

## RULES AND STANDING INSTRUCTIONS

Note: Printed copies of this RSI should be used with caution. The user must ensure the current version of the document is being referenced.

Section 12: Health Control Dept.: Health & Safety	Subject 12-17: Heat Illness Prevention Practices	
Original Issue: 7/15/2007	Latest Review: 10/13/2019	Next Review: 10/13/2021
Steward: Industrial Hygienist; A. Insley	Approved by: HS Supervisor; M. Bennett	

### PURPOSE

To help control the risk of occurrence of heat illness. The rules and standing instructions apply to all outdoor work locations, including all locations/spaces without permanent HVAC systems in place (e.g. confined spaces, shops, welding bays, process units, tankage, construction projects, etc.).

### CODE REFERENCES

Title 8, Section 3395, "Heat Illness Prevention"

Title 8, Sections 3363, "General Safety Order (GISO): Sanitation", Drinking Water quality and availability.

Title 8, Sections 5192, (GISO) 5155 "HAZWOPER; allowances for temperature, heat stress".

Title 8, Sections 1524, Construction Safety Orders, Water Supply, Potable Water quality and availability.

National Institute for Occupational Safety & Health (NIOSH), <http://www.cdc.gov/niosh/topics/heatstress/>, "Heat Stress".

The Heat List: Heat Stress Resources on the Internet, <http://www.baesg.org/heatlist.htm>

### DEFINITIONS

The following additional definitions are applicable to this standard.

**Table 1 Definitions**

Term	Description
Acclimatization	The body's ability to adjust to environmental conditions such as heat. Heat acclimatization usually requires 4 to 15 days of repeated exposure to heat for at least 2 to 4 hours per day. Heat acclimatization may be inadequate for "heat waves" with sudden, abnormally high temperatures.
Emergency Breaks	Required when person shows signs or symptoms of heat illness found in table 2. Worker cannot go back to work until signs have subsided.
Heat Cramps	Heat-related illness caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs are muscle spasm and pain in the extremities and abdomen.
Heat Exhaustion	A milder form of heat-related illness that can develop after exposure to high temperatures and inadequate or unbalanced replacement of fluids. Symptoms include heavy sweating, muscle cramps, dizziness, pale skin, headache, and nausea.
Heat Rash	A mild form of heat-related illness caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat as well as being a nuisance.
Heat Stress	Physiological stress that occurs when the human body can no longer regulate heat through control of blood flow and sweat production.

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**Table 1 Definitions**

Term	Description
Heat Stroke	An acute condition which occurs when the heat-regulating mechanisms of the body become overwhelmed and unable to effectively deal with the heat, and body temperature climbs uncontrollably. This is a medical emergency that requires immediate medical attention. Symptoms and signs of heat stroke include high body temperature, flushed dry skin, rapid pulse, hallucinations, difficulty breathing, seizure, and coma.
High Temperature Environment	Elevated air temperature and/or humidity in a work location. High temperature work environments MAY occur with any of the following: <ul style="list-style-type: none"> <li>• exposure to direct sunlight (temperatures above 95 degrees F)</li> <li>• increase in relative humidity</li> <li>• proximity to process equipment in service that radiate heat</li> <li>• the use of equipment designed to heat treat metal.</li> <li>• the use of maintenance equipment that produces heat</li> </ul> The risk factor for developing a heat related illness in a high heat environment increases with the strenuousness of the work and the duration of the work.
Heat Wave	A temperature that is 10 degrees higher than the last 5 day average (i.e. the last 5 days were under 80°F, and the sixth day is 90° F).
Personal Risk Factors	Factors inherent to a worker which may have an impact on that individual's ability to maintain a normal body temperature. Attachment 1 lists some of the most common factors.
Preventative Break	Required once an hour in heat waves, heat high environments, and over 95° F days, and consist of a break less than 5 minutes drinking water in a shaded area.
Owner	Refinery
Parent Document	The Specification, Practice, or Industry Standard used as the basis for the process being defined.

## RESPONSIBILITIES

- A. Health & Safety (Industrial Hygiene)
  - a. Identify High Temperature Environments within the refinery.
  - b. Take air temperature and humidity readings when necessary prior to start of task.
  - c. Help determine controls and/or adequate work/rest rotation periods for jobs in High Temperature Environments.

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- d. Document work/rest rotation periods and/or various controls onto Special Hazard permits when temperature readings are taken for a job.

### B. Team Leads and Supervisors

- a. Ensure crew members have received awareness training on the identification and prevention of heat-related illness.
- b. Schedule work that must be performed in a High Temperature Environment during the cooler hours of the day, when possible.
- c. Ensure provisions are made for water and/or sports drinks, cooling devices, and shaded break areas.
- d. Monitor employees during breaks from high heat environments, for heat illness symptoms found in table 2. If symptoms are found, encouraged to remain in the shade and not ordered back to work until symptoms are gone. Employees with symptoms must be provided appropriate first aid or emergency response.
- e. Water must be fresh, pure, and suitably cool.
- f. All workers are assumed acclimatized, including Contractors.

### C. Work Crew Supervision

- a. Ensure crew members have received awareness training on the identification and prevention of heat-related illness.
- b. As applicable, include a discussion of potential hazards of a High Temperature Environment during the pre-task assessment with work crew.
- c. Consult with the Health and Safety departments to help establish a work/rest schedule for jobs in a High Temperature Environment. This job rotation schedule should allow reasonable amounts of rest time outside of the hot environment.
- d. Ensure the work crew has a sufficient supply of drinking water that is fresh, pure, and suitably cool, and/or sports drinks when working in a High Temperature Environment.
- e. Provide a shaded area for rest breaks, when required.
- f. Monitor employees during breaks from high heat environments, for heat illness symptoms found in table 2. If symptoms are found, encouraged to remain in the shade and not ordered back to work until symptoms are gone. Employees with symptoms must be provided appropriate first aid or emergency response.
- g. Responsible for checking water levels in the drinking water containers twice a shift (i.e. at the start and during lunch).

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- h. All workers are assumed acclimatized, including Contractors.

### A. MAINTENANCE AND OPERATIONS

- a. Receive awareness training on the identification and prevention of heat-related illness.
- b. Implement controls established by Health & Safety in order to minimize ambient temperatures and radiant heat exposure.
- c. Monitor employees during breaks from high heat environments, for heat illness symptoms found in table 2. If symptoms are found, encouraged to remain in the shade and not ordered back to work until symptoms are gone. Employees with symptoms must be provided appropriate first aid or emergency response.
- d. Follow the job rotation schedule established to minimize the potential for heat related illness.
- e. Stay properly hydrated by drinking water and/or sports drinks in sufficient quantity, as recommended by this procedure.
- f. During non-emergencies notify Supervision immediately if a member of the crew exhibits signs of heat related illness.
- g. Activate the Emergency Response System for medical emergencies should medical attention be required for an individual suffering a heat related illness.
- h. Stop work in hot environments and notify Health & Safety (IH) to complete an assessment, implement controls, and/or establish a work/rest rotation period.
- i. Drinking water containers, the potable water, and ice shall be procured from the warehouse for use in the field.
- j. Utilities will validate that the potable water used to fill maintenance drinking water containers from the warehouse is potable.
- k. All workers are assumed acclimatized, including Contractors.

### B. OPERATIONS/MAINTENANCE COORDINATOR (OMC)

- a. Identify tasks occurring in High Temperature Environments which would require a Special Hazard Permit.
- b. Document controls established by Health & Safety during the Job Hazards Analysis in order to minimize ambient temperatures and radiant heat exposure.
- c. Include minimum required work/rest rotation or controls on the Job Safety Analysis and Special Hazards permit and/or note that specific task may not start without a heat assessment from the Safety & Health IH or designee.

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### PROCEDURE

#### A. GENERAL INFORMATION

Proper training and use of the preventative measures described in Section C below will help reduce the risk of heat related illness and loss of work productivity.

Preventing an initial occurrence of a heat related illness is important because once an individual suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries.

#### B. WORK IN HIGH TEMPERATURE ENVIRONMENTS

- a. For requirements regarding work in confined spaces that may be considered High Temperature Environment, readings shall be taken by Health & Safety. Notify Safety & Health if temperature is greater than 95°F. Confined space work in air temperatures above 105°F, and work in environments outside of confined spaces above 110°F in Chemical Protective Suits and 120°F in normal refinery clothing, requires a Team Risk Assessment (TRA) to establish controls and is subject to approval based on residual risk.
- b. Requirements for non-confined space work will be established on a case-by-case basis in consultation with the Health & Safety Department.
- c. If a work area is suspected to be a High Temperature Environment, the Health & Safety Department should be contacted for a consultation and assessment.
- d. Non-confined space work in air temperatures above 120 °F with no chemical protective clothing and 110 °F with chemical protective clothing, require a Team Risk Assessment (TRA) to establish controls and are subject to approval based on residual risk.
- e. For lessons learned from equipment causing high heat environments, and working in and around high heat, see Appendix 1.
- f. Areas which have been established as High Temperature Environments can be found in Appendix 2.

#### C. MEASURES TO REDUCE THE RISK OF HEAT-RELATED ILLNESS

The following items shall be considered when work is required in a High Temperature Environment as means of reducing the risk of heat related illness:

- a. Water and/or sports drinks should be brought to the worksite. Crew members should be encouraged to drink prior to beginning work and during breaks from work.
- b. When water is supplied in a reusable container, the following practices are recommended:
  - i. The coolers must be cleaned with disinfecting soap and potable water on at least a daily basis.
  - ii. Coolers should be closed/sealed and individual cups provided.

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- iii. The date the cooler was sealed will be identified on each cooler by a tag or written on the tape sealing the cooler. Any cooler with a sealed date greater than 24 hours must be cleaned, refilled, and sealed before it can be used.
- iv. Water shall be fresh, pure, and suitably cool.
- c. Personnel required to work in a High Temperature Environment should refrain from consuming an excessive amount of caffeinated drinks, which promote dehydration.
- d. Adjusting how work is scheduled can help reduce the risk of heat related illness, e.g., scheduling especially strenuous work in High Temperature Environments during the cooler hours of the day whenever possible, or at night if adequate lighting can be provided.
- e. Rotating of personnel in and out of High Temperature Environments will help minimize the risk of overstress or overexertion of any one person.
- f. Providing shaded break areas for personnel.
  - i. Being aware that protective clothing (including FRC, Tyvek, and acid gear) can add to an individual's heat stress burden by restricting the body's ability to cool itself through perspiration, especially in a High Temperature Environment. Work/rest schedules are adjusted to accommodate use of some impermeable protective clothing.
  - ii. Clothing made of cotton (or predominantly cotton, as stated in the Personal Protective Equipment procedure), worn under FRC will absorb perspiration and better assist in providing cooling.
  - iii. Utilizing PPE accessories (which provides direct personal cooling) or mechanical equipment (which helps to mitigate heat exposure in a high heat environment), or both. Such accessories and equipment includes:
    - Cooling suits, jackets, vests, or headbands,
    - Ventilation fans to promote air movement of cooler air,
    - Air movers inside confined spaces,
    - Insulation shields to protect the workers from radiant heat of process equipment, or/and
    - Refrigerated air units

### COMBATING HEAT ILLNESS

Ref: Cal OSHA 3395 Heat Illness Prevention Standard

Personnel should focus on the key indicators (see table 2) when deciding the appropriate action to take. Heat related illnesses can occur during strenuous activity at almost any Heat Stress condition. Heatstroke is a life-threatening medical emergency that needs to be identified and treated immediately. Death may result from brain, kidney, liver, heart and muscle damage.

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**Table 2. Key indicators**

	Dehydration	Heat Exhaustion	Heat Stroke
<b>Key indicators</b>			
Mental State	Conscious, may be <b>dizzy</b>	Conscious, may <b>dizzy</b>	Sudden <b>collapse</b> , unusual behavior, altered mental state
Body Temperature	Normal	Normal	Hot, elevated
<b>Other Symptoms</b>	Headache, <b>Dry Mouth</b> , Loss of Skin Turgor (remains elevated when pinched)  Note: If you're urinating, and it's light yellow that's a good indicator that you're hydrated	Weakness, Headache, Dry Mouth, <b>Nausea</b> , Muscle Cramps, Muscle Spasms	Red Face/Skin, Strong Rapid Pulse, Wet or <b>Dry Skin</b> , Most likely sweating in younger individuals

C. Heat Stress Risk Factors when evaluating Heat Stress. Consideration needs to be given to the factors found in table 3 below, as well as factors that can affect an individual's response to heat: acclimatization, weight, age, illnesses, medications, types of clothes required for the job, ambient temperature, humidity, air movement in work area, and the task being performed.

**Table 3. Flag Conditions and Rules for Outdoor Conditions\***

Flag Conditions	Air Temperature	Temperature Chemical Suits	Protective Clothing	Acclimatized
White	< 80°F	<70 °F		No rules
Green	80 °F – 84 °F	70 °F - 74°F		<ul style="list-style-type: none"> <li>Water and shade must be as close as practical.</li> </ul>
Yellow	85 °F – 94 °F	75 °F – 84 °F		<ul style="list-style-type: none"> <li>Water/shade must be as close as practical.</li> <li>Consider implement work rest cycles as part of the Job planning.</li> </ul>
Red	95°F – 109°F	85 °F – 99 °F		<ul style="list-style-type: none"> <li>Water/shade must be as close as practical.</li> <li>Contact the Health &amp; Safety Department for temperature readings and work/rest cycles.</li> </ul> <p>Consider the following:</p> <ul style="list-style-type: none"> <li>include a buddy system/constant communication with workers, and</li> <li>“effective” observation and monitoring of symptoms occur based on Table 2;</li> <li>contact Medical if symptoms occur;</li> </ul>
Black**	110 °F - 119°F	100°F – 109°F		<ul style="list-style-type: none"> <li>Contact Health department for additional conditions</li> <li>JSA is required for work</li> </ul>

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\* Flag conditions are based on air temperature and Chemical PPE, excluding disposable coveralls

\*\* a standard work/rest cycle cannot be created for Martinez. A work/rest cycle takes into account the ambient temperature, the environmental temperature, humidity, engineering controls, PPE worn, tasks to be performed, duration of task(s), etc.

### TRAINING

- A. Each employee (supervisory & non-supervisory) shall receive initial training which addresses the topics specified in Title 8, CCR Section 3395 and annual refresher training thereafter. Fire Brigade and Haz Mat Teams shall also be trained initially and have annual refresher training. The Topics Include:
1. The environmental and personal risk factors for heat illness;
  2. The employer's procedures for complying with the requirements of this standard;
  3. The importance of frequent consumption of small quantities of water , up to 4 cups per hours, when the work environment is hot and employees are likely to be sweating more than usual in the performance of their duties;
  4. The importance of acclimatization;
  5. The different types of heat illness and the common signs and symptoms of heat illness;
  6. The importance to employees of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers;
  7. The employer's procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary;
  8. The employer's procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider;
  9. The employer's procedures for ensuring that, in the event of an emergency, clear and precise directions to the work site can and will be provided as needed to emergency responders.
  10. Heat Stress Awareness is required for all persons working in hot environments (>95°F wearing regular work clothing or >80°F if wearing additional PPE over work clothing). Awareness can be accomplished via the work permit hazard analysis or training.
  11. Training materials are available through H &S Department



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12. **(ERT Only)** Medical evaluation is required per regulations for entry and exiting Hazmat exclusion zone for responders and the standard recovery procedures to be used.

### PERSONAL RISK FACTORS

Personal risk factors that can increase the risk of heat-related illness include:

- Obesity
- Malnutrition
- Fatigue/tiredness
- Medical conditions, e.g., diabetes
- Drugs/Medication
- Dehydration/not drinking enough water
- Excessive consumption of alcoholic/caffeinated beverages
- Sunburn
- Not being acclimatized
- History of heat related illness

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### ATTACHMENT 1. LESSONS LEARNED FROM WORK ACTIVITIES WITHIN HIGH TEMPERATURE ENVIRONMENTS

FIN FANS (CONFINED SPACE)	<p>Fin fans present a challenge when work activities are to be conducted inside the shrouds. Wind affects each fin fan cell differently depending on the orientation and location of the cell.</p> <p>When possible, isolation of the bank the fin fan services has proven to eliminate the need for engineering controls and work/rest rotation periods on most of the cells under this condition.</p> <p>Forcing air<sup>(1)</sup> by means of blowers/fans strategically placed, placing insulating blankets/mats on fin tubes (top mounted fin fans), temperature monitoring, and work/rest period restrictions<sup>(2)</sup> may facilitate entry into the space for maintenance activities while the bank is in service.</p> <p>Conducting the maintenance activities in the early hours of the day also provides an additional cooling effect. However, the need for additional lighting must be considered.</p>
CONFINED SPACE	<p>Atmosphere exchanges can be improved by increasing the amount of blowers/fans<sup>(1)</sup> servicing the confined space, monitoring the temperature inside a hot confined space and by establishing a proper seal. Pulling air from the location closest to the heat source (pipes, elbows, vessel bottom) when feasible and establishing work/rest period restrictions<sup>(2)</sup> may facilitate entry into the space.</p> <p>Air conditioning units can deliver cooled air to the confined space entrant(s) provided all permitting requirements are met.</p> <p>Vessels where sections of metal have been pre or post-weld heat treated for hot work are environments with elevated temperatures and may require temperature monitoring prior to entry into the space.</p>
RADIANT HEAT	<p>When working around or on extremely hot equipment, radiant heat can be deflected using insulating blankets/pads as barriers and increasing the airflow in the area by adding fans/blowers aimed at (behind) or to the side of personnel. The blankets/pads can be hung (curtained) or laid on top of equipment (applicable in confined spaces too).</p> <p>Insulating blankets/pads could create hot spots on equipment when laid directly on them. Therefore, retrieval of the blankets/pads after the task is completed is essential. The proper engineering authorities need to be consulted prior to placing insulating materials on equipment (applicable in confined spaces too).</p>

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	Conducting the maintenance activities in the early hours of the day also provides an additional cooling effect. However, the need for additional lighting must be considered.
ENCLOSURES	High temperatures inside fabricated enclosures can be alleviated by increasing the ventilation by means of negative air machines (abatement jobs) and/or the use of an air conditioning unit.  Blocking direct sunlight also could ease or eliminate temperature issues.

(1). - A portable **oil-free** air compressor or electric fan will need to be used for this application. The location for the intakes of such devices needs to be considered to avoid introducing contaminants into the confined space.

(2). - Work/rest rotation periods can be established by H&S to complement the controls when determined that the temperature was not lowered enough and if the heat stress assessment allows for them.

**Note:** This section is a reference only document and does not supersede any controls established in this procedure.

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### **ATTACHMENT 2. REFINERY HIGH TEMPERATURE ENVIRONMENTS ABOVE 120°F, RESTRICTED**

Below are areas in the refinery with elevated air temperatures (>120°F) which are limited to Operations walking through only. All other tasks will require a Team Risk Assessment (TRA) to determine control methods and are subject to approval based on residual risk.

- Alky guillotine
- Contact H&S to determine if your area has equipment that should be listed in this attachment.

### **REFINERY HIGH TEMPERATURE ENVIRONMENTS BELOW 120°F, CONTROLS REQUIRED**

High temperature areas below 120°F require awareness of heat stress symptoms and the implementation of controls to minimize heat exposure, such as a work/rest rotation. These areas include, but are not limited to, the following:

- Within fin fan body
- Contact H&S to determine if your area has equipment that should be listed in this attachment.

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**ATTACHMENT 3.** Table below is based on NIOSH Heat Index

### Heat Index (Apparent Temperature) Chart

The **Heat Index (HI)** is the temperature the body feels when heat and humidity are combined. The chart below shows the HI that corresponds to the actual air temperature and relative humidity. (NOTE: This chart is based upon shady, light wind conditions. **Exposure to direct sunlight can increase the HI by up to 15°F.**) (Due to the nature of the heat index calculation, the values in the tables below have an error of +/- 1.3F.)

Heat Index	<i>General Effect of Heat Index on People in Higher Risk Groups</i>
80 to 89° - Caution	Fatigue possible with prolonged exposure and/or physical activity.
90 to 104° - Extreme Caution	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.
105 to 129° - Danger	Sunstroke, heat cramps or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity.
130° or higher - Extreme Dangers	Heat/sunstroke highly likely with continued exposure.

		Relative Humidity (in percent)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
Air Temp (in F)	140	125																					
	135	120	128																				
	130	117	122	131																			
	125	111	116	123	131	141																	
	120	107	111	116	123	130	139	148															
	115	103	107	111	115	120	127	135	143	151													
	110	99	102	105	108	112	117	123	130	137	143	150											
	105	95	97	100	102	105	109	113	118	123	129	135	142	149									
	100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144							
	95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136					
	90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122			
	85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108	
	80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91	
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80		
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	70	71	71	71	71	71	72	