

TASK:	PREPARED BY:	CREATE DATE:
Cold Stress Procedure	Scott McMillan	June 14, 2010
		REVISION DATE:
EQUIPMENT AND/OR MATERIALS:	SAFETY AND PROTECTIVE EQUIPMENT:	
Various	Clothing suitable for the conditions.	
PERMIT REQUIRED:	NUMBER OF WORKERS:	
N/A	N/A	
STEPS IN PROCEDURE:		
<p>WCB Handbook available: Hypothermia</p> <p>Worker Responsibilities</p> <ul style="list-style-type: none"> • A worker who is at risk of developing hypothermia or cold-related injuries will wear adequate insulated clothing and personal protective equipment. • If clothing becomes wet so that its insulating value is impaired, the worker will have the opportunity to change into dry clothing in a heated shelter. • Workers will protect their hands from cold when operating vibrating tools. They should ensure extra gloves are available if their gloves get wet. • Workers will report, or be sent to First Aid if they develop symptoms of hypothermia or cold-related injuries. <p>Supervisor Responsibilities</p> <ul style="list-style-type: none"> • Allow workers a period of adjustment to the cold before assigning a full work schedule. • Ensure availability of a heated shelter nearby, when the temperature is below -7°C (19°F). • Develop a work schedule that allows warming breaks, considering the conditions. • Establish a buddy system for working outdoors. • Ensure workers have been trained to: <ul style="list-style-type: none"> • Recognize symptoms of frostbite and hypothermia, • Re-warm adequately, and know when First Aid is necessary, • Conduct work in a safe manner. 		
APPLICABLE OCCUPATIONAL HEALTH & SAFETY REGULATIONS:		
Parts: 7.33 – 7.38		

APPENDICES

Appendix A – Wind Chill Table

Appendix B – Stages of Hypothermia

Appendix C – First Aid Treatment for Hypothermia

Appendix D – Stages of Frostbite and First Aid Treatment

APPENDIX A – EQUIVALENT CHILL TEMPERATURE

The cooling power of wind (°C)

Estimated wind speed (in km/h)	Actual temperature reading (°C)													
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	
Equivalent chill temperature (°C)														
Calm	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	
8	9	3	-2	-7	-12	-18	-23	-28	-33	-38	-44	-49	-54	
16	4	-2	-7	-14	-20	-27	-33	-38	-45	-50	-57	-63	-69	
24	2	-5	-11	-18	-25	-32	-38	-45	-52	-58	-65	-72	-78	
32	0	-7	-14	-21	-28	-35	-42	-50	-56	-64	-71	-78	-84	
40	-1	-8	-16	-24	-31	-38	-46	-53	-60	-67	-76	-82	-90	
48	-2	-10	-17	-25	-33	-40	-48	-55	-63	-70	-78	-86	-94	
56	-3	-11	-18	-26	-34	-42	-50	-58	-65	-73	-81	-89	-96	
64	-3	-11	-19	-27	-35	-43	-51	-59	-66	-74	-82	-90	-98	
(Wind speeds greater than 64 km/h have little additional effect.)	LITTLE DANGER In < 1 hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.					
	Trenchfoot and immersion foot may occur at any point on this chart.													

 Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (96.8° F) per cold stress TLV.

APPENDIX B – STAGES OF HYPOTHERMIA

Stages of Hypothermia		
Stage	Core Temperature	Signs and Symptoms
Mild Hypothermia	36°C-35°C (96.8°F-95°F)	<ul style="list-style-type: none"> • Feel chilled/cold sensation • Goose bumps • Unable to perform complex tasks with hands • Poor judgement, muddled thinking and abnormal behaviour • Bouts of Shivering • Hands may be numb
Moderate Hypothermia	35°C-32.2°C (95°-90°F)	<ul style="list-style-type: none"> • Violent shivering or shivering has stopped altogether • Inability to think and pay attention (e.g. victim cannot understand what is being said) • Mild confusion although may appear alert • Slow, shallow breathing • Slurred speech • Poor body co-ordination (e.g. stumbling gait) • Slow, weak pulse
Severe Hypothermia	< 32.2°C (< 90°F)	<ul style="list-style-type: none"> • Shivering has stopped • Unconsciousness • Little or no breathing • Weak, irregular or non-existent pulse • Dilated (wide open) pupils • Exposed skin blue and/or puffy • Possible similarity of symptoms to clinical definition of death

APPENDIX C – FIRST AID TREATMENT FOR HYPOTHERMIA

Definitions

Afterdrop

A situation in which the core temperature decreases during the re-warming of a hypothermic victim. Caused by peripheral vessels in the arms and legs dilating if they are re-warmed

Vasoconstriction

Narrowing of blood vessels decreases the blood flow to periphery, thereby reducing the process of heat loss

Vasodilation

Opening of blood vessels increases surface blood flow, thereby increasing the process of heat loss (when ambient temperature is less than body temperature)

General Tips for Handling Hypothermic Victims

- Always handle the victim gently. Rough handling can cause heartbeat irregularities and death
- Remove the victim from the cold environment and assess by Level 2 or Level 3 First Aid Attendant or by a physician, as soon as possible
- Hot fluids may be given only if the victim is fully alert, without any signs of confusion. Victims with moderate and severe hypothermia have a high risk of vomiting and must not be given anything by mouth
- Do not attempt to exercise victims. Take immediate measures to prevent further heat loss and continue to do so even if victim regains consciousness
- Remember that the victim may still be alive even if there is little or no pulse or heart beat

Management/Re-warming of Mild Hypothermic Victims

- Minimize his/her exertion
- Remove wet clothing and get the victim into warm, dry clothes and wrap victim in warm blankets. Make sure the victim's head is covered. Place something warm and dry under the victim. Move the victim to a warm environment. Do not make the victim exercise to warm up
- Do not suppress shivering, even if violent. Shivering is the most effective way to generate body heat
- Do not massage the extremities (hands, arms, legs, feet, etc.) or the trunk
- Do not place victim in a warm bath or shower

Management/Re-warming of Moderate to Severe Hypothermic Victims

- Check for airway obstructions and breathing or circulation problems and perform appropriate action if there are any abnormalities in these areas

Appendix C – First Aid Treatment for Hypothermia (continued)

- Remove all wet clothing, make sure victim is dry and replace with dry, multiple-layered coverings. If possible, the victim should have a polypropylene layer next to the skin to minimize sweating on the skin
- Wrap the victim in warm blankets or a sleeping bag. If this is not possible, cover the victim with warm dry clothing or blankets, making sure that the victim's head is covered and something warm and dry is also placed under the victim.
- Move the victim to a warm, dry environment
- Do not suppress shivering, even if it is violent. Shivering generates body heat
- Do not give anything by mouth, as there is a high risk of vomiting
- Do not massage the trunk or extremities of the victim
- Do not place the victim in a hot bath or shower
- If available, heated, humidified air or oxygen should be administered
- Continue first aid treatment even if the victim appears lifeless. The body sometimes survives for hours without signs of life at very low body temperatures
- Know how to assess hypothermia and give help when it is needed, even if the victim resists help. The victim may be confused and unaware of what is happening and may deny assistance when it is needed
- Arrange rapid transport to the nearest medical facility

CPR for Hypothermic Victims

If a person is suffering from severe hypothermia they may exhibit many of the clinical signs of death:

- Cold, blue skin
- Fixed and dilated pupils
- No discernible pulse
- No discernible breathing
- Comatose and unresponsive to any stimuli
- Rigid muscles

Despite exhibiting these signs, the victim may still be alive and further steps should be taken to closely evaluate the victim's condition:

1. Check for airway obstructions and breathing or circulation problems. Take appropriate action if there are any abnormalities in these areas
2. Complete a full 1-minute assessment of the victim. The radial pulse may be absent if the victim is in severe hypothermia therefore, check the carotid pulse for a 1-minute period to ascertain if there is a slow heart beat. Although the heart rate may be as low as 2-3/minute and breathing rate 1/30 seconds, the heart will be filling completely and distributing blood fairly effectively. Due to the severely reduced demands of the

Appendix C – First Aid Treatment for Hypothermia (continued)

hypothermic body, the reduced heartbeat may be able to satisfy circulatory needs with only 2-3 beats/minute

3. If there is no pulse, commence CPR and continue to do so as the victim is re-warmed
4. Although ventilation may have stopped, it is possible that the body may be able to survive for some time using only the oxygen that is already in the body. If ventilation has stopped, artificial ventilation should be commenced. In addition to making more oxygen available, blowing warm air into the person's lungs may assist in internal re-warming

Note: During severe hypothermia the heart is hyperexcitable and mechanical stimulation such as CPR, moving the victim or the effects of “afterdrop”, may result in fibrillation of the heart, leading to death. As a result, CPR may be contraindicated for some hypothermic victims.

APPENDIX D –STAGES OF FROSTBITE & FIRST AID TREATMENT

Frostbite most typically affects the ears, cheeks, nose, fingers and toes. By using a “buddy system” it is possible to prevent frostbite injuries from occurring if co-workers are educated in the signs and symptoms of the disorder.

First Aid Treatment for Frostbite		
Stage of Frostbite	Signs and Symptoms	First-Aid Treatment
Frostnip	<ul style="list-style-type: none"> Freezing of the top layers of skin tissue Skin appearance: white, waxy, To touch: top layer of skin feels hard & rubbery Deep tissue is still soft Numbness 	<ul style="list-style-type: none"> Re-warm the area gently, generally by blowing warm air on it or placing the area against a warm body part Do not rub the area – this causes damage to skin and tissue
Superficial Frostbite	<ul style="list-style-type: none"> Skin appearance: white To touch: wooden feeling throughout affected area All layers of skin affected Numbness, sensation may be absent 	<ul style="list-style-type: none"> Re-warm as for frostnip if affected area is only small If area is large, use immersion method Transport to hospital if necessary
Deep Frostbite	<ul style="list-style-type: none"> Skin appearance: white To touch: wooden feeling throughout affected area Includes all layers of the skin May include freezing of muscle and/or bone 	<ul style="list-style-type: none"> Begin re-warming techniques using immersion method Transport to hospital as soon as possible

Appendix D –Stages of Frostbite & First Aid Treatment (continued)

Re-warming Techniques for Frostbite Injury

Treatment for frostbite should ideally be performed in a hospital. The following procedures may be followed if, for some reason, hospital treatment is not available:

- Monitor water temperature (38.9°C - 43.33°C /102°-110°F) closely throughout the immersion period
- Remove any wet or tight clothing
- Gently place the affected area in a warm water bath. If warm water has to be added to maintain immersion temperature, do not pour directly on the affected area as this will cause the tissue to warm too fast causing further damage
- Circulate the water frequently to maintain an even temperature
- Immerse affected body area for 25-40 minutes as appropriate
- Thawing is complete when the part is pliable and color and sensation has returned. Discontinue the warm water bath when thawing is complete
- Do not use dry heat to re-warm
- After the affected area has been warmed, it may become puffy and blister with a burning feeling or numbness. When normal feeling, movement and skin color have returned, the affected area should be dried and wrapped in a sterile bandage to keep it clean and warm. Warning: once the area is re-warmed, there can be significant pain
- If there is a chance that the affected area may get cold again, do not re-warm it as it will cause severe tissue damage
- If the person is hypothermic and frost-bitten, the first concern is to re-warm the core body temperature. Do not re-warm the frost-bitten areas until the core temperature reaches 35.5°C (96°F)
- Refrain from consuming alcohol
- Refrain from smoking, as nicotine constricts blood vessels thereby increasing the risk of developing frostbite
- Seek medical attention as soon as possible.