Section 13. Outdoor Heat and Cold Stress Prevention Plan

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13.1 Policy Statement
This program was developed to protect employees and students from hazards posed by working in the outdoor environment. WSU is committed to preventing heat related illnesses that can occur to employees and students working outdoors by:

- Identifying, evaluating and controlling potential exposure to extreme temperature, humidity, and other environmental factors.
- Providing drinking water
- Providing supervisor and employee training
- Establishing heat-related emergency procedures

13.2 Preventing Heat-Related Illnesses
This program applies when employees and students are exposed to outdoor heat at or above the following temperature and clothing action levels.

<table>
<thead>
<tr>
<th>Outdoor Temperature &amp; Clothing Action Levels</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All other clothing</td>
<td>89 °F</td>
</tr>
<tr>
<td>Double-layer woven clothes including coveralls, jackets and sweatshirts</td>
<td>77 °F</td>
</tr>
<tr>
<td>Non-breathing clothes including vapor barrier clothing or PPE such as chemical resistant suits</td>
<td>52 °F</td>
</tr>
</tbody>
</table>

Outdoor work includes any employee and student assigned to work in the outdoor environment on a regular basis.

This program does not apply to incidental exposure which exists when an employee or student is not required to perform a work activity outdoors for more than fifteen minutes in any sixty-minute period.

Note: It is possible outdoor heat related illness might result at temperatures below the action levels when employees and students have not acclimatized to sudden and significant increases in temperature and humidity. Supervisors, employees and students should monitor for sign and symptoms of outdoor heat related illness when there is a significant and sudden increase in temperature.

13.2.1 Program Responsibility
Units are responsible for implementing this program as part of their Accident Prevention Program. Supervisors are responsible for encouraging employees and students to frequently consume acceptable beverages (acceptable beverages include water and sports drinks that do not contain caffeine) to ensure hydration.

Employees and students are responsible for monitoring their own personal factors for heat related illness including consumption of water or other acceptable beverages to ensure hydration.
13.2.2 Evaluating and Controlling Outdoor Heat Stress Factors
In addition to outdoor temperature, supervisors should evaluate other potential heat stress factors. These factors include:

- Radiant Heat (Example: Reflection of heat from asphalt, rocks, or composite roofing material, or work in direct sunlight)
- Air Movement (Example: Wind blowing and temperature above 95 °F)
- Conductive Heat (Example: Operating orchard tractor for mowing)
- Workload Activity and Duration (Examples: Hand sawing, digging with a shovel)
- Personal Protective Equipment (Examples: Wearing a respirator, chemical resistant suit and gloves for pesticide application, or leathers and gloves for welding)

Supervisors should attempt to control outdoor heat stress factors when feasible. Controls to consider include:

- Taking breaks in a shaded area (building, canopy and under trees)
- Starting the work shift early (when daylight begins) and ending the shift early and/or not working outside during the hottest part of the day.
- Removing personal protective equipment such as respirators, chemical resistant clothing and gloves, and welding leathers during breaks
- Using cooling vests or headbands
- Workers should not work alone in the heat for long periods of time.

13.2.3 Drinking Water
Sufficient quantity of potable drinking water will be provided and made accessible to employees and students. At least one quart of water per employee/student per hour will be available. Water can be found at the following locations:

- Office and lab buildings
- Columbia View rest rooms
- Sunrise orchard potable water hydrants
- If a potable water source is not available at the worksite it is the supervisor’s responsibility to ensure that 1 quart of water/hour is available to each employee.

13.2.4 Procedures for Responding to a Heat-Related Illness
Supervisors will respond to heat-related illness in a quick and safe manner. The table below outlines the potential types of heat-related illnesses, signs and symptoms and specific first aid and emergency procedures. The information should be present at all work sites where outdoor work activities are conducted.

- Employees and students experiencing signs and symptoms of a heat-related illness are to cease work and report their condition to their supervisor.
• Employees and students showing signs or demonstrating symptoms of heat-related illness are to be relieved from duty and provided sufficient means to reduce body temperature.

• Employees and students experiencing sunburn, heat rash or heat cramps will be monitored to determine whether medical attention is necessary.

• Emergency medical services will be called (911) when employees and students experience signs and symptoms of heat exhaustion or heat stroke.

<table>
<thead>
<tr>
<th>Heat-Related Illness First Aid and Emergency Response Procedures</th>
</tr>
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<tbody>
<tr>
<td>Heat-Related Illness</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Sunburn</td>
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<td>Heat Rash</td>
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<td>Heat Cramps</td>
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</tbody>
</table>

*In remote areas specific procedures might be required to move or transport employees and students to a place where they can be reached by emergency medical services.
13.3 Heat Illness Training

13.3.1 Supervisor Training

Prior to supervising employees and students working in outdoor environments with heat exposure at or above the action levels supervisors will receive training in the following topics:

- The content and procedures contained in this program.
- Procedures listed in this program the supervisor will follow if an employee or student shows signs and symptoms consistent with possible heat-related illness.
- Specific procedures, if necessary, describing how to move or transport employees and students to a place where they can be reached by emergency medical services.
- Information provided to employees.

13.3.2 Employee/Student Training

Employees and students who may be exposed to outdoor heat at or above the action levels are to be trained on the following topics:

- Environmental factors that might contribute to the risk of heat-related illness (temperature, humidity, radiant heat, air movement, conductive heat sources, workload activity and duration, and personal protective equipment)
- Personal factors that may increase susceptibility to heat-related illness (age, degree acclimatization, medical conditions, drinking water, consuming alcohol, caffeine use, nicotine use and use of medications that affect the body’s response to heat).
- The importance of removing heat retaining personal protective equipment, such as non-breathable chemical resistant clothing, during breaks.
- The importance of frequent drinking of small quantities of water.
- The importance of acclimatization.
- The different types and common signs and symptoms of heat-related illnesses.
- The procedure for immediately reporting signs and symptoms of heat-related illness in themselves, co-workers or students to their supervisor or person in charge.

13.3.3 Refresher Training

Supervisors, employees and students covered by this program are to receive annual refresher training, available at: [http://www.tfrec.wsu.edu/pages/safety/Heat_Illness](http://www.tfrec.wsu.edu/pages/safety/Heat_Illness)

13.3.4 Additional Training Programs and Materials

Visit the Environmental Health and Safety website ([www.ehs.wsu.edu](http://www.ehs.wsu.edu)) for training materials that can be used to provide supervisor and employee training or contact EH&S at 335-3041 for assistance.
13.4 Preventing Cold-Related Illnesses

During the winter months many agricultural workers face an additional occupational hazard—exposure to the cold. Some health problems can arise including frostbite, trench foot, and hypothermia. This sheet is designed to provide readers with basic information on how to prevent cold-related illnesses.

13.4.1 The Cold Environment

How the body responds to cold. An individual gains body heat from food and muscular work and loses it through convection, conduction, radiation, and sweating to maintain a constant body temperature of approximately 98.6 °F. The body's first response to a cold environment is constriction of the blood vessels of the skin that reduces heat loss from the surface of the skin by decreasing peripheral blood flow and/or shivering that generates heat by increasing the body's metabolic rate.

Environmental conditions that cause cold-related stresses are low temperature, cool high winds, dampness, and cold water. Wind chill (temperature and wind velocity) is an important factor to evaluate when working outside. For example, when the actual air temperature of the wind is 40 °F and its velocity is 35 mph, the exposed skin would perceive these conditions as if the equivalent still air temperature were 11 °F. A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures.

13.4.2 Other Major Risk Factors for Cold-Related Stresses

In addition to the cold environment, other major risk factors contributing to cold-related stresses include:

- Inadequate clothing or wet clothing (the actual effects of cold on the body depend on how well the skin is insulated from the environment).
- Drug use or certain medications may inhibit the body's response to cold or impair judgment (examples include beta blocks, neuroleptic drugs, alcohol, and cigarettes).
- A cold or other disease, such as diabetes, atherosclerosis and hypothyroidism, may increase risk.
- Gender: male death rates due to cold exposure are greater than the rates for females; perhaps because of inherent risk-taking activities, body fat composition, or other physiological differences.
- Susceptibility increases with age.
- Exhaustion or immobilization, especially through injury or entrapment.

13.4.3 Harmful Effects of Cold

Common harmful effects of cold include frostbite, trench foot, and general hypothermia. Frostbite occurs when skin tissue actually freezes and cell damage results. The freezing point of skin is approximately 30 °F and wind chill can be a significant factor in accelerating the process. Fingers, toes, cheeks, nose, and ears are primarily affected.
13.4.3.1 *Frostbite*

The symptoms of frostbite include an uncomfortable sensation of coldness; there may be a tingling, stinging, or aching feeling followed by numbness. Initially the frostbitten area appears white and is cold to the touch. This is followed by heat, redness, and swelling. Occasionally a victim may not be aware of the frostbite.

Tissue damage can be mild and reversible or severe, resulting in scarring and tissue death. Amputation or loss of function can be an unfortunate result. First aid includes treating affected areas with warm water at 102 to 110 °F. **Be careful to avoid rubbing frostbitten areas because this can lead to greater tissue injury.** If there is a chance for refreezing, do not rewarm the affected areas.

13.4.3.2 *Trench Foot*

Trench foot may be caused by long, continuous exposure to a wet and cold environment or actual immersion in water. This may be a special concern of commercial fishermen. The condition is characterized by vascular damage. Symptoms include a tingling and/or itching sensation, pain, and swelling. Blisters may form and be followed by death of skin tissue and ulceration.

First aid treatment for trench foot is similar to the treatment for frostbite, and includes moving the victim to a warm area, treating the affected part with warm water (102-110 °F) or warm packs, arranging bed rest in a warm environment and obtaining medical assistance as soon as possible.

13.4.3.3 *Hypothermia*

General hypothermia is the progressive loss of body heat with prolonged exposure to cold. Body heat loss is accelerated more rapidly when a person is wet because of sweat or working in a damp environment. Most cases of hypothermia develop in air temperatures between 30 and 50 °F, but significant hypothermia can occur with air temperatures as high as 65 °F (particularly when clothing is wet) or in the water at 72 °F.

The first symptoms of hypothermia are uncontrollable shivering and feeling of cold. As the body's temperature continues to drop, an individual can become confused, careless, and disoriented. At this point a person may make little or no effort to avoid further exposure to the cold. For those working around machinery or animals, accidental injury is an additional risk. When the core body temperature falls below 86°F, the body’s adaptive mechanisms for reducing heat loss become ineffective and death can occur.

Individuals experiencing mild hypothermia should be immediately moved to a warm, dry shelter. Further heat loss is minimized by removing wet clothing and applying warm blankets for insulation. Warm, nonalcoholic, caffeine-free drinks may be offered. More severe cases of hypothermia require intensive medical care.
13.4.4 Preventing Cold-Related Disorders

The following recommendations may help to reduce the number of cold-related disorders that agricultural workers experience during the winter months.

13.4.4.1 Personal Protective Clothing

- Dress appropriately. Wear at least three layers:
  - An outer layer to break the wind and allow some ventilation (like Gore-Tex or nylon)
  - A middle layer of wool, down, or synthetic pile to absorb sweat and retain insulating properties when wet;
  - An inner layer of cotton or synthetic weave to allow ventilation and escape of perspiration.
- Layer clothing to create air pockets that help retain body heat. Layering also makes adapting to changes in weather and level of physical exertion easier.
- Keep available a change of clothing, if work garments become wet.
- Pay special attention to protecting feet, hands, head, and face. Keep the head covered (up to 40% of body heat can be lost when the head is exposed). Fingers and hands lose their dexterity at temperatures below 59 °F.
- Wear footgear that protects against cold and dampness. Footgear should be insulated and fit comfortably when socks are layered.
- Avoid wearing dirty or greasy clothing because such garments have poor insulating properties.
- The employing department must provide extreme cold weather protective equipment. Extreme cold weather is defined as an equivalent chill temperature of -25 °F or lower. **However, supervisors must consider employee requests to use extreme cold weather protective outerwear regardless of temperature.**

13.4.4.2 Environmental Protection

- Protect hands, face, and feet from frostbite with an on-site source of heat. Air jets, radiant heaters, or contact warm plates may be employed.
- Provide a heated shelter for workers who experience prolonged exposure to the equivalent wind-chill temperature of 20 °F or less.
- Shield work areas from drafty or windy conditions.
- Use thermal insulating material on the handles of equipment when temperatures drop below 30 °F. Do not sit or kneel on cold, unprotected surfaces.

13.4.4.3 Safe Work Practices

- Allow individuals to set their own pace and take extra work breaks when needed. Avoid activities, whenever possible, that may cause heavy perspiration.
- Shift as many outdoor activities to the inside as feasible and, when working outside, select the warmest hours of the day.
• Minimize activities that reduce circulation, such as sitting or standing in a cold environment for prolonged periods of time.

• Keep energy levels up and prevent dehydration by consuming warm, sweet, caffeine-free, nonalcoholic drinks and soup.

• Allow a period of adjustment to the cold before embarking on a full work schedule. Avoid working alone. In very cold weather use a buddy system.

• Seek warm shelter immediately following these symptoms: heavy shivering, an uncomfortable sensation of coldness, severe fatigue, drowsiness, or euphoria.

13.4.5 Worker Health and Education

Older workers, or those with certain medical problems, need to be extra alert about the effects of cold stress. Check with a doctor about special needs and precautions.

Avoid using alcohol or drugs, which may impair judgment while working in a cold environment. Hypothermia commonly occurs in association with alcohol abuse. In addition to its effects on judgment, alcohol increases heat loss through vasodilation and may impair shivering.

Educate new workers on the hazards of working in a cold environment. Prevent chapped skin by the frequent application of protective lotions. Stay in good physical condition.

13.4.6 Supervisor Responsibility

Supervisors are to:

• Determine whether employees will be working in cold weather conditions.

• Ensure that employees are equipped with and wear protective outerwear when necessary.

• Implement work/warm-up schedules when indicated by the equivalent chill temperature chart.

• Upon observing, or being notified of, an employee experiencing the initial symptoms of frostbite or hypothermia, the supervisor is to ensure that the employee is moved to a warm location. If symptoms worsen or additional symptoms appear, the supervisor should ensure that the employee is examined by a medical professional. The supervisor must complete an Accidental Injury or Occupational Illness Report upon notification of potential frostbite or hypothermia.

13.4.7 Employee Responsibility

• Wear department provided protective outerwear or equivalent personal protective outerwear when required to work in cold weather conditions.

• An employee experiencing any of the initial symptoms of frostbite or hypothermia must immediately move to a warm location and notify his/her supervisor of the symptoms. If symptoms worsen or additional symptoms appear, the employee must immediately seek medical attention.
### New Wind Chill Chart

<table>
<thead>
<tr>
<th>Temperature (F)</th>
<th>Calm</th>
<th>40</th>
<th>35</th>
<th>30</th>
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<td>-74</td>
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<td>-88</td>
<td>-95</td>
<td></td>
</tr>
</tbody>
</table>

**Frostbite occurs in 15 minutes or less**

http://www.crh.noaa.gov/ddc/?n=windchill#New
### TLVs Work/Warm-up Schedule for Outside Workers based on a Four-Hour Shift*

<table>
<thead>
<tr>
<th>Air Temperature - Sunny Sky</th>
<th>No Noticeable Wind</th>
<th>5 mph Wind</th>
<th>10 mph Wind</th>
<th>15 mph Wind</th>
<th>20 mph Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C (approx) °F (approx)</td>
<td>Max. work Period</td>
<td>No. of Breaks **</td>
<td>Max. Work Period</td>
<td>No. of Breaks</td>
<td>Max. Work Period</td>
</tr>
<tr>
<td>-26° to -28°</td>
<td>-15° to -19°</td>
<td>(Norm breaks) 1</td>
<td>75 min.</td>
<td>2</td>
<td>55 min.</td>
</tr>
<tr>
<td>-29° to -31°</td>
<td>-20° to -24°</td>
<td>(Norm breaks) 1</td>
<td>75 min.</td>
<td>2</td>
<td>55 min.</td>
</tr>
<tr>
<td>-32° to -34°</td>
<td>-25° to -29°</td>
<td>75 min.</td>
<td>2</td>
<td>55 min.</td>
<td>3</td>
</tr>
<tr>
<td>-35° to -37°</td>
<td>-30° to -34°</td>
<td>55 min.</td>
<td>3</td>
<td>40 min.</td>
<td>4</td>
</tr>
<tr>
<td>-38° to -39°</td>
<td>-35° to -39°</td>
<td>40 min.</td>
<td>4</td>
<td>30 min.</td>
<td>5</td>
</tr>
<tr>
<td>-40° to -42°</td>
<td>-40° to -44°</td>
<td>30 min.</td>
<td>5</td>
<td></td>
<td>Non-emergency work should cease</td>
</tr>
<tr>
<td>-43° &amp; below</td>
<td>-45° &amp; below</td>
<td>Non-emergency work should cease</td>
<td>Non-emergency work should cease</td>
<td>Non-emergency work should cease</td>
<td>Non-emergency work should cease</td>
</tr>
</tbody>
</table>

Table applies only if workers are wearing dry clothing and doing moderate to heavy work activity. For light to moderate work activity, move down one line to decrease maximum work period and increase the number of breaks.