipped with ladder safety devices; ***or*** self-retracting lifelines and rest platforms at intervals not to exceed 150 feet (45.7 m); ***or*** a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet (15.2 m) in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet (15.2 m). In addition, fixed ladders must meet the following requirements:

- Fixed ladders must be able to support at least two loads of 250 pounds (114 kg) each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup,

winds, rigging and impact loads resulting from using ladder safety devices.

- Individual rung/step ladders must extend at least 42 inches (1.1 m) above an access level or landing platform either by the continuation of the rung spacings as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.
- Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds (114 kg) applied in the middle of the step or rung.
- Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches (41 cm).
- Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.
- Rungs and steps of fixed metal ladders manufactured after March 15, 1991, must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.
- Minimum perpendicular clearance between fixed ladder rungs, cleats, and steps and any obstruction behind the ladder must be 7 inches (18 cm), except that the clearance for an elevator pit ladder must be 4.5 inches (11 cm).
- Minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats and steps, and any obstruction on the climbing side of the ladder must be 30 inches (76 cm). If obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm), provided a deflection device is installed to guide workers around the obstruction.
- Step-across distance between the center of the steps or rungs of fixed ladders and the nearest

edge of a landing area must be no less than 7 inches (18 cm) and no more than 12 inches (30 cm). A landing platform must be provided if the step-across distance exceeds 12 inches (30 cm).

- Fixed ladders without cages or wells must have at least a 15-inch (38 cm) clearance width to the nearest permanent object on each side of the centerline of the ladder.
- Fixed ladders must be provided with cages, wells, ladder safety devices or self-retracting lifelines where the length of climb is less than 24 feet (7.3 m) but the top of the ladder is at a distance greater than 24 feet (7.3 m) above lower levels.
- Side rails of through or side-step fixed ladders must extend 42 inches (1.1 m) above the top level or landing platform served by the ladder. Parapet ladders must have an access level at the roof if the parapet is cut to permit passage through it. If the parapet is continuous, the access level is the top of the parapet.
- Steps or rungs for through-fixed-ladder extensions must be omitted from the extension; and the extension of side rails must be flared to provide between 24 inches (61 cm) and 30 inches (76 cm) clearance between side rails.
- When safety devices are provided, the maximum clearance distance between side rail extensions must not exceed 36 inches (91 cm).
- Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.

Cages for Fixed Ladders

The requirements for cages for fixed ladders are as follows:

- Horizontal bands must be fastened to the side rails of rail ladders or directly to the structure, building or equipment for individual-rung ladders.

- Vertical bars must be on the inside of the horizontal bands and must be fastened to them.
- Cages must not extend less than 27 inches (68 cm), or more than 30 inches (76 cm) from the centerline of the step or rung and must not be less than 27 inches (68 cm) wide.
- Insides of cages must be clear of projections.
- Horizontal bands must be spaced at intervals not more than 4 feet (1.2 m) apart measured from centerline to centerline.
- Vertical bars must be spaced at intervals not more than 9.5 inches (24 cm), measured centerline to centerline.
- Bottoms of cages must be between 7 feet (2.1 m) and 8 feet (2.4 m) above the point of access to the bottom of the ladder. The bottom of the cage must be flared not less than 4 inches (10 cm) between the bottom horizontal band and the next higher band.
- Tops of cages must be a minimum of 42 inches (1.1 m) above the top of the platform or the point of access at the top of the ladder. There must be a way to access the platform or other point of access.

Wells for Fixed Ladders

The requirements for wells for fixed ladders are as follows:

- Wells must completely encircle the ladder.
- Wells must be free of projections.
- Inside faces of wells on the climbing side of the ladder must extend between 27 inches (68 cm) and 30 inches (76 cm) from the centerline of the step or rung.
- Inside widths of wells must be at least 30 inches (76 cm).
- Bottoms of wells above the point of access to the bottom of the ladder must be between 7 feet (2.1 m) and 8 feet (2.4 m).

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Ladder Safety Devices and Related Support Systems for Fixed Ladders

The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches (23 cm) in length. In addition, ladder safety devices and related support systems on fixed ladders must conform to the following:

- All safety devices must be able to withstand, without failure, a drop test consisting of a 500-pound weight (226 kg) dropping 18 inches (41 cm).
- All safety devices must permit the worker to ascend or descend without continually having to hold, push or pull any part of the device, leaving both hands free for climbing.
- All safety devices must be activated within 2 feet (.61 m) after a fall occurs and limit the descending velocity of an employee to 7 feet/second (2.1 m/sec) or less.

Requirements for Mounting Ladder Safety Devices for Fixed Ladders

The requirements for mounting ladder safety devices for fixed ladders are as follows:

- Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings spaced along the entire length of the carrier, to provide the necessary strength to stop workers' falls.
- Mountings for flexible carriers must be attached at each end of the carrier. Cable guides for flexible carriers must be installed with a spacing between 25 feet (7.6 m) and 40 feet (12.2 m) along the entire length of the carrier, to prevent wind damage to the system.
- Design and installation of mountings and cable guides must not reduce the strength of the ladder.
- Side rails and steps or rungs for side-step fixed ladders must be continuous in extension.

Defective Ladders

Ladders needing repairs are subject to the following rules:

- Portable ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails, corroded components or other faulty or defective components—must immediately be marked defective or tagged with "Do Not Use" or similar language and withdrawn from service until repaired.
- Fixed ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails or corroded components—must be withdrawn from service until repaired.
- Defective fixed ladders are considered withdrawn from use when they are immediately tagged with "Do Not Use" or similar language, *or* marked in a manner that identifies them as defective, *or* blocked—such as with a plywood attachment that spans several rungs.
- Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to use.

Rules for Stairways

The rules covering stairways and their components generally depend on how and when stairs are used. Specifically, there are rules for stairs used during construction and stairs used temporarily during construction, as well as rules governing stair rails and handrails.

Stairways Used During Construction

The following requirements apply to all *stairways used during construction:*

- Stairways that will not be a permanent part of the building under construction must have landings at least 30 inches deep and 22 inches wide (76 x 56 cm) at every 12 feet (3.7 m) or less of vertical rise.

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- Stairways must be installed at least 30 degrees—and no more than 50 degrees—from the horizontal.
- Variations in riser height or stair tread depth must not exceed 1/4 inch in any stairway system, including any foundation structure used as one or more treads of the stairs.
- Doors and gates opening directly onto a stairway must have a platform that extends at least 20 inches (51 cm) beyond the swing of the door or gate.
- Metal pan landings and metal pan treads must be secured in place before filling.
- Stairway parts must be free of dangerous projections such as protruding nails.
- Slippery conditions on stairways must be corrected.
- Workers must not use spiral stairways that will not be a permanent part of the structure.

Temporary Stairs

The following requirements apply to *stairways used temporarily during construction.*

Except during construction of the stairway,

- Do not use stairways with metal pan landings and treads if the treads and/or landings have not been filled in with concrete or other materials unless the pans of the stairs and/or landings are temporarily filled in with wood or other materials. All treads and landings must be replaced when worn below the top edge of the pan.
- Do not use skeleton metal frame structures and steps (where treads and/or landings will be installed later) unless the stairs are fitted with secured temporary treads and landings.

Note: Temporary treads must be made of wood or other solid material and installed the full width and depth of the stair.

Stair Rails

The following general requirements apply to all stair rails:

- Stairways with four or more risers or rising more than 30 inches (76 cm) in height—whichever is less—must be installed along each unprotected side or edge. When the top edge of a stair rail system also serves as a handrail, the height of the top edge must be no more than 37 inches (94 cm) nor less than 36 inches (91.5 cm) from the upper surface of the stair rail to the surface of the tread.
- Stair rails installed after March 15,1991, must be not less than 36 inches (91.5 cm) in height.
- Top edges of stair rail systems used as handrails must not be more than 37 inches (94 cm) high nor less than 36 inches (91.5 cm) from the upper surface of the stair rail system to the surface of the tread. (If installed before March 15, 1991, not less than 30 inches [76 cm]).
- Stair rail systems and handrails must be surfaced to prevent injuries such as punctures or lacerations and to keep clothing from snagging.
- Ends of stair rail systems and handrails must be built to prevent dangerous projections, such as rails protruding beyond the end posts of the system.

In addition,

- Unprotected sides and edges of stairway landings must have standard 42-inch (1.1 m) guardrail systems.
- Intermediate vertical members, such as balusters used as guardrails, must not be more than 19 inches (48 cm) apart.
- Other intermediate structural members, when used, must be installed so that no openings are more than 19 inches (48 cm) wide.

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- Screens or mesh, when used, must extend from the top rail to the stairway step and along the opening between top rail supports.

Handrails

Requirements for handrails are as follows:

- Handrails and top rails of the stair rail systems must be able to withstand, without failure, at least 200 pounds (890 n) of weight applied within 2 inches (5 cm) of the top edge in any downward or outward direction, at any point along the top edge.
- Handrails must not be more than 37 inches (94 cm) high nor less than 30 inches (76 cm) from the upper surface of the handrail to the surface of the tread.
- Handrails must provide an adequate handhold for employees to grasp to prevent falls.
- Temporary handrails must have a minimum clearance of 3 inches (8 cm) between the handrail and walls, stair rail systems and other objects.
- Stairways with four or more risers, or that rise more than 30 inches (76 cm) in height—whichever is less—must have at least one handrail.
- Winding or spiral stairways must have a handrail to prevent use of areas where the tread width is less than 6 inches (15 cm).

Midrails

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members must be provided between the top rail and stairway steps to the stair rail system. When midrails are used, they must be located midway between the top of the stair rail system and the stairway steps.

Training Requirements

Employers must train all employees to recognize hazards related to ladders and stairways, and instruct them to minimize these hazards. For example, employers must ensure that each employee is trained by a competent person in the following areas, as applicable:

- Nature of fall hazards in the work area;
- Correct procedures for erecting, maintaining and disassembling the fall protection systems to be used;
- Proper construction, use, placement and care in handling of all stairways and ladders; and
- Maximum intended load-carrying capacities of ladders used.

Note: Employers must retrain each employee as necessary to maintain their understanding and knowledge on the safe use and construction of ladders and stairs.

Glossary

cleat — A ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.

double-cleat ladder — A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending.

failure — Load refusal, breakage or separation of components.

fixed ladder — A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

handrail — A rail used to provide employees with a handhold for support.

job-made ladder — A ladder that is fabricated by employees, typically at the construction site; non-commercially manufactured.

load refusal — The point where the structural members lose their ability to carry the load.

point of access — All areas used by employees for work-related passage from one area or level to another.

portable ladder — A ladder that can be readily moved or carried.

riser height — The vertical distance from the top of a tread or platform/landing to the top of the next higher tread or platform/landing.

side-step fixed ladder — A fixed ladder that requires a person to get off at the top to step to the side of the ladder side rails to reach the landing.

single-cleat ladder — A ladder consisting of a pair of side rails connected together by cleats, rungs or steps.

stair rail system — A vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels.

temporary service stairway — A stairway where permanent treads and/or landings are to be filled in at a later date.

through fixed ladder — A fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.

tread depth — The horizontal distance from front to back of a tread, excluding nosing, if any.

OSHA Assistance

OSHA can provide extensive help through a variety of programs, including technical assistance about effective safety and health programs, state plans, workplace consultations, voluntary protection programs, strategic partnerships, and training and education, and more. An overall commitment to workplace safety and health can add value to your business, to your workplace, and to your life.

Safety and Health Program Management Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. In fact, an effective safety and health program forms the basis of good worker protection and can save time and money—about $4 for every dollar spent—and increase productivity and reduce worker injuries, illnesses and related workers' compensation costs.

To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Program Management Guidelines (Federal Register 54* (16): 3904-3916, January 26, 1989). These voluntary guidelines can be applied to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management system:

- Management leadership and employee involvement,
- Workaday analysis,
- Hazard prevention and control, and
- Safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program. The *Federal Register* notice is available online at **www.osha.gov.**

State Programs

The *Occupational Safety and Health Act of 1970 (OSH Act)* encourages states to develop and operate their own job safety and health plans. OSHA approves and monitors these plans. There are currently 26 state plans: 23 cover both private and public (state and local government) employment; 3 states, Connecticut, New Jersey and New York, cover the public sector only. States and territories

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with their own OSHA-approved occupational safety and health plans must adopt standards identical to, or at least as effective as, the federal standards.

Consultation Services

Consultation assistance is available on request to employers who want help in establishing and maintaining a safe and healthful workplace. Largely funded by OSHA, the service is provided at no cost to the employer. Primarily developed for smaller employers with more hazardous operations, the consultation service is delivered by state governments employing professional safety and health consultants. Comprehensive assistance includes an appraisal of all mechanical systems, work practices, and occupational safety and health hazards of the workplace and all aspects of the employer's present job safety and health program. In addition, the service offers assistance to employers in developing and implementing an effective safety and health program. No penalties are proposed or citations issued for hazards identified by the consultant. OSHA provides consultation assistance to the employer with the assurance that his or her name and firm and any information about the workplace will not be routinely reported to OSHA enforcement staff.

Under the consultation program, certain exemplary employers may request participation in OSHA's Safety and Health Achievement Recognition Program (SHARP). Eligibility for participation in SHARP includes receiving a comprehensive consultation visit, demonstrating exemplary achievements in workplace safety and health by abating all identified hazards, and developing an excellent safety and health program.

Employers accepted into SHARP may receive an exemption from programmed inspections (not complaint or accident investigation inspections) for a period of 1 year.

Voluntary Protection Programs (VPP)

Voluntary Protection Programs and onsite consultation services, when coupled with an effective enforcement program, expand worker protection to help meet the goals of the *OSH Act.* The three VPP—Star, Merit, and Demonstration—are designed to recognize outstanding achievements by companies that have successfully incorporated comprehensive safety and health programs into their total management system. The VPP motivate others to achieve excellent safety and health results in the same outstanding way as they establish a cooperative relationship between employers, employees, and OSHA.

For additional information on VPP and how to apply, contact the OSHA regional offices listed at the end of this publication.

Strategic Partnership Program

OSHA's Strategic Partnership Program, the newest member of OSHA's cooperative programs, helps encourage, assist, and recognize the efforts of partners to eliminate serious workplace hazards and achieve a high level of worker safety and health. Whereas OSHA's Consultation Program and VPP entail one-on-one relationships between OSHA and individual work sites, most strategic partnerships seek to have a broader impact by building cooperative relationships with groups of employers and employees. These partnerships are voluntary, cooperative relationships between OSHA, employers, employee representatives, and others (e.g., trade unions, trade and professional associations, universities, and other government agencies).

For more information on this and other cooperative programs, contact your nearest OSHA office, or visit OSHA's website at **www.osha.gov.**

Alliance Program

Alliances enable organizations committed to workplace safety and health to collaborate with

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OSHA to prevent injuries and illnesses in the workplace. OSHA and its allies work together to reach out to, educate, and lead the nation's employers and their employees in improving and advancing workplace safety and health.

Alliances are open to all, including trade or professional organizations, businesses, labor organizations, educational institutions, and government agencies. In some cases, organizations may be building on existing relationships with OSHA through other cooperative programs.

There are few formal program requirements for alliances, which are less structured than other cooperative agreements, and the agreements do not include an enforcement component. However, OSHA and the participating organizations must define, implement, and meet a set of short- and long-term goals that fall into three categories: training and education; outreach and communication; and promotion of the national dialogue on workplace safety and health.

Training and Education

OSHA's area offices offer a variety of information services, such as compliance assistance, technical advice, publications, audiovisual aids and speakers for special engagements. OSHA's Training Institute in Arlington Heights, Ill., provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private sector employers, employees, and their representatives.

The OSHA Training Institute also has established OSHA Training Institute Education Centers to address the increased demand for its courses from the private sector and from other federal agencies. These centers are nonprofit colleges, universities, and other organizations that have been selected after a competition for participation in the program.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually. Grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training and education, contact the OSHA Training Institute, Office of Training and Education, 2020 South Arlington Heights Road, Arlington Heights, IL 60005, (847) 297-4810, or see **Outreach** on OSHA's website at **www.osha.gov.**

For further information on any OSHA program, contact your nearest OSHA area or regional office listed at the end of this publication.

Electronic Information

OSHA has a variety of materials and tools available on its website **www.osha.gov.** These include *e-Tools* such as *Expert Advisors, Electronic Compliance Assistance Tools (e-cats), Technical Links;* regulations, directives and publications; videos and other information for employers and employees. OSHA's software programs and compliance assistance tools walk you through challenging safety and health issues and common problems to find the best solutions for your workplace.

OSHA's CD-ROM includes standards, interpretations, directives, and more and can be purchased on CD-ROM from the U.S. Government Printing Office. To order, write to the Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250-7954
or phone (202) 512-1800,
or order online at **http://bookstore.gpo.gov.**

OSHA Publications

OSHA has an extensive publications program. For a listing of free or sales items, visit OSHA's website at **www.osha.gov** or contact the OSHA Publications Office
U.S. Department of Labor
200 Constitution Avenue, NW, N-3101
Washington, DC 20210
Telephone (202) 693-1888 or
fax to (202) 693-2498.

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Emergencies, Complaints or Further Assistance

To report an emergency, file a complaint or seek OSHA advice, assistance or products, call (800) 321-OSHA or contact your nearest OSHA regional or area office listed at the end of this publication. The teletypewriter (TTY) number is (877) 889-5627.

You can also file a complaint online and obtain more information on OSHA federal and state programs by visiting OSHA's website at **www.osha.gov.**

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Boston, MA 02203
(617) 565-9860

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(NJ,* NY,* PR,* VI*)
201 Varick Street, Room 670
New York, NY 10014
(212) 337-2378

Region III
(DE, DC, MD,* PA,* VA,* WV)
The Curtis Center
170 S. Independence Mall West
Suite 740 West
Philadelphia, PA 19106-3309
(215) 861-4900

Region IV
(AL, FL, GA, KY,* MS, NC,* SC,* TN*)
61 Forsyth Street, SW, Room 6T50
Atlanta, GA 30303
(404) 562-2300

Region V
(IL, IN,* MI,* MN,* OH, WI)
230 South Dearborn Street, Room 3244
Chicago, IL 60604
(312) 353-2220

Region VI
(AR, LA, NM,* OK, TX)
525 Griffin Street, Room 602
Dallas, TX 75202
(214) 767-4731 or 4736 x224

Region VII
(IA,* KS, MO, NE)
City Center Square
1100 Main Street, Suite 800
Kansas City, MO 64105
(816) 426-5861

Region VIII
(CO, MT, ND, SD, UT,* WY*)
1999 Broadway, Suite 1690
P.O. Box 46550
Denver, CO 80201-6550
(303) 844-1600

OSHA
www.osha.gov

Region IX
(American Samoa, AZ,* CA,* HI, NV,* Northern Mariana Islands)
71 Stevenson Street, Room 420
San Francisco, CA 94105
(415) 975-4310

Region X
(AK,* ID, OR,* WA*)
1111 Third Avenue, Suite 715
Seattle, WA 98101-3212
(206) 553-5930

*These states and territories operate their own OSHA-approved job safety and health programs (Connecticut, New Jersey and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.

Note: To get contact information for OSHA Area Offices, OSHA-approved State Plans and OSHA consultation projects, please visit us online at **www.osha.gov** or call us at (800) 321-OSHA (6742).

APPENDIX F

MSDS Notice

IN THIS SECTION:

- Notice to All Employees Re: Material Safety Data Sheets

Tab 6

Notice: To All Employees

Re: Material Safety Data Sheets

Please be aware that all Material Safety Data Sheets are kept on file at the main office and are available for reference. If a situation occurs where you need immediate access to MSDS information the information will be made available to you by fax or email. If you have any questions please call Angel White (313-8344) or Glenn Watts (344-6381).

Thank you,

Angel White
H. Watt & Scott, Inc.
Ph 907-313-8344
Fax 907-344-5360

APPENDIX G

Health & Safety Letter of Commitment & Safety Violation Notice

IN THIS SECTION:

- Notice to All Employees Re: Health & Safety Commitment
- Safety Violation Notice Forms

10th March 2017

Health and Safety
Letter of Commitment

To All H. Watt & Scott Employees,

On the 26th of September, 2016, OSHA [Occupational Safety and Health] drove past the Wendy's on Benson project and noticed that workers were on the roof with no fall protection or protective barriers. An OSHA investigation was conducted and a Citation was issued for $1000.00. In addition to this violation, we were also cited for using wall-mounted power outlets without protective covers.

H. Watt and Scott's aim is to conduct business responsibly and to protect the health and safety of our employees and customers. As part of our responsibility, we are committed to continuous improvement in health and safety performance throughout our operations.

Our Commitment:

- We will comply with health and safety laws wherever we operate;
- We will provide a safe and healthy working environment and we will not compromise the health and safety of any individual;
- We will provide the necessary training and resources to ensure that the day-to-day activities are carried out safely.

Although creating a safe workplace begins with the leadership team, it involves every employee. We need to work together to achieve the common goal of an accident and citation free workplace.

Moving forward, if a safety violation is committed, employees will be required to fill out a "Safety Violation Notice" [see attached] that will be put in the employees file. Essentially, this means that if an employee violates safety protocol, they may be subject to a company safety violation. Any violations that make it into an employee's file, will be used as part of the employee's evaluations regarding wage raises, promotions etc.

Thank you for helping make H. Watt and Scott a safe workplace.

Glenn Watts, President

Glenn Z Watts

SAFETY VIOLATION NOTICE

Company Name: _____ Date of Violation: _____

Supervisor Name: _____ Job Name: _____

Employee Name: _____ Job #: _____

☐ 1st Offense ☐ 2nd Offense ☐ 3rd Offense

☐ Counseling/Retraining ☐ Written Reprimand ☐ Suspension ☐ Termination

The above named employee was contacted today regarding the following safety violation:

_____

_____

_____

_____

_____

_____

The employee's explanation of his/her behavior is the following:

_____

_____

_____

_____

_____

_____

I (the employee) understand that safety rules and practices are necessary to reduce accidents and injuries on the job. Safe behavior on the job not only protects me, but my fellow workers as well. it is also understood that my employer, by law, must impose disciplinary procedures, which could include termination.

_____ _____

Employee Signature Date

This form is to be filled out by the manager/supervisor and the employee. The form will be maintained in the employee's personnel file for two years.

_____ _____

Supervisor Signature Date

SAFETY VIOLATION NOTICE

Company Name: _____ Date of Violation: _____

Supervisor Name: _____ Job Name: _____

Employee Name: _____ Job #: _____

☐ 1st Offense ☐ 2nd Offense ☐ 3rd Offense

☐ Counseling/Retraining ☐ Written Reprimand ☐ Suspension ☐ Termination

The above named employee was contacted today regarding the following safety violation:

_____

_____

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The employee's explanation of his/her behavior is the following:

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I (the employee) understand that safety rules and practices are necessary to reduce accidents and injuries on the job. Safe behavior on the job not only protects me, but my fellow workers as well. it is also understood that my employer, by law, must impose disciplinary procedures, which could include termination.

_____ _____

Employee Signature Date

This form is to be filled out by the manager/supervisor and the employee. The form will be maintained in the employee's personnel file for two years.

_____ _____

Supervisor Signature Date

SAFETY VIOLATION NOTICE

Company Name: _____ Date of Violation: _____

Supervisor Name: _____ Job Name: _____

Employee Name: _____ Job #: _____

☐ 1st Offense ☐ 2nd Offense ☐ 3rd Offense

☐ Counseling/Retraining ☐ Written Reprimand ☐ Suspension ☐ Termination

The above named employee was contacted today regarding the following safety violation:

_____

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The employee's explanation of his/her behavior is the following:

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_____

I (the employee) understand that safety rules and practices are necessary to reduce accidents and injuries on the job. Safe behavior on the job not only protects me, but my fellow workers as well. it is also understood that my employer, by law, must impose disciplinary procedures, which could include termination.

_____ _____

Employee Signature Date

This form is to be filled out by the manager/supervisor and the employee. The form will be maintained in the employee's personnel file for two years.

_____ _____

Supervisor Signature Date

SAFETY VIOLATION NOTICE

Company Name: _____ Date of Violation: _____

Supervisor Name: _____ Job Name: _____

Employee Name: _____ Job #: _____

☐ 1st Offense ☐ 2nd Offense ☐ 3rd Offense

☐ Counseling/Retraining ☐ Written Reprimand ☐ Suspension ☐ Termination

The above named employee was contacted today regarding the following safety violation:

_____

_____

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_____

The employee's explanation of his/her behavior is the following:

_____

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_____

I (the employee) understand that safety rules and practices are necessary to reduce accidents and injuries on the job. Safe behavior on the job not only protects me, but my fellow workers as well. it is also understood that my employer, by law, must impose disciplinary procedures, which could include termination.

_____ _____

Employee Signature Date

This form is to be filled out by the manager/supervisor and the employee. The form will be maintained in the employee's personnel file for two years.

_____ _____

Supervisor Signature Date