SEVERE WEATHER MANAGEMENT PROCEDURE

AGREEMENT NO.	**:**	**09-5578-E-4**
PROJECT NAME	**:**	**Ruwais Refinery Expansion Project EPC-4: Tankage & Associated Interconnecting Piping**
COMPANY	**:**	**Abu Dhabi Oil Refining Company (TAKREER)**
PMC	**:**	**Mott MacDonald Ltd.**
CONTRACTOR	**:**	**Daewoo Engineering & Construction Co., Ltd.**

This page is a record of all revisions of this document. All previous issues are hereby superseded and are to be destroyed.

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NOTES:

(a) Revisions are denoted by a vertical line placed in the right-hand margin against the revised text.

(b) PREP = Prepared by, CHKD = Checked by, REVD = Reviewed by, APP'D = Approved by.

(c) In case of conflict between any requirements stipulated in this document with the contractual requirements, the contractual requirements shall prevail.

REVISION INDEX DETAILS

Rev	Location of Change	Brief Description of Change
B	Paragraph 2, 3.2, 4.5, 5.4	Incorporation of COMPANY Comments

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1. INTRODUCTION

The severe weather management procedure has been developed due to the geographical location of the Ruwais Refinery Expansion PROJECT (EPC-4). The temperatures in Ruwais get extremely high during summer time and this is further compounded by the humidity. Other severe weather conditions that can be found in the area are high wind speeds, sand storms and fog in the mornings.

1.1 Purpose

The purpose of this procedure is to define the severe weather conditions that will be faced during the execution of the PROJECT as well as the control measures that will be implemented during to control these hazards.

1.2 Objectives

The objectives of this procedure are;

- To outline the different severe weather conditions that will be faced on EPC-4.
- To detail the information that has to be communicated to all site personnel regarding the severe weather conditions.
- Define a system for monitoring, controlling and communicating the severe weather conditions on EPC-4.

1.3 Scope

The severe weather monitoring procedure is applicable to all personnel working on EPC-4, and who will be exposed to severe weather conditions.

2. DEFINITIONS

Anemometer	A gauge for determining the force or speed of the wind, and sometimes its direction.
Company	Abu Dhabi Oil Refining Company (TAKREER)
Contractor	Daewoo Engineering and Construction Company Ltd.
Heat Cramps	Painful muscle spasm due to the loss of salts and electrolytes from heavy sweating.
Heat Exhaustion/ Stress	This is a heat related illness which is caused due to prolonged exposure to extreme heat. The casualty will be sweating, experience severe weakness and may even collapse.
Heat Index	This is a term used to describe the combined readings of temperature and humidity. It is also known as the apparent- or 'real feel' temperature.
Heat Rash/ Prickly Heat	Heat related illness which causes a skin rash and sometimes severe pain.
Heat Stroke	The most severe heat related illness resulting from prolonged exposure to adverse weather and may result in death. The casualty will have a hot and dry skin, rapid pulse, low blood pressure and may experience breathing difficulties.
Fog	A cloud (stratus) which has its cloud base on or close to ground, and reduces visibility to less than 1000 meters. The visibility normally becomes a problem for motorist when it falls below 200 meters.
Sandstorm	A strong wind that sweeps clouds of sand through the air and reduces visibility.
Strong Wind	Air in natural motion, with violent atmospheric disturbance of strong winds. This has the possibility of causing material damage that can also result in personnel injury. Lifting activities will normally be suspended if the wind speed exceeds 10m/s or as otherwise specified by manufacturers of lifting appliances.
Thunder Storm	A thunderstorm, also known as an electrical storm, a lightning storm, or simply a storm is a form of weather characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere known as thunder

3. RESPONSIBILITIES

3.1 Project Manager

Is wholly responsible to arrange all necessary resources, material, services and training which are required to protect the life of personnel and property in case of severe weather conditions.

3.2 HSE Manager

The HSE Manager has the following responsibilities;

- Ensure that severe weather conditions are monitored and recorded on a continuous basis
- Communicate severe weather conditions through different mediums to ensure that all site personnel are made fully aware of such situations
- Issue the order to suspend work/ activities as may be required due to severe weather conditions
- Ensure that tools and equipment as defined in this procedure are available and in place to adequately monitor, record, communicate and control severe weather conditions
- Carry out training and awareness programs on severe weather conditions to all site personnel
- Ensure compliance to severe weather management procedure such as rotation of workers, supply of drinking water, shade shelters, suspension of lifting activities and/ or scaffolding works due to high winds, suspension of driving during heavy fog etc.
- Monitor water Quality to ensure if meets the relevant standard.

3.3 Section Managers

The section managers have the following responsibilities;

- Ensure that instructions from HSE are strictly followed, i.e. suspension of work, rotation of workers etc.
- Instruct their field supervisors to suspend activities as may be required.
- Ensure that workers follow the heat index charts for rotation and consumption of water
- Ensure that adequate heat stress/ rest shelters are in place for workers.

3.4 HSE Supervisors

The HSE Supervisors will have the following responsibilities;

- Monitor site weather conditions including heat index, wind speeds, ambient conditions
- Ensure that heat index flags are changed as required
- Monitor compliance to severe weather management program

3.5 Security Supervisors

The Security Supervisors will have the following responsibilities;

- Send out SMS alerts on severe weather conditions
- Ensure that heat index flags are changed as required

4. HEAT STRESS MANAGEMENT

Due to the geographical location heat related illnesses is a very common risk and have to be strictly controlled on the project. There are two main ways in which the human body produces heat;

- Metabolic Heat: The body creates heat through the digestion of food, work and exercise
- Environmental Heat: The body absorbs heat from the surrounding environment, whether it is the hot sun, humidity or a hot room/ tank

The human body in turn has three main ways in which it cools down;

- Convection: The transfer of heat through the circulation of air
- Evaporation: The process which occurs when liquid changes into vapour
- Radiation: Heat is naturally emitted from the body's surface

As part of the severe weather management program a heat stress management program will be implemented. The main components of the system are as follows;

1) Supervision
2) Heat index monitoring
3) Acclimation
4) Training
5) Communication
6) Shade shelters
7) Hydration
8) Rotation

It is very important to note and understand that if the control measures are not strictly followed and work crews are found on site non-conforming to these requirements they will be sent to the camp to rest for the remainder of the day. The purpose of this is that if work crews are exposed to extreme heat and control measures are not taken, the changes are very good that they will already be dehydrated and immediately there is a high risk of heat related illness if they do remain on site.

Apart from the control measures mentioned below additional control measures may also be considered during the development of dedicated risk assessments for particular jobs. Workers who for example may need to work in the pontoons of floating roofs will be exposed too much greater temperatures than site personnel. In such cases ice jackets may be considered. These will however be managed on a case by case basis.

4.1 Supervision

The first and most important control measure in the heat stress management program is the provision of adequate, competent on-site supervision who fully grasps the severity and possible consequences of heat related illnesses. The supervision will act as the first line of defense to control heat illnesses.

The supervision's functions will include ensuring that they are fully aware of the signs and symptoms of heat related illnesses and what to do in case their workers start demonstrating any of these signs. It is also essential for the supervision to manage their workers and strictly follow the heat index cards, in reference to the flags that will be hoisted on site.

The supervisors will be required to attend the heat stress management training to ensure that they are fully aware of the program.

The supervisors will at all times ensure that their workers have adequate cool drinking water as well as sufficient shade to take rest breaks.

4.2 Heat Index Monitoring

The heat index monitoring will start before the summer season due to the hot arid climate of Abu Dhabi. The heat index will be monitored from March through to October, although the hottest months are during summer which is from June to September. Due to this, the U.A.E Ministry of Labour have released official communication stating that the general working midday break will take place from 12h30 to 15h00 for all workers with the exception of certain outdoor Utilities services for technical reasons. This will be effective from 15 June through to 15 September. Companies are to strictly follow this requirement by law, failing to do so shall result in fines of different increments depending on the number of transgressions.

The heat index will be monitored by using Kestrel weather meters. The Heat Index will be monitored on an hourly basis and communicated to site via the flag system, which is described in the Communication section below. The heat index is a combination of the relative humidity and the temperature to give a real feel temperature.

It is also important that confirmation and cross checking be done on site as there is a possibility that temperatures may vary in different locations. In case of tanks the radiation of the tank shell plates may also increase the heat index, and if variations are found temperatures in that area where the variations are detected will be monitored by the area HSE Superintendent.

The QA/QC department will also circulate weather prediction information and this should be closely monitored as proactive measures to anticipate and communicate in advance extremely hot days.

4.3 Acclimation

Acclimation is the natural process where a person's body becomes use to the ambient conditions. It is very important for supervisors and line management to be very aware that acclimation of new workers are essential when they arrive on site.

New workers should be given some time to adapt to the local conditions, especially persons who come from colder climates. New persons are also to be closely monitored by supervisors and reminded to consume the correct amounts of fluid during the hot months.

The acclimation period for new workers is a minimum of two weeks, and this period is an ideal time to partake in all the required training. As a rule, no full day hard labor may be done by new persons during their first two (2) weeks on site.

4.4 Training

As stated above all supervisors will be required to undergo the heat stress program training. The training will cover all the aspects of heat stress management but will also encompass other aspects of severe weather such as high winds, fog and sandstorms which are prevalent on site.

Apart from the supervisors training during the start of the hot season a dedicated awareness campaign will be run for all site personnel which will include tools such as heat stress tunnels with charts, pamphlets and displays, tool box talks, issuance of heat index cards etc.

4.5 Communication

Communication is one of the key elements in the program. The first step in communication is the training and awareness that will be carried out as described in section 4.4 above. The second step in communication is the hoisting of heat stress flags on site to communicate the heat index to all site personnel.

Flag poles will be erected in all areas on site and colored flags will be raised, representing the different Heat Index that is recorded during the monitoring. The heat index card design can be found in the attachments. The Heat Index Table is made up of 5 colors; Green, Yellow, Orange, Red and Black. Each color represents a Heat Index bracket, along with the Heat Illness Risk, Resting Time and Water Requirement i.e. Green has a Heat Index of between 30 – 37, Heat Illness Risk is; Fatigue possible with prolonged exposure and physical activity, Resting Time; No Requirement, and Water Need; 1 glass*/20 minutes . Flags will also be raised at access points to the site. The safety officers and security officers will be tasked to change the flags and this will be communicated through the centralized SMS system that will be established on site.

Apart from this, posters and signs will also be posted on site explaining the heat stress program, urine color charts, heat index charts and control measures.

It is also important to consider different languages spoken on site, and ensure communication is done in languages that the workers can understand. This will be evaluated and should be considered based on actual site conditions and demographics of site personnel.

4.6 Shade shelters

Adequate shade shelters will have to be provided for workers on site, to take rest breaks out of the direct sunlight. Due to the nature of the work there will not be that much shade and work crews will have to be provided with shade shelters wherever they work on site. This will be strictly monitored by the safety personnel on site.

4.7 Hydration

Site personnel will have to be provided with adequate cool drinking water. Safety personnel will monitor this constantly and severe disciplinary action will be taken against supervisors who allow work crews to work without cool drinking water.

Glucose will also be distributed on site to replace electrolytes and salts that are lost during perspiration. It is however very important to note that rehydration salts or powders may only be given to workers by medical personnel who are familiar with treatment for heat illness.

4.8 Rotation

As described in the heat index cards workers need to be rotated so that adequate rest breaks may be taken and so prevent heat related illness. Apart from rotation consideration should also be made to initiate night shift during summer months and to implement extended lunch breaks.

4.9 Heat Related Illness

The medical team from the first aid clinic will be on full time standby during the hot months period and respond to any emergency situation on site. Adequate medication will be made available to treat casualties. The following types of heat related illness may be experienced on site;

Heat Rash (Prickly Heat): Heat related illness which causes a skin rash and sometimes severe pain.

Heat Cramps: Painful muscle spasm due to the loss of salts and electrolytes from heavy sweating.

Heat Exhaustion/stress: This is a heat related illness which is caused due to prolonged exposure to extreme heat. The casualty will be sweating, experience severe weakness and may even collapse.

Heat Stroke: The most severe heat related illness resulting from prolonged exposure to adverse weather and may result in death. The casualty will have a hot and dry skin, rapid pulse, low blood pressure and may experience breathing difficulties.

5. SEVERE WEATHER CONDITIONS

Apart from extreme heat the location also posses other severe weather conditions which will have to be monitored and controlled. The other severe weather conditions which will have to be considered are fog, high winds and sand storms.

The severe weather conditions will firstly be monitored through the weekly weather reports that are circulated by the QA/QC department. Severe weather such as high wind speeds will be monitored using the Kestrel Weather devices as well as anemometers installed on some cranes and finally through simple observation of site conditions, i.e. fog in the mornings or sandstorms.

5.1 Fog

Fog is a cloud that is in contact with the ground. A cloud may be considered partly fog; for example, the part of a cloud that is suspended in the air above the ground is not considered fog, whereas the part of the cloud that comes in contact with higher ground is considered fog.

Fog normally occurs in Abu Dhabi during the cooler months of November to March. During this period the weather predictions will have to be monitored closely and the Security on night shift will send out alerts if fog occurs, before personnel start driving to site.

It is company policy that during dense fog no vehicles or equipment may drive around. If vehicles or equipment drive into fog they are to pull over to the side of the road and switch on their hazard lights. It is not permitted to switch on hazard lights whilst still driving on the road. Vehicles shall be fitted with fog lights for in case light fog occurs during early morning hours.

Due to the lack of visibility permits on site will also be held back during dense fog and no equipment or vehicles will be allowed to move on site until the fog clears.

5.2 High Winds

During the hot months, June to September, high winds also occur in Abu Dhabi. Wind speeds will be monitored by with the Kestrel weather monitors and all lifting activities will be suspended if winds exceed 10m/s.

The wind speed for lifting activities should however be monitored on a case by case basis as structures on site may reduce wind speeds in specific areas.

Scaffolding erection, insulation and lagging as well as blasting and painting works will be suspended if wind speeds exceed 12 m/s.

5.3 Sand Storms

As stated above during June to September high winds are experienced in Abu Dhabi. During this time there is an increased possibility of sandstorms. In case of dense sand storms where the visibility is significantly reduced the exact same rules will apply as in case of dense fog.

6. ATTACHMENTS

6.1 Heat Index Charts & Flag Colour Coding

GENERAL GUIDELINESS FOR PREVENTION OF HEAT ILLNESS					
DANGER CATEGORY	HEAT INDEX	HEAT ILLNESS RISK	RESTING TIME	WATER NEED	
STOP WORK	65 & up	Heat Stroke highly likely with minimal physical activity	STOP WORK	1 glass*/ 10 minutes	BLACK
Extreme Danger	54-64	Heat stroke highly likely with prolonged exposure	15 minutes per hour	1 glass*/10 minutes	RED
Danger	46-53	Heat Stroke highly likely. Heat stroke possible with prolonged exposure and physical activity	15 minutes per hour	1 glass*/10 minutes	ORANGE
Extreme caution	38-45	Heat cramps and heat exhaustion possible with prolonged exposure and physical activity	7 minutes per hour	1 glass*/15 minutes	YELLOW
Caution	30-37	Fatigue possible with prolonged exposure and physical activity	No requirement	1 glass*/20 minutes	GREEN

6.2 Urine Charts

ORANGE	**Danger Zone**	Extremely Dehydrated Drink water immediately
DARK YELLOW		
YELLOW		Mildly dehydrated Drink more water
LIGHT YELLOW		
WHITE	**Safe Zone**	Not Dehydrated