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HAZARDOUS CHEMICALS & SUBSTANCES PROCEDURE

AGREEMENT NO. : 09-5578-E-4

PROJECT NAME : Ruwais Refinery Expansion Project
EPC-4: Tankage & Associated
Interconnecting Piping

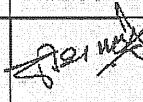
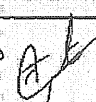


COMPANY : Abu Dhabi Oil Refining Company (TAKREER)

PMC : Mott MacDonald Ltd.

CONTRACTOR : Daewoo Engineering & Construction Co., Ltd.

	RUWAIS REFINERY EXPANSION PROJECT		
TAKREER	EPC-4 TANKAGE AND ASSOCIATED INTERCONNECTING PIPING		DAEWOO E&C
	AGREEMENT No. 09-5578-E-4		
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NOTES:

- (a) Revisions are denoted by a vertical line placed in the right-hand margin against the revised text.
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- (c) In case of conflict between any requirements stipulated in this document with the contractual requirements, the contractual requirements shall prevail.

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1. INTRODUCTION

The control of substances hazardous to health is recognized as a critical element of the safety program and shall be achieved through a combination of hazard communication, establishment of HSE systems of work and controlled handling and disposal of such substances.

All activities within the Site will be carefully and systematically evaluated for potential health hazards to provide comfortable working circumstance and the preservation of good Health and Hygiene Practices.

Methods such as systematic inspections, interviews and questionnaires, and follow up by technical sampling of the employees on location will assist in identifying and assessing hazards.

All chemicals and substances, whether of a high or low risk, are to be covered by the requirements of this procedure. The requirements of Material Safety Data Sheets (MSDS) will be used as a common reference point in the implementation of this procedure.

1.1 Purpose

The purpose of this procedure is to ensure the safe transportation, storage, handling, use and disposal of all hazardous chemicals and substances that will be used in all DEC project sites. This procedure and guidance are aimed at the protection of personnel and the environment from the effects of hazardous substances

1.2 Scope

This procedure covers all chemicals and hazardous substances to be used at the Work Site, except for radioactivity substances which is covered in a separate project procedure Radiation Control Procedure (5578-E4-HSE-HU-00045).

2. RESPONSIBILITIES

2.1 Project Manager

The Project Manager is responsible for ensuring that the requirements of this procedure are adhered strictly to during execution of the project.

2.2 Construction Manager

The Construction Manager is responsible for ensuring that;

- Monitoring and checking of the compliance of this procedure
- The environment is protected from spills and releases that could arise during the construction activities.
- Manpower, equipment and funds are available to effectively contain and clean up chemical spills in case they occur during the construction activities.

2.3 HSE Manager

The HSE Manager is responsible for ensuring that, when working with hazardous materials, chemicals, and agents or where there is the potential for spills or releases.

- Proper training is conducted

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- Toolbox meeting is conducted.
- JSA system is applied.
- Hazardous spills or releases prevention and containment measures are in place.
- All identified necessary work and precautions are properly executed.

2.4 HSE Supervisor

The HSE Supervisor is responsible for

- Identifying the construction activities that could lead to spills or releases.
- Ensuring that JSA related to activities which may result in spills or releases are properly conducted.
- Ensuring that Material Safety Data Sheets (MSDS) are available.
- Ensuring that records, including inventories, of hazardous substances are properly maintained. The Material Controller is responsible for maintaining the inventory.
- Maintaining records concerning any spill or release to the environment.

2.5 Supervisors

The Supervisors are responsible for ensuring that all oil and chemicals are stored in designated and secure areas with secondary containment and that adequate fire-fighting and first-aid facilities are available.

3. HAZARDOUS CHEMICALS

Throughout the Construction and Commission phase of the project various chemicals of both high and low risk will be utilized. Those of high risk include, but may not be limited to the following:

- Hydrochloric acid
- Nitrogen gas
- Molecular sieve
- Isocyanides
- Painting and insulation products (Highly flammable)
- Fuels (petrol, oil, diesel)
- Combustible gases (welding, cutting)

Low risk chemicals include but may not be limited to the following:

- Citric acid
- Curing compounds (civil works)
- Soda ash

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A Material Safety Data Sheet (MSDS) which is kept at the worksite in the DEC medical facility shall cover all such chemicals that will be used on the project. There are at present three volumes of generic material safety data sheets applicable to all known chemicals.

DEC HSE Department will keep copies of these MSDS at site.

Hazardous chemicals are only to be allowed on site with the approval of the DEC HSE manager.

3.1 Storage

Subcontractor will store all chemicals in an area dedicated by DEC, which will satisfy the storage requirements of the respective Material Safety Data Sheet. The amount of chemicals permitted to be located at the work site will be strictly controlled by DEC.

Storage Map

- All chemical storage location shall clearly be marked on map and submit to Client Environment manager.
- Client Environment manager and DEC HSE manager shall consider the map for planning of Oil Spill Response Drill.

Precautions for Storage

Acids

- Store large bottles of acids on low shelves or in acid cabinets.
- Segregate oxidizing from organic acids, flammable and combustible materials.
- Segregate acids from bases and active metals i.e. sodium, potassium, magnesium
- Use bottle carriers for transporting acid bottles.
- Have spill control pillows or acid neutralizers available in the event of a spill.

Bases

- Segregate bases from acids.
- Store solutions of inorganic hydroxides in polyethylene containers.
- Have spill control pillows or caustic neutralizers available for caustic spills.

Flammables

- Store in approved safety cans or cabinets.
- Segregate from oxidizing acids and oxidizers.
- Keep away from sources of ignition.
- Keep fire extinguishing and spill control equipment readily available.
- Store highly volatile flammable liquids in a specially equipped refrigerator.

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Oxidizers

- Store in a cool, dry area
- Store away from flammable and combustible materials, such as paper, wood, etc.

Peroxide Forming Chemicals

- Store in airtight containers in a dark, cool, dry area.
- Label containers with receiving, opening, and disposal dates.
- Dispose of peroxide forming chemicals prior to the expiration date or before peroxides form

Compressed Gases

- Store in a secure and upright position.
- When not in use, secure cylinder cap.
- Use a cylinder cart; remove manifolds, secure cap, and chain to cart for transport.

3.2 Transportation and Handling

Transportation of hazardous substances at the worksite will be carried out in strict compliance with the transportation requirements of the Respective Material Safety Data Sheet. In certain circumstances an escort for the transportation of some chemicals may be necessary.

In all cases the chemical being transported will be clearly identified by signs attached to the transport vehicle.

3.3 Usage

Prior to any employee, supervisor or manager being exposed to any chemical they shall be briefed on all safety requirements pertaining to that particular chemical or hazardous substance. Each supervisor who is in control of work associated with hazardous chemicals or substances will be issued with (following the safety briefing) a copy of the Product Material Safety Data Sheet for future reference.

3.4 Material Safety Data Sheet (MSDS)

All hazardous substances to be used during the Construction and Commissioning phases of the Project shall be covered by a Material Safety Data Sheet.

Subcontractors, Vendors and others bringing to and using hazardous chemicals on site shall submit the relevant MSDS to DEC HSE manager 10 days prior to arrival of the hazardous chemical at site.

On receipt of this documentation the person or persons who will be using this product will be briefed on the requirements outlined in the MSDS.

Additionally, the group will scrutinize the use of any newly introduced hazardous substance using the Job Safety Analysis technique, which are to use the product. The DEC HSE manager or his representative shall facilitate the Job Safety Analysis. From this analysis it may become necessary to produce a specific safe work method.

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3.5 Personal Protective Equipment (PPE)

Employees shall be equipped with, and shall wear the following PPE as required whilst using hazardous substances:

- Hard hat
- Safety spectacles
- Safety mono goggles
- Full face shield
- Respiratory protection and breathing apparatus
- Chemical suits
- Rubber boots and gloves
- Hearing protection.

Such PPE will be made available to and its use enforced for all employees employed to carry out work with hazardous substances. Such PPE will be issued in strict compliance to the recommendations contained in the MSDS's.

Should the issue of specialized PPE be necessary, DEC shall ensure all personnel required to use such equipment are adequately trained and are proficient in the use of such equipment.

3.6 Disposal






The disposal of any residual hazardous substance and/or its container shall be carried out in accordance with relevant country Statutory Regulations, DEC, Client and MSDS requirements. Consultation with the environmental group will also be undertaken to ensure all safety and projects environmental aspects of disposal are discussed and agreed upon

3.7 Hazardous Warning Symbols

The following diagrams depict hazardous warning symbols that should appear on packaging and containers to warn of the hazards associated with their contents.

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Symbols are in black on an orange yellow background;

Meanings	Diagram	Safety Precautions and Medical Action.
<p>Toxic/Very Toxic</p> <p>May cause serious health risk or even death if inhaled, ingested or Penetrates the skin.</p>		<p>Wear suitable protective clothing, gloves and eye, face protection.</p> <p>After contact with skin, wash immediately with plenty of water.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p> <p>In case of accident or if you feel unwell, seek medical advice immediately.</p>
<p>Corrosive</p> <p>On contact may cause destruction of living tissue or burns.</p>		<p>Wear Suitable gloves and eye face protection.</p> <p>Take off immediately all contaminated clothing.</p> <p>In case of contact with skin, wash immediately with plenty of water.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p>
<p>Harmful</p> <p>May cause limited health risk if inhaled, ingested or Penetrates the skin.</p>		<p>Do not breathe vapor/spray/dust.</p> <p>Avoid contact with skin.</p> <p>Wash thoroughly before you eat, drink or smoke.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p>
<p>Irritant</p> <p>May cause inflammation or irritation on immediate, repeated or prolonged contact with the skin, or if inhaled.</p>		<p>Do not breathe vapor//spray/dust.</p> <p>Avoid contact with skin.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p> <p>In case of contact with skin, rinse immediately with plenty of water.</p>
<p>Highly flammable</p> <p>May become hot or catch fire in contact with air or is gaseous and will ignite at any ignition source.</p>		<p>Protect from source of ignition.</p> <p>Have fire precautions at hand.</p>

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4. CHEMICAL HAZARDS

4.1 Health Hazards

Hazards to health arise from inhaling, swallowing, or skin contact. The severity of the hazard ranges from nuisance chemicals that produce no injury, to chemicals that on short exposure can cause severe injury or death. For industrial workers, the most prominent means of entry of a hazardous chemical into the human body is through the respiratory tract by inhalation. The next most important means of entry is through skin absorption. The least hazardous pathway is through swallowing the chemical, as this seldom occurs in industry. (Reference: Chemical Hazard Bulletins.)

4.1.2 Inhalation Pathway Hazard

Chemicals may be in the form of gases, vapors, dusts, or a mixture of these. The **senses of sight or smell cannot be depended upon to warn** of chemical hazards. Some *gases are* harmful in concentrations which cannot be detected by their odor. Furthermore, some can paralyze the sense of smell. Hydrogen sulfide, at low concentrations, can very quickly paralyze the olfactory nerves so that harmful concentrations cannot be detected through smell. Ordinary automotive gasoline, to some extent, does the same thing.

When handling a volatile liquid, the maximum allowable concentration (MAC) of the vapor should be known and not exceeded. Where exhaust ventilation is not available, good mechanical ventilation must be provided or the work must be done outdoors.

In the case of a chemical spill, it may not be possible to control the maximum allowable concentration. Therefore it is necessary to keep the worker from breathing the vapor by limiting the amount of vapor through careful handling or through the use of local exhaust ventilation. If the concentration of the chemical in the air exceeds the threshold limit value (TLV) or MAC, then respiratory protective devices are needed. It is important that the right kind of device for the particular hazard be obtained. (See Breathing Apparatus, Section I.10 of this Manual.)

Dust is a common hazard. Whenever dusty material is handled, a respiratory hazard may exist. Exhaust ventilation, fans, blowers, and proper handling procedures must be used to keep the dust from entering the worker's breathing zone. If these methods fail, dust masks must be provided and their use enforced.

Fine droplets of liquid form whenever liquids are sprayed or splashed so suitable precautions must be taken to prevent the fine droplets of liquid from entering the worker's breathing zone. Ventilation is also recommended. If such methods are not adequate, suitable respiratory protection must be provided.

4.1.3 Skin Hazards

Skin contact/exposure hazard may not be as dangerous to life as respiratory hazards, but they are far more common. Dermatitis resulting from contact with harmful chemicals is a common work injury. Proper handling methods are the first step in protection. The second step, in the *case* of materials which *act* rapidly on the human body, such as corrosive chemicals (i.e. acids and caustics) is to provide a physical barrier in the form of goggles, face shields, hoods, gloves, aprons, suits, etc. The third step is to provide eyewash fountains and safety showers, which flush the material from the eyes or skin.

The type of personal protective equipment required depends on the hazardous characteristics of the chemical and the way it is used. Personal cleanliness is important. Thorough washing of the hands and

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face before meals, daily bathing, and a regular change of clothing will reduce harmful contact with chemicals.

4.1.4 Hazards of Swallowing Chemicals

In industry, swallowing chemicals does not occur frequently. The main precaution is to ensure that employees know that the material is hazardous if swallowed, and that they must wash their hands free of harmful chemicals before smoking, drinking or eating. Never store harmful chemicals in food containers or handle chemicals near food.

4.2 Emergency Treatment

4.2.1 Artificial Respiration

Persons overcome by harmful gases and vapors must be taken out into the fresh air and, if they have stopped breathing, given artificial respiration; if there is no heartbeat, commence cardiopulmonary resuscitation (CPR). Call emergency assistance immediately by calling emergency.

4.2.2 First Aid

In case of accidental swallowing of chemicals, it is not wise to induce the patient to vomit. The hospital must be informed of the chemical injury or chemical swallowed and the person should be moved to the hospital immediately for medical treatment. In the case of caustics or corrosives, drinking a large amount of water, followed by medical treatment, is recommended. (As per site emergency contact numbers for poison information)

4.2.3 Showers and Eyewash Fountains

For skin hazards, the best treatment is thorough water washing under the emergency shower or eyewash fountain. Field treatment should only consist of flushing away the chemical. The patient should then be taken to the hospital for treatment.

These water flushing devices are required, because working procedures and personal protective equipment may fail. In the case of materials that are immediately harmful to the eyes or skin, safety showers or eyewash fountains should be provided. They should be within 6 meters of the exposure site and accessible in an unobstructed straight line from the work location. Emergency showers shall be properly identified with signs and color background. A person who is blinded by a chemical must immediately be taken to the shower or eyewash fountain. Some emergency showers or eyewash fountains are designed so that standing under or near them activates the water supply. Others have hinged gates which are pushed to activate the shower, but all should be easily activated.

If the water piping to the shower or fountain is exposed to the sun, the water will become so hot during summer that it could scald the user. The piping must be buried, insulated or shaded from the sun or the line must be only a very short branch from a main water line that is used frequently enough to keep the water from overheating in the sun. Emergency showers and eyewash fountains should be checked daily.

There are two important points that workers must be taught about the correct use of emergency fountains and shower:

1 Before removing goggles, face shields, or other personal protective equipment, the user must get under the shower or *use* the eyewash fountain to wash off as much of the chemical as possible.

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It is a mistake to start for the hospital without first doing everything possible to flush out the harmful chemical. The eyes or skin must be washed for quite a long time to remove the chemical. It is necessary to wash the eyes holding the eyelids open with the fingers for at least fifteen minutes to free the eyes of bases or caustics. This will be painful, but it is absolutely necessary. In the case of acids, water will remove the acid quickly, but it is necessary to hold the eyelids open with the fingers, painful as this may be, and roll the eyes around under the shower or in the eye fountain to make sure that all acid is removed. At least fifteen minutes of thorough washing are required in the case of acid contact to skin or eyes.

Caustic alkalis such as sodium hydroxide and potassium hydroxide are much more difficult to wash from the skin or eyes. Strong alkalis of this type mixed with water feel slippery to the touch. The skin should be washed until the slippery feeling has gone and washing should be continued for at least 15 minutes.

4.3 Fire Hazards

Hazardous materials must not be allowed to accumulate, and any extra amounts should be cleared from the work area. Spill liquids or trash should be cleared away immediately. All flammable materials should be stored according to the specifications of their Chemical Hazard Bulletins, (CHBs) or Material Safety Data Sheets (MSDS).

Smoking and the use of sparking devices near flammable liquids or finely divided combustible solids must be prohibited.

Blocking off air to a burning object is often possible in acid dip tanks or rubbish containers where a cover can be provided and dropped down on the container to smother the flames.

Ordinary sand is a good extinguishing agent for smothering small fires. The fire hazards of most common materials can be found in the references given in this section. The proper fire extinguisher should be at the job site and readily available at all locations where a fire hazard is possible.

4.4 Reactivity Hazards

The manual of Hazardous Chemical Reactions, NFPA 491M, lists many of the chemicals which are likely to have dangerous reactions with other chemicals. As a general precaution, rough handling and shock should be avoided. Chemicals should not be allowed to mix with other chemicals unless it is known that no harmful reaction will occur.