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1.0 INTRODUCTION

This procedure is designed to outline the approach that Anacortes Refinery has taken to ensure employees and contractors know and understand the hazards associated with heat stress, and how mitigate accordingly.

1.1 Purpose

This procedure controls the risk of occurrence of heat-related illnesses. In addition, it provides information on required work processes and training for prevention of work-related heat illness.

1.2 Scope

This procedure applies to Anacortes Refinery employees and contractors. All personnel working on Anacortes Refinery property must comply with this procedure.

2.0 REFERENCES

2.1 Marathon Standards, Policies & Procedures

- RSP-1127-000 Confined Space Entry

2.2 Government Regulations

- WAC 296-62-09510 Physical Agents Purpose & Scope
- WAC 296-62-09013 Temperature, Radiant Heat, or Temperature-Humidity Combinations

3.0 DEFINITIONS

The following definitions are applicable to this procedure.

Table 1 Definitions

Term	Description
Acclimatization	A temporary adaptation of the body to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within four to fourteen days of regular work for at least two hours per day in the heat.
Drinking Water	Water satisfying the Department of Health's (DOH) requirements as potable water suitable for drinking by the public. Water packaged as a consumer product is an acceptable source of drinking water.

Table 1 Definitions

Term	Description
Environmental Risk Factors for Heat Illness	Working conditions that create the possibility that heat illness could occur, including air temperature, relative humidity, radiant heat (i.e. from the sun and other sources), conductive heat sources (i.e. from the ground), air movement, workload severity and duration, protective clothing, and/or personal protective equipment (PPE) worn by employees. This includes areas where expected temperatures or the heat index approaches caution levels, such as around furnaces and fin fan exchangers (See Attachment 2).
Heat Cramps	Painful muscle cramps caused by a loss of body salt through excessive sweating. To help prevent heat cramps, drink plenty of non-alcoholic and caffeine-free fluids while working in a hot environment. Check with your doctor about the use of salt tablets. They may be recommended in some cases. Anyone suffering from heat cramps should be watched carefully for signs of more serious heat stress. If the cramps persist or other symptoms develop, seek medical attention immediately.
Heat Exhaustion	This results from inadequate salt and water intake, and is a sign the body's cooling system is not working properly. The victim will sweat heavily, skin will be cool and moist, pulse weak, may breathe rapidly (i.e. even pant), vision may be blurred, and they will seem tired, confused, clumsy, irritable or upset. The victim may strongly argue that they are okay even with these obvious symptoms. If you suspect heat exhaustion, do not let the victim talk you out of seeking immediate medical attention. The heat exhaustion will affect their ability to exercise good judgment. Until medical help arrives, try to cool the victim and offer sips of cool water as long as the victim is conscious. Immediate medical attention is required. Heat exhaustion can quickly lead to heat stroke.
Heat Rash	Caused by a hot, humid environment, and plugged sweat glands. It is a bumpy red rash that itches severely. It is not life-threatening, but is very annoying. Dry clothes that help sweat evaporate will reduce the chance of heat rash. Washing regularly and keeping the skin clean and dry will help prevent heat rash.
Heat Related Illness	A serious medical condition resulting from the body's inability to cope with a particular heat load, and includes heat cramps, heat exhaustion, heat syncope and heat stroke.
Heat Stroke	The deadliest of all heat stress conditions, which occurs when the body's cooling mechanism has shut down after extreme loss of salt and fluids. The victim's body temperature will rise, pulse will be fast, skin will be hot, red, and dry, and they may complain of headache or dizziness. They will probably be weak, confused, and upset. Later stages of heat stroke cause a loss of consciousness and may lead to convulsions. In the event of heat stroke, seek immediate medical attention. Until help arrives, try to cool the victim and offer sips of cool water if the victim is conscious. Recognizing the symptoms of heat stress is very important, particularly since the victim may not realize what is happening. If you work alone in a hot environment, develop a "buddy system" so someone will check in on you periodically to look for signs of heat stress.

Table 1 Definitions

Term	Description
Heat Syncope	(Pronounced "sin-co-pae") A sudden fainting caused by a reduced blood flow to the head. The victim's skin will be cool and moist and their pulse will be weak. Immediate medical attention is needed in the event of syncope.
Hyponatremia	Hyponatremia occurs when the concentration of sodium (electrolytes) in the blood is abnormally low. In acute hyponatremia, sodium levels drop rapidly – resulting in potentially dangerous effects, such as rapid brain swelling, which can result in a coma and death. Seek immediate emergency care for anyone who develops severe signs and symptoms of hyponatremia: Nausea and vomiting; Headache; Confusion; Loss of energy, Drowsiness and fatigue; Restlessness and irritability; Muscle weakness, Spasms or cramps; Seizures; Coma and Death. Remember that (electrolyte) replacement is an important consideration in addition to hydration during high intensity or high heat/humidity.
Personal Risk Factors	Factors that affect the body's water retention or other physiological responses to heat, such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and/or use of prescription medications.
Preventive Recovery Period	A period of time to recover from the heat in order to prevent heat illness.
Shade or Shield	Blocking of direct sunlight or shielding from a heat generating source. Canopies, umbrellas, and other temporary structures or devices may be used to provide shade or shield from heat sources. One indicator that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight or air temperature readings have dropped.

4.0 ROLES AND RESPONSIBILITIES

Both supervisors and personnel have responsibilities to ensure that heat related illnesses are prevented at work. The following organizations and work groups have responsibilities related to this procedure.

4.1 Safety Specialist

Marathon Safety Specialists will ensure Industrial Hygiene best practices are met when testing for heat stress hazards.

4.2 Supervisor

Supervisors are responsible for utilizing the pre-job planning process (i.e. permitting) and for considering heat illness prevention. Supervisors are also responsible for ensuring heat stress mitigation is followed and reporting requirements are met, as related to the early onset of heat illness due to work.

4.3 Employees & Contractors

All personnel are responsible for minimizing personal risk factors for heat illness by arriving to work in good mental and physical condition.

5.0 IDENTIFYING, EVALUATING, AND CONTROLLING HEAT STRESS EXPOSURES

5.1 Identifying Heat Stress Hazards

5.1.1 Outdoor Work

Marathon employees must contact the Safety Department for further evaluation when working in ambient conditions that exceed 95 degrees. This includes situations where equipment (i.e., including process equipment) may cause the working ambient temperature to meet or exceed 95 degrees. The Heat and Humidity Chart within Attachment 2 contains further explanation on temperature and relative humidity hazards. The general controls described in this procedure should be followed for temperatures below 95 degrees.

5.1.2 Confined Space Work

When temperatures in the confined space exceed 70°F, consideration must be given to heat stress prevention for workers entering the confined space and any personnel in protective clothing outside the confined space. Confined space entry is not permitted if the dry bulb temperature exceeds 110°F inside the confined space. (The use of this limit needs to be applied in conjunction with procedures that involve proactive employee feedback and Supervisor oversight.) Workers should be rotated as necessary to prevent heat stress.

In cases where the 110°F requirement cannot be met, but it is determined that a safe way to perform a job exists, the safety variance process outlined in R-11-005 may be used. The safety variance will ensure the deviation is reviewed and hazards mitigated. The Operations Superintendent, Zone Safety Specialist, and Maintenance or Projects Superintendent (or their designees) must review and approve all Safety Variance Forms (see Attachment 1).

5.2 Evaluating and Testing for Heat Stress

Further evaluation will involve heat stress monitoring utilizing a Heat Stress Monitor. The following recommendations may result:

- Develop a work/rest regimen
- Water consumption requirements
- Cooling vest, air cooling requirements, or other methods to cool core body temperature
- Rotating personnel out of areas of high heat
- Taking breaks in a shaded area

Note: Based on results, no additional requirements may be recommended.

5.3 Controlling or Mitigating Heat Stress

5.3.1 General Controls

- Drink small volumes of water (i.e., approximately 1 cup of water or other acceptable replacement) about every 20 minutes
- Report symptoms of heat-related disorders to Supervisor
- Observe co-workers to detect and report signs of heat strain
- Maintain a healthy lifestyle, ideal body weight, and electrolyte balance

Note: Never ignore anyone's signs or symptoms of heat-related disorders.

5.3.2 Work Rest Regimen & Water Log

Depending on the heat stress evaluation results, the Safety Department may implement a specific work/rest regimen and water breaks. This mitigation must be tracked on the form located in Attachment 1.

6.0 THRESHOLD LIMIT VALUES FOR HEAT STRESS

The Anacortes Refinery has adopted the ACGIH Threshold Limit Values (TLV) for general guidelines concerning heat stress. These values are based on light, moderate, heavy, and very heavy working conditions. The table below is a guide for determining heat stress exposure and hazard mitigation.

Table 2 Screening Criteria for Heat Stress Exposure

Note: Wet Bulb Globe Temperature (WBGT) values in °C

Maximum Allowable Work Time	TLV				Action Limit			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
100%	31	28	-	-	28	25	-	-
75%	31	29	27.5	-	28.5	26	24	-
50%	32	30	29	28	29.5	27	25.5	24.5
25%	32.5	31.5	30.5	30	30	29	28	27

A Heat Stress Monitor capable of providing Wet Bulb Globe Temperature (WBGT) will be utilized in determining heat exposure and hazard mitigation steps.

Examples of work categories are below:

Light	Sitting with light manual work with hands or hands and arms. Standing with light arm work and occasional walking.
Moderate	Sustained moderate hand and arm work, moderate arm and leg work, moderate arm and trunk work, or light pushing and pulling. Normal Walking
Heavy	Intense arm and trunk work, carrying, shoveling, manual sawing; pushing and pulling heavy loads; walking at a fast pace.
Very Heavy	Very intense activity at fast to maximum pace.

7.0 PROVISIONS OF WATER

The Anacortes Refinery provides access to drinking water at work locations and offices. Water is provided in sufficient quantity to all personnel, at the beginning of the work shift and throughout the work shift. Frequent communications are distributed on the need for all personnel to consume the appropriate amount of water to ensure proper hydration. When heat related illness hazards are present, drinking water must be provided and made readily accessible in sufficient quantity to provide at least one quart of water per person per hour.

8.0 ACCESS TO SHADE OR MEDICAL SUPPORT

All personnel have access to shade in the form of air-conditioned buildings, vehicles, trailers, shops, and office buildings. Any personnel potentially suffering from heat illness or believing a preventative recovery period is needed, is provided access to an area with shade that is either open to the air, ventilated, or cooled for a period no less than five minutes. Such access to shade is permitted at all times.

Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning.

Refer to and follow R-11-006 Injury Management and Reporting. When emergency professional medical services are needed, dial x333 and state the following:

- Your name & location
- Request for emergency medical services
- Nature of medical emergency (i.e., heat related illness)
- Condition of victim

Table 3 Responding to Symptoms of Possible Heat Illness

Heat-Related Illness	Signs and Symptoms	First Aid
Sunburn	- Red, hot skin - May blister	- Move to shade, loosen clothing - Apply cool compresses or water
Heat Rash	- Red, itchy skin - Bumpy skin - Skin infection	- Apply cool water or compresses - Keep affected area dry - Control itching and infection with prescribed medication
Heat Cramps	- Muscle cramps or spasms - Grasping the affected area - Abnormal body posture	- Drink water or sport drinks - Rest, cool down - Massage affected muscle - Get medical evaluation if cramps persist
Heat Exhaustion	- High pulse rate - Extreme sweating - Pale face	- Move to shade and loosen clothing - Initiate rapid cooling

Table 3 Responding to Symptoms of Possible Heat Illness

Heat-Related Illness	Signs and Symptoms	First Aid
	- Insecure gait - Headache - Clammy and moist skin - Weakness - Fatigue - Dizziness - Nausea	- Lay flat and elevate feet - Monitor recovery - Drink small amounts of water - Evaluate mental status by asking who, where, and when questions - If no improvement call 911
Heat Stroke	- Any of the above signs & symptoms, but more severe - Hot, dry skin (i.e., in 25-50% of cases) -Nausea - Altered mental status with confusion or agitation - Can progress to loss of consciousness and seizures - Can be fatal	- Call 911 - Immediately remove from work - Start rapid cooling - Lay flat and elevate feet - If conscious give sips of water - Monitor airway and breathing, and administer CPR if needed

9.0 TRAINING

Training on the following topics shall be provided to all Anacortes Refinery employees:

- Environmental and personal risk factors for heat illness
- Employer's procedures for identifying, evaluating, and controlling exposures to the environmental and personal risk factors for heat illness
- Importance of frequent consumption of small quantities of water (i.e., up to 4 cups per hour under extreme conditions of work and heat)
- Importance of acclimatization
- Different types of heat illness and the common signs and symptoms of heat illness
- Importance of immediately reporting to their Supervisor any symptoms or signs of heat illness (i.e., in themselves or co-workers)
- Procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary

Note: Contract groups must also provide their employees with heat stress training that meets or exceeds WAC 296-62-09510.

10.0 REVIEW AND REVISION HISTORY

Revision #	Preparer	Date	Description
0	Mark Willand	12/17/2021	Reformatted and Numbered per Document Control Policy, R-63-001.

11.0 ATTACHMENT 1 – WORK/REST REGIMEN AND WATER LOG SAMPLE (R-14-005-F01)

Marathon Petroleum Company	REFINERY-WIDE	R-14-005-F01
ANACORTES REFINERY	Work/Rest Regimen and Water Log	Page 1 of 2
		REVISION: 0

Date: _____ **Operations Supervisor:** _____
Zone: _____ **F/S Specialist:** _____
Unit: _____
Equipment: _____

Describe the Heat Stress Hazards Below (include readings from monitor):

F/S to circle the applicable results from the table below:

Table 1 Screening criteria for heat stress exposure (WBGT values in °C)

	TLV				Action Limit			
Work/Recovery Cycle	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75 – 100% work	31	28	--	--	28	25	--	--
50 – 75% work	31	29	27.5	--	28.5	26	24	--
25 – 50% work	32	30	29	28	29.5	27	25.5	24.5
0 – 25% work	32.5	31.5	30.5	30	30	29	28	27

F/S to check the appropriate mitigation requirements below:

- ☐ Work/Rest Regimen _____
- ☐ Water Consumption Requirements _____
- ☐ Cooling Vest _____
- ☐ Other Methods of Cooling _____
- ☐ Rotate Personnel _____
- ☐ Breaks in Shade _____
- ☐ No Additional Requirements Needed _____

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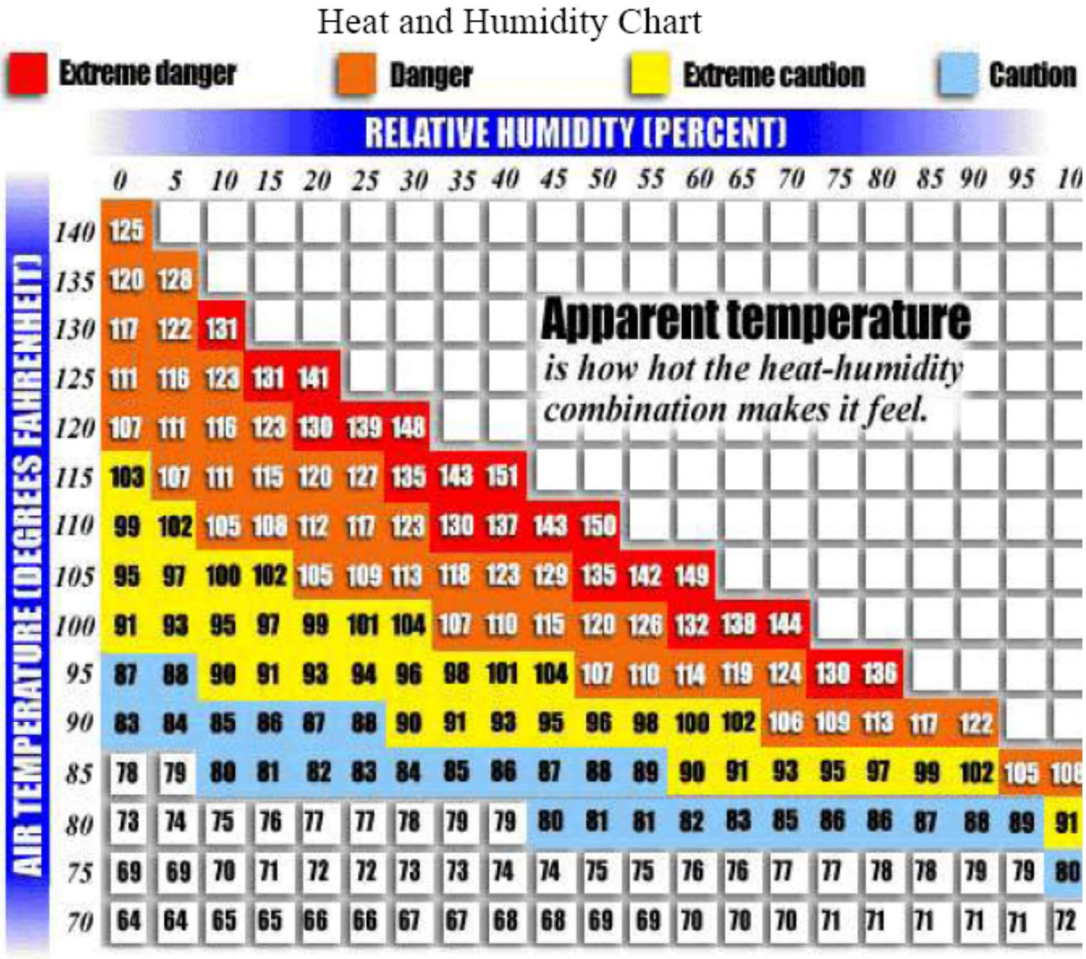
Marathon Petroleum Company LP	REFINERY-WIDE	R-14-005-F01
ANACORTES REFINERY	Work/Rest Regimen and Water Log	Page 2 of 2
		REVISION: 0

*Log is similar to Confined Space Log where employee gets logged each time they begin to work in the area of concern.
*Identify work cycle in percent (75% of 1 hour work is 45 minutes work, 15 minute break)

	Work/Rest Regimen			Water Intake		Daily Record	
Person	In	Out	Required Cycle	Last H2O Intake	Net H2O Intake	Start Shift	End Shift

12.0 ATTACHMENT 2 – HEAT AND HUMIDITY CHART (NOAA)



http://www.crh.noaa.gov/dvn/tools/heatindex.pdf.

Heat Index	General Effect of Heat Index on People in Higher Risk Groups
80 - 89 *Caution*	Fatigue possible with prolonged exposure and physical activity.
90 - 104 *Extreme Caution*	Sunstroke, heat cramps, and heat exhaustion possible.
105 - 129 *Danger*	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130 or higher *Extreme Danger*	Heat Stroke highly likely with continued exposure.