

# Industrial Cities Health, Safety, Security & Environment Health & Hygiene

## **Heat Stress Prevention Guidelines**

QGDL-DC-004

Date: 30/06/2016 Date: Date: LH KH REVIEWED REVIEWED REVIEWED CUSTODIAN Manager, Manager, Manager, Health & Hygiene Advisor HSSE (MIC) HSSE (DCA) HSSE (RLC)

Date: 26/7/2016 Date: 27/7/2016 Date: /14/8/16
CK CL CM

REVIEWED REVIEWED REVIEWED

Manager,
Dukhan Concession Area (DCA) Ras Laffan Industrial City (RLC) Mesaieed Industrial City (MIC)

Date: 4/8/20/6
DC
APPROVED
Vice President,
Industrial Cities



QGDL-DC-004

Rev. No:

Date: 24-05-2016

01

Page 2 of 21

# **Document Reviews History**

Date	Draft No.	Reviewed By	Description	Section No.
26.05.2016	Final	LHH	Reviewed and endorsed document.	All
12.06.2016	Final	LES	Reviewed with comments on document content.	All



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 3 of 21

# **Document Change History**

Doc. Code	Rev. No.	Draft No.	Date	Revision Description	Page No.	Approved By
QGL-CH-001	00	Final	04.02.2013	First publication.	All	СН
QGL-LHH-001	01	Final	14.12.2015	Revised of the current publication as per DC new organizational structure. Changed of document code to QGL-LHH-001. Issued for approval.	All	LH, MH, KH
QGDL-DC-004	01	Final	25.05.2016	Issued to Custodian for final review and endorsement.	All	LHH
QGDL-DC-004	01	Final	31.05.2016	Issued to LES for final review.	All	LES
QGDL-DC-004	01	Final	14.06.2016	Re-issued for approval with new document code and approval signatories.	All	DC



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 4 of 21

# **Table of Contents**

1.0	OBJ	ECTIVE		6
2.0	BAC	KGROU	ND	6
3.0	sco	PE		6
4.0	DEF	NITIONS	S AND ABBREVIATIONS	7
	4.1	Definition	ons	.7
	4.2	Abbrevi	ations	.7
5.0	HEA	T STRES	SS S	9
	5.1	Heat Ind	dex	.9
	5.2	Heat Di	sorders and Health Effects	.9
	5.3	Factors	Contributing to Heat Stress	10
		5.3.1	Activity/Task Factors	10
		5.3.2	Environmental Factors	10
		5.3.3	Employee Factors	10
6.0	HEA	T STRES	SS CONTROL	11
	6.1	Engine	ering Controls	11
		6.1.1	Shade and Shielding	11
		6.1.2	Area Cooling	11
		6.1.3	Ventilation	11
	6.2	Adminis	strative Controls and Work Practices Controls	
		6.2.1	Acclimatisation	12
		6.2.2	Work Scheduling	
		6.2.3	Work Rest Intervals	
		6.2.4	Self Evaluation	
		6.2.5	Employee Rotation	
		6.2.6	Fluid Replacement	
		6.2.7	Buddy System	
		6.2.8	Reduction of Internal Heat Generated by Worker	
		6.2.9	Flagging System	
7.0	PER:	SONAL	PROTECTIVE EQUIPMENT (PPE)	14
8.0	TRA	INING	•	14
9.0	ROL			14
	9.1	End Use	ers and EPC Contractors	14
	9.2	Medical	Officer (RLC/MIC/DCA)	15
	9.3	Employ	ees	15
	9.4	Supervi	sors	15
10.0	IMPL	EMENT	ATION AND AUDIT	15
11.0	REF	ERENCE	ES ·	15
12.0	ATT	ACHMEN	NTS .	16
	12.1	Heat Ind	dex Chart	17



QGDL-DC-004		
Rev. No:	01	
Date:	24-05-2016	
	Page 5 of 21	

12.2	Guide on Work Practices to Minimize the Effect of Heat Exposure	18
12.3	Urine Chart	19
12.4	Heat Stress and First Aid	20
12.5	Heat Stress Questionnaire	21



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 6 of 21

## 1.0 OBJECTIVE

The objective of this document is to establish and implement a set of guidelines to protect workers from illness and injuries resulting from exposure to heat within the Industrial Cities Directorate.

#### 2.0 BACKGROUND

Qatar's summer climate is very hot and humid with temperatures ranging from 33°C to 50°C with relative humidity up to 100%. This climate creates a potentially dangerous situation for those exposed to the heat.

Employees working in environments where there are high air temperatures, a proximity to radiant heat sources, high humidity, or where strenuous physical exertion is required have a high potential for heat related illnesses and injuries.

This guideline shall be based on the normal risk based approach as follows:

- Recognition the hazard must be identified.
- Evaluation the hazard must be measured.
- Control the hazard must be reduced or mitigated.

The role of Supervisor or Foreman is critical in controlling heat stress among the workers who are potentially exposed to conditions that can promote heat related illness. The Supervisor can implement controls when heat stress conditions are identified which will protect the workers, if properly assigned and carried out.

The workers must be trained to recognize the heat stress signs, symptoms and environmental conditions to be ready to protect themselves and those around them. This document identifies fundamental practices and methods of identification of factors that could lead to heat stress and the associated illnesses and provides work practices and other controls that can mitigate or reduce the hazards.

## 3.0 SCOPE

This Heat Stress Prevention Guideline addresses heat stress identification, evaluation as well as controls to be implemented to reduce the effects of heat related illness and injures such as heat stroke, heat exhaustion, heat cramp, heat rashes, heat fatigue and dehydration among the workers throughout Industrial Cities.

This document is applicable to all personnel in Industrial Cities including QP employees, End-users, contractors and visitors at all worksites and projects that require individuals to work outdoors in a hot climate in Industrial Cities Directorate.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 7 of 21

## 4.0 DEFINITIONS AND ABBREVIATIONS

## 4.1 Definitions

Terms	Description
Acclimatization	A gradual physiological adjustment process that the body makes to improve an individual's ability to tolerate heat. Acclimatization usually takes several days with gradual build up to expected heat loads, workloads, and duration of the job.
Buddy system	Pairing of co-workers or team members for the purpose of health protection and looking out for one another.
Heat Index	An index that combines air temperature and relative humidity in an attempt to determine the human-perceived equivalent temperature.
Heat Related Illness	Any of the following terms: Heat Stress, Heat Exhaustion, Heat Stroke, brought on by excessive exposure to heat without adequate water, shelter and proper acclimatization.
Dry Bulb Temp. OR Air Temp. (DB)	The dry bulb or air thermometer measures the ambient air temperature. This measurement is used in the heat index calculation. A series of white plates surround the sensor to shield it from radiant heat.
Globe Temperature (GT)	The globe temperature gives an indication of the radiant heat exposure on an individual due to either direct light or hot objects in the environment. This is accomplished by placing a temperature sensor inside a blackened copper sphere and measuring the temperature rise.
Natural Wet Bulb Temperature (WB)	The natural wet bulb thermometer gives an indication of the effects of humidity on an individual. Relative humidity and wind speed are taken into account by measuring the amount of evaporative cooling taking place by a thermometer covered with a moistened wick. A cotton wick immersed into a reservoir containing distilled water is usually used to take natural wet bulb measurements. This measurement is used in calculating the heat index.
Relative Humidity (RH)	Relative humidity is the ratio of the quantity of water vapour present in the air to the quantity that would saturate it at any specific temperature.

## 4.2 Abbreviations

Abbreviation	Definition
DC	Vice- President, Industrial Cities
DCA	Dukhan Concession Area
HSSE	Health Safety, Security & Environment
н	Heat Index
LH	Manager, Health Safety Security & Environment (RLC)
LHH	Health & Hygiene Advisor



 QGDL-DC-004

 Rev. No:
 01

 Date:
 24-05-2016

Page 8 of 21

Abbreviation	Definition
MIC	Mesaieed Industrial City
PPE	Personal Protective Equipment
QP	Qatar Petroleum
RLC	Ras Laffan Industrial City



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 9 of 21

## 5.0 HEAT STRESS

#### 5.1 Heat Index

Heat stress occurs when heat is absorbed from the environment faster than the body can get rid of it. The resulting strain on the body comes from the combined contributions of the job (e.g. work activity), environmental factors (e.g. air temperature, humidity, air movement, radiant heat) and worker factors (e.g. extent of acclimatization and hydration).

The "Heat Index" has been selected to define the general overall heat stress conditions for the workforce. The Heat Index, also known as the "effective temperature", is useful as a first order indicator of the effect of humidity on how hot a particular exposure feels to an individual.. The heat index does not take into account the radiant heat load that is primarily attributed by working in direct sunlight. It also does not take into account the nature of the work (heavy manual work or light work) nor the clothing worn by the worker.

The heat index can be obtained by directly measuring the dry bulb temperature and relative humidity and reading the corresponding heat index from the heat stress table.

When the heat index reaches levels that have been known to produce heat illness, additional work practices to reduce the heat stress should be implemented to reduce the effects of the radiant heat load, physical activity, and insulated effect of the clothing and personal protective equipment. Refer to the work practices in the "Control" section.

Instrumentation to determine the heat index must be utilized to measure the air temperature in full shade conditions and measure or calculate the relative humidity. The heat index will be determined using properly calibrated instruments and in accordance with manufacturer's recommendations.

#### 5.2 Heat Disorders and Health Effects

Table below outlines the types of health disorders and their associated health effects:

Heat Disorder	Health Effects
Heat Fatigue	A factor that predisposes an individual to heat fatigue is lack of acclimatization. The signs and symptoms of heat fatigue include impaired performance of skilled mental, or vigilance jobs.  There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.
Heat Rashes	It is the most common problem in hot work environment. Prickly heat is manifested as red papules and they usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by un-evaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to cool environment.
Heat Cramps	These are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating and lack of water replenishment. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.



**QGDL-DC-004**Rev. No: 01

Date: 24-05-2016

Page 10 of 21

Heat Disorder	Health Effects
Heat Collapse	In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the worker should gradually become acclimatized to the hot environment.
Heat Exhaustion	Heat exhaustion should not be dismissed lightly. However, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he faints. In addition, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.
	Signs and symptoms: headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.
Heat Stroke	Heat stroke is a form of hyperthermia, an abnormally elevated body temperature with accompanying physical and neurological symptoms
	This occurs when the body's system of temperature regulation fails and body temperature rises to critical levels.
	Primary signs and symptoms of heat stroke: confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature (106°F).

#### **5.3** Factors Contributing to Heat Stress

Heat stress is normally brought about by a range or combination of factors involving the interaction of the Activity/task, environment and the employee.

## 5.3.1 Activity/Task Factors

- Frequency of exposure.
- Duration of exposure.
- · Physicality of work.
- Inadequate rest periods.

#### 5.3.2 Environmental Factors

- High air temperatures.
- Low air movement.
- High relative humidity.
- · Radiant heat from hot objects such as machinery.

#### 5.3.3 Employee Factors

- Incomplete acclimatization.
- Dehydration.
- Excessive or inappropriate clothing.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 11 of 21

Medical Condition.

• Individual Susceptibility (age, overweight, poor physical condition).

#### 6.0 HEAT STRESS CONTROL

Heat Stress Controls, which can be applied to work situation, could be categorised as work practices, personal, administrative, or engineering.

These controls shall be applied to fit the nature of the task depending on the specific situation.

#### 6.1 Engineering Controls

Feasible engineering controls will be sought and implemented, where practicable to do so, to reduce the heat load on an individual.

The type of engineering controls that can be implemented are described in the following sub sections.

#### 6.1.1 Shade and Shielding

Shade serves as one of the most important heat stress controls for Qatar's summer climate. Radiant heat load can be reduced as much as 10°C degrees when working in shade as opposed to working under direct sunlight. Use of windscreens can also provide some additional measure of shade yet allow significant radiant heat through and reduce ventilation.

Radiant heat sources such as hot pipes in regular work areas should be insulated to reduce the heat load. Re-insulation, either temporary- or permanent, should be done as soon as possible after repairs.

For non-routine working areas without insulation from hot sources, temporary-insulating blankets should be used to shield the sources while work is performed in the area.

As a minimum guideline, the shaded area must have a green net on all the sides including the top to prevent the direct sun light with seating arrangements to rest. Cool drinking water is to be provided with glasses/flasks. Necessary drainage arrangements are to be made to drain the excess water. Using hands as a means to drink water is to be avoided. Food may only be consumed in the designated dining facilities.

#### 6.1.2 Area Cooling

Spot cooling equipment such as misting fans can be utilized when work is performed in one fixed location such as a valve or control box. The cool airflow streams need to be directed towards the workers and the discharge ducts should be as close as practical to the work area.

Portable trailer mounted with air conditioning units can be utilized for larger enclosed areas such as confined spaces or vessels. These units can help to significantly reduce heat stress and greatly increase the job efficiency.

Shaded break areas should be kept cooler than the work areas to facilitate quicker recovery from the effects of heat. It is recommended that a 10-15 degree difference in temperatures to be maintained between the work area and the break area. This will avoid excessive cooling which is not recommended except for heat emergencies. Where cooling of a break area is not feasible, air circulation with fans should be used to help with cooling through sweat evaporation.

#### 6.1.3 Ventilation

Increasing airflow through a work area via fans and air conditioning will help increase the evaporation rate and cooling of the people. This will not be effective if the temperature of the air blowing across the workers is over 40 °C since it may then actually result in increased heat stress.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 12 of 21

Confined spaces should be evaluated for proper ventilation. If needed, cool air should be pulled in near the workers. This may require relocation of the air movers and the opening/closing of man ways as the work progresses to assure proper air distribution.

#### 6.2 Administrative Controls and Work Practices Controls

#### 6.2.1 Acclimatisation

The human body is able to adapt to heat exposure to some extent. This physiological adaptation is called acclimatization. After a period of acclimatization, the same activity will produce fewer cardiovascular demands. The worker will sweat more efficiently (causing better evaporative cooling), thus will more easily be able to maintain normal body temperatures.

A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such program involves exposing employees to work in a hot environment for progressively longer periods.

#### 6.2.2 Work Scheduling

Scheduling extremely hot jobs towards the cooler part of the day, at night or during a cooler day if possible.

Where possible, postpone the hot job until the equipment can be taken out of service and allowed to cool down.

Schedule additional time for hot jobs to allow for additional cooling breaks especially if cooling measures are not used.

#### 6.2.3 Work Rest Intervals

On hot days or for hot jobs, breaks that are more frequent should be planned especially if heavy work is involved.

Rest breaks should be taken in a cool location together with consumption of cool fluids. Hot beverages and those that contain caffeine such as tea, coffee and sodas should be avoided.

#### 6.2.4 Self Evaluation

Workers who are working in hot conditions (high temperatures) must be aware of the signs and symptoms of heat stress related illnesses and early warning indications so that they can recognize them in themselves or their colleagues. Typical symptoms include weak and fatigue, painful muscle cramps, headache and dizziness, nauseated and heavy sweating.

Heart rate (rapid pulse) is one of the good indicators of the degree of heat stress that a person is experiencing.

The supervisor shall be notified of any early indications heat stress and undertake the necessary corrective actions.

Most individuals can be trained to monitor their own heart rate. For jobs where heat stress is a concern, the individuals must periodically pause work and immediately take a pulse for 15 seconds. Multiply this by 4 to get the heart rate.

Healthy acclimatised workers should avoid prolonged work or environmental combinations that cause their heart rate to exceed the recommended maximum heart rate when taken during the first minute of rest. The heart rate should drop to 110 – 120 beats per minute following the first minute of rest. Maximum heart rates should be below the following indicators:

Age	Max. Rate	
20	162	



**QGDL-DC-004**Rev. No: 01

Date: 24-05-2016

Page 13 of 21

30	157
40	152
50	147
60	141

Since each person is different and medical conditions can affect reaction to heat stress, it is important to remember that these indicators are only average indicators. The individual's maximum recommended rate could be lower. Workers must remain alert to other signs of excessive heat stress.

#### 6.2.5 Employee Rotation

On hot jobs, two groups of workers could be used to allow frequent rotation out of the hot area and cooling off. Tasks such as pick or shovel work must be rotated frequently (each 10-15 minutes).

Workers in additional clothing or suits must be rotated more frequently. If the workers are using chemical protective suits or proximity suits, additional cooling devices must be used or workers must be rotated each ten minutes.

#### 6.2.6 Fluid Replacement

One of the most important means of reducing the risk of heat stress is to drink plenty of fluids (cold water). When doing hard work in hot areas, dehydration may occur due to heavy sweating before a person even feels thirsty.

It is recommended that at least 250 ml of fluids be consumed every 20 minutes to prevent dehydration and reduce the risk of illness (Refer to the dehydration guide utilizing urine colour).

Cool water should be readily available during warm weather or in hot work areas.

Use of salt tablets are not recommended. A well balanced diet should replace all necessary salts and electrolytes.

#### 6.2.7 Buddy System

When working on high temperature jobs, consideration should be given for the workers to work in pairs with each person watching out for early warning signs of excessive heat stress in the other person.

In high temperature confined spaces, the man on watch should be alert to the warning signs of excessive heat stress and should ensure that any conditions of entry such as frequent rest and water breaks are followed.

### 6.2.8 Reduction of Internal Heat Generated by Worker

Where practical, mechanical assistance should be used to reduce the physical requirements of the job and thus, reducing the metabolic rate. For example, use of an appropriate lifting equipment/transportation to move material rather than making several trips using heavy loads or use of a backhoe for digging or spreading of gravel rather than manual handwork digging.

The split job tasks or rotation between workers will relieve a lot of stress besides giving them an opportunity to take rest pauses.

#### 6.2.9 Flagging System

The use of colour coded flagging system in accordance with the Heat Stress Index is strongly recommended at all work place areas to ensure that the Heat Stress Management System is consistently applied throughout the work sites.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 14 of 21

Besides the flagging system, boards that are currently under use are also suggested/recommended with periodic updates with respect to the Heat Index.

## 7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Three variables associated with clothing that alter the thermal balance consist of insulation, permeability and ventilation.

Cotton clothing provides most of these variables. As such, clothes should be made of thin cotton that eases evaporation, loose fitting as well as light in weight and colour (reflects heat).

Clothes should be regularly washed to remove the sweat and salt, which can irritate the skin and lead to infection. Long sleeved shirts and trousers are recommended. A hardhat should be worn to protect the head face and neck. Tinted safety glasses shall also be used to reduce any possible damage to the eyes.

In certain situations, PPE (facemasks, impermeable fire protective clothing, etc.) must be worn which can possibly aggravate heat stress by not allowing sweat to evaporate. In this case, special working practices may need to be adopted. There are synthetic under garments made up of combed cotton and polyolefin fibres, which wick moisture away from the skin leaving the body dry.

Cooling devices (ice vests water circulating cool suits, air circulating, and reflective clothing) may need to be worn for very specific tasks. However because they represent a potential safety hazard, a work assessment should be performed prior to their employment.

## 8.0 TRAINING

Supervisors, contractors and employees must be trained to recognize the symptoms of heat stress prior to performing work in potential heat stress situations.

Training must include the recognition of signs and symptoms of heat stress in themselves and coworkers, work rest schedule, emphasis on fluid intake and flagging system.

Training should be conducted closer to the summer months to ensure awareness among the workers. This can take place at "toolbox" talks and or JSA discussion sessions at the beginning of each shift.

Display of posters or charts of heat stress awareness to be written in as many common languages used by the workers shall be used as well.

#### 9.0 ROLES AND RESPONSIBILITIES

#### 9.1 End Users and EPC Contractors

- Ensure that these guidelines are taken up on their respective Heat Stress Management System and that it is followed without exception.
- Report all Heat Stress or Heat Stress related incidents to RLC/MIC/DCA Medical immediately.
- Provide Heat Stress Index measurement regularly on day-to-day basis to site staff.
- Review heat stress precautions in respect of work to be performed in hot locations.
- Consider scheduling the hottest jobs for the cooler part of the day or nights, or the use of other methods to reduce heat stress.
- Scheduling or plan for additional breaks, as needed, to cool off on hot jobs in particular hot conditions.
- Evaluate non-routine jobs where there may be a heat stress concern.
- Stop work as and when required in terms at Heat Index Indicator.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 15 of 21

#### 9.2 Medical Officer (RLC/MIC/DCA)

- Ensure that all Heat Stress related incidents reported are properly investigated and recorded.
- Report immediately any Heat Stress incident to HSSE Department.
- Follow up and coordinate Heat Stress related incidents with the End user's medical staff.

#### 9.3 Employees

- Be familiar with the early warning signs of heat stress in themselves and co-workers and take immediate action when they are noted.
- Utilize personal protective equipment as needed.
- Drink plenty of fluids prior to entering a hot environment and continuously when indicated to prevent dehydration (1/4 litre every 20 minutes).
- Take regular rest brakes and follow flagging system.
- Inform the Supervisor of any heat stress concerns relating to the work place.

#### 9.4 Supervisors

- Implement heat stress controls in accordance with the Heat Index.
- Monitor subordinates exposure to heat and modify work schedules accordingly.
- Apply effective controls to control the heat at work.
- Schedule the most physical activities, if possible, for the coolest part of the day.
- Provide cool water and encourage employees to drink fluids regularly. As the intensity of work activity and heat index climbs, increase more fluids.
- Employ the buddy system that encourages fellow employees to look out for each other.
- Ensure employees are aware of the symptoms of Heat stress. Employee training should also be focused on protective measures for working in high heat and humidity in work place areas.

#### 10.0 IMPLEMENTATION AND AUDIT

Implementation and auditing of this guideline must be done by the respective HSSE Department.

Any heat related incidents should be reported together with a questionnaire to the RLC/MIC/DCA Medical Centre and HSSE Department of Industrial Cities Directorate.

#### 11.0 REFERENCES

- 1. QP Guideline for managing heat stress
- 2. OSHA Technical Manual, Section III: Chapter 4 Heat Stress.
- 3. RasGas Company Limited Heat Stress Prevention Standard.
- 4. Qatargas/RasGas Basic guidelines.



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 16 of 21

## **12.0 ATTACHMENTS**



QGDL-DC-004

Rev. No:

Date: 24-05-2016

01

Page 17 of 21

## 12.1 Heat Index Chart

		GE	NER A	AL HE	EAT S	TRES	S IND	EX		
DANGER CATEGORY			HEAT INDEX HEAT SYNDROME			C				
IV. Extreme Danger			> 54		Heat Stroke or Sunstroke imminent					
III. Danger		39 - 53		Sunstroke, Heat Cramps or Heat Exhausion likely, Heat Stroke possible with prolonged exposure and physical activity						
II. Extreme Caution			32 - 38		Sunstroke, Heat Cramps or Heat Exhaustion possible, Heat Stroke possible with prolonged exposure and physical activity					
I. Caution			27 - 31 Fatigue possible with prolonged exposure and physical activ					activity		
* Note: Degree of Heat Stress may vary with age, health and body characterristics.										
			Т	RELATIVE HUMIDITY (Rh)						
		10%	20%	30%	40%	50%	60%	70%	80%	90%
	50	44	52	54	>54	>54	>54	>54	>54	>54
	49	43	51	54	>54	>54	>54	>54	>54	>54
	48	43	50	53	54	>54	>54	>54	>54	>54
	47	42	48	52	54	>54	>54	>54	>54	>54
	46	41	47	50	54	>54	>54	>54	>54	>54
	45	41	46	50	54	>54	>54	>54	>54	>54
	44	40	45	49	54	>54	>54	>54	>54	>54
	43	39	44	48	54	>54	>54	>54	>54	>54
Ç	42	38	43	46	54	>54	>54	>54	>54	>54
E E	41	38	41	45	52	54	>54	>54	>54	>54
UR	40	37	40	43	49	54	>54	>54	>54	>54
ΔT	39	36	38	42	47	52	54	>54	>54	>54
$\mathbf{R}$	38	35	37	41	43	49	54	>54	>54	>54
AIR TEMPERATURE (°C)	37	34	36	38	41	43	54	54	>54	>54
	36	33	35	37	40	42	49	53	54	>54
RJ	35	32	34	36	39	42	46	52	54	>54
AI	34	32	34	35	38	41	44	50	53	54
	33	31	32	33	36	38	41	46	50	53
	32	29	31	32	33	36	38	41	46	50
	31	28	30	31	32	34	35	38	41	46
	30	27	29	29	31	32	33	36	38	43
	29	26	27	28	29	30	32	33	35	37
	28	25	26	27	27	29	30	32	33	35
	27	24	25	26	26	27	28	29	30	32
	26	22	24	25	26	26	27	27	28	29



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 18 of 21

## 12.2 Guide on Work Practices to Minimize the Effect of Heat Exposure

Heat Index (Combination of air temperature and relative humidity)	Work : Rest Period (minutes)	Water Requirements (1 cup= 250 ml)	Controls	Flag colour	
27-31	50:10	1 Cup every 20 minutes	Continuous Visual Monitoring of workers under Direct Sun and Heavy work	Green (Caution)	
32-38	40:10	1 Cup every 20 minutes	No working alone	Yellow (Extreme Caution)	
39-49	30:10	1 Cup every 15 minutes	Work under shade		
50-53	20:10	1 Cup every 10 minutes	Stop elevated and confined space work.	Orange (Danger)	
>54			Stop all work.	Red (Extreme Danger)	

#### Note

- 1. Degree of Heat Stress may vary with age, health and body characteristics.
- 2. Do not take any form of "Salt Supplement" unless advised.

**Note:** - Emergency Conditions/Critical Operational activities/tasks that may arise in response to operating the plant and process safety may continue the job on 10 minutes work and 10 minutes rest under the supervision of HSSE personal.



QGDL-DC-004

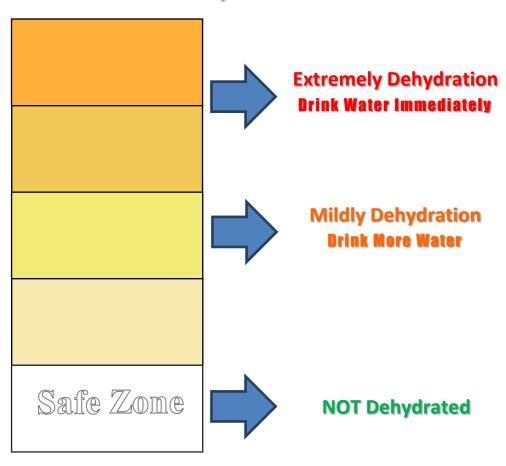
Rev. No: 01

Date: 24-05-2016

Page 19 of 21

#### 12.3 Urine Chart

# The Color of Urine Tell You How Dehydrated You Are!



Are you dehydrated?

Keep on drinking water



QGDL-DC-004

Rev. No: 01

Date: 24-05-2016

Page 20 of 21

## 12.4 Heat Stress and First Aid

Condition	Symptoms	First Aid			
Heat Rash	- Red, itchy skin	- Keep skin clean and dry - Avoid scratching			
Heat Fatigue	<ul> <li>Lack of coordination</li> <li>Decreased mental ability (thinking, memory, concentration)</li> <li>Tiredness / fatigue</li> </ul>	Remove individual from heat source     Move to cool / shaded area			
Heat Collapse	- Temporary loss of consciousness	<ul><li>Remove individual from heat source</li><li>Move to a cool / shaded area</li></ul>			
Heat Cramps	<ul><li>Painful muscle spasms in arms, legs and abdomen</li><li>Profuse sweating</li></ul>				
Heat Exhaustion	<ul> <li>- Headache</li> <li>- Nausea</li> <li>- Vertigo / dizziness</li> <li>- Weakness</li> <li>- Thirst</li> <li>- Cold, clammy, skin with excess sweat</li> </ul>	<ul> <li>Move to cool location</li> <li>Open clothing</li> <li>Give water to drink if conscious</li> <li>Victim must lie flat except when drinking</li> </ul>			
Heat Stroke (Medical Emergency)	<ul> <li>Erratic Behaviour</li> <li>Skin is hot, dry, flushed, not sweating</li> <li>Weakness, Unsteady Gait</li> <li>Body Temperature elevated</li> <li>Convulsions</li> <li>Loss of Consciousness</li> <li>Can lead to death if untreated</li> </ul>	<ul> <li>Remove excess clothing from the victim</li> <li>Douse victim with cool water until medical help arrives</li> <li>Place a covered ice bag on victims head if available</li> </ul>			



QGDL-DC-004

Rev. No:

Date: 24-05-2016

01

Page 21 of 21

## 12.5 Heat Stress Questionnaire

Heat Stress Questionnaire							
Please complete the below questions for all Heat stress relevant cases and return completed questionnaire to the Medical Centre and HSSE Department of DC. This will be used to gather statistical data for lessons learn and continuous improvement for the prevention of Heat stress related cases.							
Name: Date of Incident:			:				
Nati	onality:		Age:				
Job .	Trade:		Contact Detail:				
Com	ıpany's nam	e:	Location of Incident:				
Proj	ect:		Accommodation Camp:				
1	How long	are you in working in Qatar?					
2	How long	do you work in a day – shift timings?					
2	What is th	e interval of your work - rest brakes					
3	Were you given time to acclimatize?				Yes	No	
4	Did you have your breakfast / lunch?					No	
5	Are you on any medications (sedatives)? –				Yes	No	
	If yes, plea	se provide details -					
6	6 Did you receive any training on Heat Stress from your company? (e.g. Induction training, Toolbox talks, hand outs)				Yes	No	
7	Do you use the flag system on your work site?				Yes	No	
8	What was	the flag colour when you started to fee	el sick?	Green		]	
9	Do you ha	ve a rest shelter on site with extra vent	ilation? (e.g. Fans	s, Air conditioning)	Yes	No	
10					Yes	No	
11						No	
12					Yes	No	
Inter	viewed by:						
Name			Department				
Company			Date & Sign				