UNIVERSITY OF NOTRE DAME

HEAT AND COLD STRESS PREVENTION PROGRAM

1. PURPOSE
   1.1. The purpose of this program is to provide awareness of the potential for and the dangers associated with heat and cold illnesses. This program gives guidance in the recognition, evaluation and control of potential heat and cold related illnesses.

2. SCOPE
   2.1. This program applies to all personnel at the University of Notre Dame who may be exposed to heat and cold illnesses through working in temperature extremes.

3. DEFINITIONS
   3.1. **Engineering Controls:** Engineering controls protect workers by removing hazardous conditions or by placing a barrier between the worker and the hazard.
   3.2. **Heat and Cold Illness Signs and Symptoms and Treatment** – Appendix D
   3.3. **Heat Index:** The Heat Index is a single numeric value that uses both temperature and humidity to inform the public on how the weather outdoors "feels". The higher the Heat Index, the hotter the weather feels.
   3.4. **Heat Stress:** A collective name for illnesses or disorders associated with excessive exposure to heat including heat stroke, heat exhaustion, heat cramps, heat rash, and heat syncope.
   3.5. **Radiant Heat:** Transfer of heat between a person and surrounding solid objects (i.e. boiler, die heads, steam lines, heated reactors, etc.).
   3.6. **Wet Bulb Globe Temperature (WBGT) Index:** An index of the heat stress potential in humans when work is performed in a hot environment, used by ACGIH and NIOSH. The WBGT is a combined temperature derived from humidity (wet bulb, T_W), radiant heat and air movement (globe temperature, T_G), and ambient temperature (dry bulb temperature, T_D), $WBGT = 0.7T_W + 0.2T_G + 0.1T_D$.
   3.7. **Work/Rest Regimen:** Based on occupational health guidelines for the control of heat stress. The WBGT Index can be used as a guide to establish recommended rest periods of various levels of physical work.

4. RESPONSIBILITIES
   4.1. Supervisors:
      4.1.1. Ensure all employees are properly trained before working in extreme temperature conditions. Consult with Risk Management and Safety as necessary.
      4.1.2. Assess the day-to-day heat or cold stresses on employees using the process in section 5 and 6.
      4.1.3. Approve work as needed in Severity Levels V and VI of the WBGT Work Chart (Appendix A).

4.1.4. Ensure all employees have the appropriate personal protective equipment (PPE) prior to working in extreme temperature conditions.

4.2. Employees:

4.2.1. Review and comply with the provisions outlined in this program.

4.2.2. Complete training before working in extreme temperature conditions.

4.2.3. Wear the appropriate PPE.

4.2.4. Report heat and cold stress concerns to their supervisor.

4.3. Risk Management and Safety (RMS):

4.3.1. Provide WBGT monitoring.

4.3.2. Assist with the development of procedures to minimize the adverse effects of heat and cold stress in the workplace.

4.3.3. Develop heat and cold stress training and provide to affected employees.

4.3.4. Conduct Heat and Cold Stress Prevention Program reviews.

5. PROCESS FOR WORKING IN A HOT ENVIRONMENT

5.1. Heat Measurement

5.1.1. A WBGT measurement device or the Heat Index can be used to determine protective measures for working in extreme heat. Consult RMS for assistance.

5.1.2. Utilize a WBGT measurement device in indoor or outdoor environments to measure the heat impact on employees. Utilize the WBGT Work Chart (Appendix A) to determine the work / rest regimen necessary for working in extreme heat.

5.1.3. Utilize the Heat Index and Protective Measures (Appendix B) to determine protective measures necessary for working in extreme heat.

5.2. Protective Measures

5.2.1. Implement Engineering Controls when appropriate. Where possible, use air conditioning to cool the work area. Alternatively, increase the general ventilation as much as possible by opening windows and use cooling fans.

5.2.2. Ensure Safe Work Practices. Employees working outdoors or working indoors without air conditioning or ventilation should take water breaks as needed in cool areas. Supervisors should consider scheduling the hottest work for the coolest part of day, assigning extra employees to high demand tasks, and using work-saving devices such as power tools, hoists or lifting aids. All employees should watch out for the safety of their coworkers and immediately report any problems to a supervisor. Consider allowing employees to acclimate to working in heat through a gradual adjustment to the hot environment.

6. PROCESS FOR WORKING IN A COLD ENVIRONMENT

6.1. Measurement

6.1.1. Utilize the Wind Chill Temperature and Frostbite Guide (Appendix C) for guidance on preventing frostbite.

6.2. Protective Measures

6.2.1. Implement Engineering Controls when appropriate. Where possible, use heaters to warm the work area. Alternatively, decrease the general ventilation as much as possible by closing windows or doors.

6.2.2. Ensure Safe Work Practices are followed.
- Employees working outdoors or working indoors without heat should take water breaks as needed in warm areas.
- If available, use wind barricades to block the wind from employees.
- Supervisors should consider scheduling most work for the warmest part of day, assigning extra employees to high demand tasks that will require longer periods in cold areas.
- All employees should watch out for the safety of their coworkers and immediately report any problems to a supervisor.
- Permit employees to acclimate to working in cold through a gradual adjustment to the cold environment.

6.2.3. Consider proper clothing and equipment when working in a cold environment.
- Wearing at least three layers of clothing; an inner layer of wool, silk or synthetic to wick moisture away from the body; a middle layer of wool or synthetic to provide insulation even when wet; an outer wind and rain protection layer that allows some ventilation to prevent overheating,
- Wearing a hat or hood; 40% of body heat can be lost when the head is exposed,
- Wearing insulated boots or other footwear,
- Avoiding tight clothing; loose clothing provides better ventilation,
- Keeping a change of clothing available in case work clothes become wet.

7. TRAINING

7.1. Employees whose job descriptions require them to work in extreme hot or cold conditions receive training prior to working in such conditions. Training is assigned through ComplyND and is required annually.

7.2. Training includes the following information:

7.2.1. Identifying the hazards that can result from working in hot or cold environments, including physical signs, symptoms, and treatments.

7.2.2. Identifying ways to protect yourself from heat and cold stresses, including observing environmental protections, undertaking other preparations and practices, and dressing appropriately.

8. FREQUENCY OF REVIEW – This program is reviewed at least every three years and updated as needed to meet applicable regulation changes.

9. REFERENCES

9.1. OSHA. Personal Protective Equipment 29 CFR Subpart I

Revision History Table

History	Effective Date
Procedure developed	January 2022

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Appendix A
WBGT Work Chart

Severity Level	WBGT	Light Work ● Sitting or standing to control machines ● Performing light hand or arm work ● Instrument calibration	Moderate Work ● Walking with moderate lifting & pushing ● Standing, moderate & heavy arm work ● Walking, moderate arm work ● Lifting ~35 lbs., 3 times per minute	Heavy Work ● Pick and shovel work ● Shoveling ~18 lbs. load, 10 times per minute ● Lifting ~35 lbs., 10 times per minute ● Walking, carrying heavy loads ● *Personal Protective Equipment
I	**<78 F**	Continuous Work No Precautions	Continuous Work No Precautions	Continuous Work Standard Precautions
II	**78–81F**	Continuous Work Standard Precautions	Continuous Work Standard Precautions	Work Rest Regimen 75% Work-25% Rest, each hour Standard Precautions & use buddy-system
III	**82-85F**	Continuous Work Standard Precautions	Work Rest Regimen 75% Work - 25% Rest, each hour Standard Precautions	Work Rest Regimen 50% Work - 50% Rest, each hour Standard Precautions & use buddy-system
IV	**86-89F**	Work Rest Regimen 75% Work - 25% Rest each hour Standard Precautions	Work Rest Regimen 50% Work - 50% Rest each hour Standard Precautions & use buddy-system	Work Rest Regimen 25% Work - 75% Rest each hour Standard Precautions & use buddy-system
V	**90-95F**	Work Rest Regimen 50% Work - 50% Rest each hour Standard Precautions & use buddy-system	Work Rest Regimen 25% Work - 75% Rest each hour Standard Precautions & use buddy-system	Requires Approval
VI	**>95F**	Requires Approval	Requires Approval	Requires Approval

Standard Precautions

Replenish fluids frequently and pace work accordingly; Break as needed in air-conditioned environment; Be aware of early symptoms of heat illness: fatigue, headache, muscle cramps.

Personal Protective Equipment

The use of suits (e.g. Tyvek coverall) and respirators can cause stress on the body. Regardless of the task, wearing this equipment is considered Heavy Work.

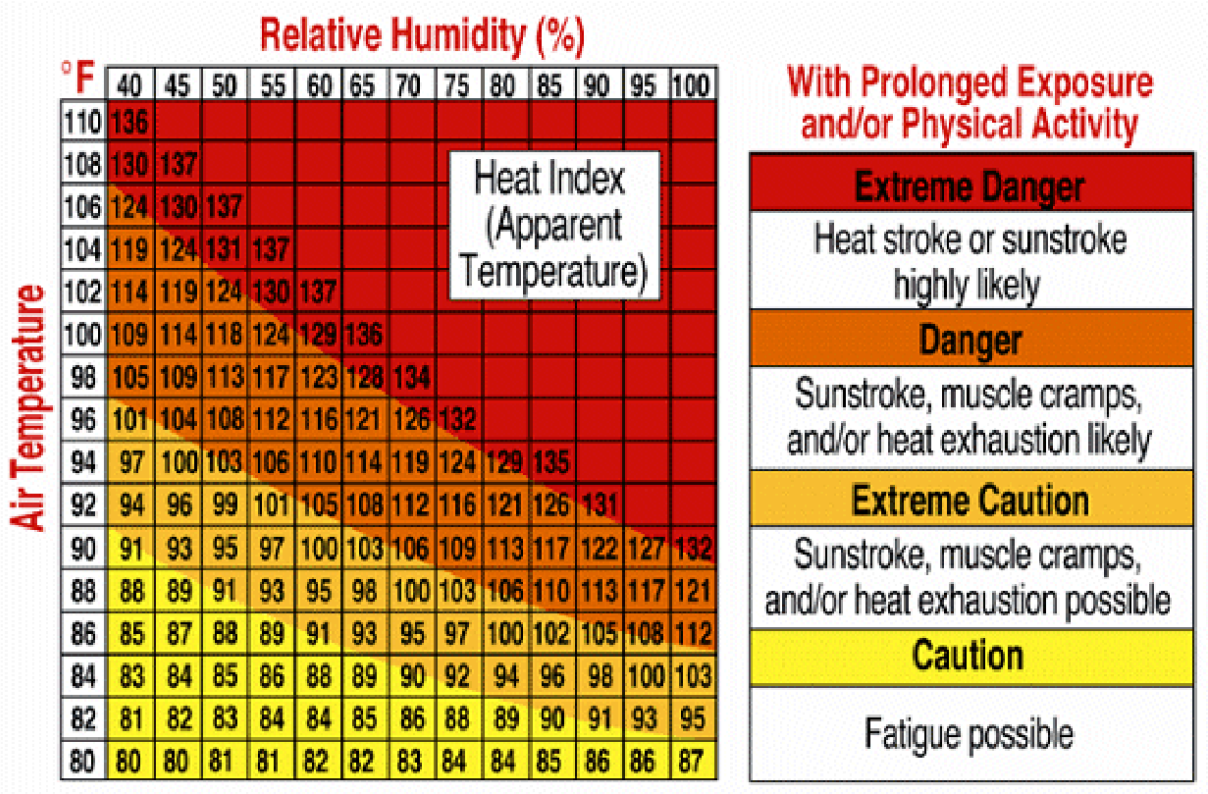
Buddy System

Individuals are teamed up and assume responsibility for one another's safety.

APPENDIX B
Heat Index and Protective Measures

The heat index is a simple tool and a useful guide for making decisions about protecting employees in hot weather. It does not account for certain conditions that contribute additional risk, such as physical exertion.

Consider taking the steps at the next highest risk level to protect employees from the added risks posed by working in the direct sun (can add up to 15°F to the heat index value) or wearing heavy clothing or protective gear.



°F	40	45	50	55	60	65	70	75	80	85	90	95	100
110	136												
108	130	137											
106	124	130	137										
104	119	124	131	137									
102	114	119	124	130	137								
100	109	114	118	124	129	136							
98	105	109	113	117	123	128	134						
96	101	104	108	112	116	121	126	132					
94	97	100	103	106	110	114	119	124	129	135			
92	94	96	99	101	105	108	112	116	121	126	131		
90	91	93	95	97	100	103	106	109	113	117	122	127	132
88	88	89	91	93	95	98	100	103	106	110	113	117	121
86	85	87	88	89	91	93	95	97	100	102	105	108	112
84	83	84	85	86	88	89	90	92	94	96	98	100	103
82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	80	81	81	82	82	83	84	84	85	86	86	87

Heat Index	Risk Level	Recommended Protective Measures
<91°F	**Lower (Caution)**	• Provide plenty of drinking water • Ensure that adequate medical services are available • Plan ahead for times when heat index is higher, including worker heat safety training • Encourage workers to wear sunscreen • If workers must wear heavy protective clothing, perform strenuous activity or work in the direct sun, additional precautions are recommended to protect workers from heat related illness
91°F to 103° F	**Moderate**	**In addition to the steps listed above:** • Remind workers to drink water often (about 4 cups per hour) • Review heat related illness topics with workers such as recognition, prevention and first-aid • Schedule frequent breaks in cool, shaded areas • Acclimatize workers • Set up a buddy system and instruct workers and supervisors to watch for signs of heat related illnesses • Schedule strenuous activities at a time when the heat index is lower • Develop and enforce work rest schedules • Monitor workers closely
103°F to 115°F	**High**	**In addition to the steps listed above:** • Alert workers of high-risk conditions • Limit physical exertion • Have a knowledgeable person at the work site who is well informed about heat related illness and able to determine appropriate work/rest schedules • Adjust work activities (e.g. reschedule work, pace/rotate jobs) • Use cooling techniques • Watch/communicate with workers at all times
115°F	**Very High to Extreme**	**If essential work must be done, in addition to the steps listed above:** • Conduct physiological monitoring (e.g. pulse, temperature, etc.) • Stop work if essential control methods are inadequate or unavailable • Reschedule non-essential activities for days with a reduced heat index or to a time when the heat index is lower • Move essential work tasks to the coolest part of the work shift • Consider earlier start times, split shifts or evening/night shifts • Strenuous work tasks and those requiring the use of heavy or non-breathable clothing or impermeable chemical protective clothing should not be conducted when the heat index is at or above 115°F

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Appendix C
Wind Chill Temperature Index and Frostbite Guide

Wind Speed (mph)	Temperature (°F)														
Calm	**35**	**30**	**25**	**20**	**15**	**10**	**5**	**0**	**-5**	**-10**	**-15**	**-20**	**-25**	**-30**	**-35**
5	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52
10	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59
15	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64
20	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68
25	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71
30	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73
35	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76
40	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78
45	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
50	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81
55	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82
60	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84
Frostbite occurs in:						30 minutes			10 minutes			5 minutes			

Appendix D
Heat and Cold Illnesses

1. Heat Related Illness Signs and Treatment
   1.1. Heat stroke occurs when the body temperature increases above 104˚F. Symptoms include confusion, loss of consciousness, seizures, and lack of perspiration. This condition should be treated as a medical emergency. While waiting on medical assistance, the employee should be moved to a cool/shaded area, cooled with water/wet towels/ice packs, and fanned to increase cooling.
   1.2. Heat exhaustion occurs when the body temperature is greater than 100.4˚F. Symptoms include headache, nausea, dizziness, weakness, irritability, confusion, thirst, and heavy perspiration. Employees experiencing heat exhaustion should be moved to a cool area, given fluids to drink and given cold compresses for their head, face and neck. They should also be taken to a facility to be monitored by medical personnel.
   1.3. Heat cramps are caused by the loss of body salts and fluids. The muscle pains can be alleviated by replacing fluids with water and/or carbohydrate-electrolyte replacement liquids. If cramps are severe, seek medical attention.
   1.4. Heat rash is caused by excessive perspiration. It looks like a red cluster of pimples or small blisters on the neck, upper chest, in the groin, under the breasts and in elbow creases. Provide cooler, less humid environment to treat heat rash.
   1.5. Heat Syncope occurs when blood flow increases to the skin as a cooling response, reducing the blood flow to the brain. Symptoms include sudden dizziness, feeling faint and sometimes fainting, pale skin, rapid heart rate, and normal body temperature. Move to a cooler environment and drink water. Seek immediate medical attention for repeated episodes of fainting; or if chest pain, seizures, or confusion is experienced.
2. Cold Illness Signs and Treatment
   2.1. Hypothermia occurs when body heat is lost faster than it is replaced and the core body temperature drops to approximately 95°F. Symptoms include shivering, loss of coordination, slurred speech, fumbling with items in the hand, and pale/cold skin. Seek medical attention.
   2.2. Frostbite occurs when the skin freezes and loses water in temperatures at 30°F or lower. Wind chill factors can allow frostbite to occur in above-freezing temperatures. Frostbite typically affects the extremities; the affected body part will be cold, tingling, stinging or aching followed by numbness. Skin color turns red, then purple, then white, and is cold to the touch. There may be blisters in severe cases. Seek medical attention.
   2.3. Trench Foot can occur when feet are exposed to damp, unsanitary and cold conditions for long periods. Symptoms are similar to frostbite, but less severe consisting of tingling, itching or burning sensation. For treatment, soak feet in warm water, then wrap with dry cloth bandages. Seek medical attention if necessary.
   2.4. Chilblains are caused by a combination of cold weather and poor circulation. Symptoms include patches of discolored, swollen and itchy skin. Resist the urge to scratch affected areas and utilize a product that soothes itching.