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**RUWAIS REFINERY
EXPANSION PROJECT**

**EPC-4 TANKAGE AND ASSOCIATED
INTERCONNECTING PIPING**

AGREEMENT No. 09-5578-E-4

DAEWOO E&C

PROJECT No. 5578

Doc. No. 5578-E4-HSE-HU-00043

Rev. 0

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MANUAL LIFTING & HANDLING PROCEDURE

AGREEMENT NO. : 09-5578-E-4

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


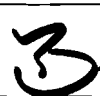
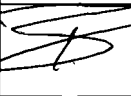

COMPANY : Abu Dhabi Oil Refining Company (TAKREER)

PMC : Mott MacDonald Ltd.

CONTRACTOR : Daewoo Engineering & Construction Co., Ltd.

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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.

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1. INTRODUCTION

1.1 Purpose

This procedure has been compiled in order to make all personnel aware of the hazards and precautions to be taken when handling various types of materials to avoid any injury related to any task which required the manual handling.

1.2 Scope

This procedure will cover all manual lifting and handling operations during the execution of Ruwais Refinery Expansion project.

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 Section Manager

The Section Manager is responsible in ensuring that all site personnel under his responsibilities are complying in this procedure

2.3 HSE Manager

The HSE Manager shall ensure that the correct implementation of the safety precautions enclosed within the procedure.

Shall ensure that necessary training will be conducted for the personnel involved in manual handling (e.g. Toolbox Meeting, Manual handling training)

Shall ensure that JSA is applied

2.4 HSE Supervisor

The HSE Supervisor is responsible for monitoring the safe practices related to manual handling to be applied, educate the personnel about the correct method of manual handling.

2.5 Supervisors

The Supervisors are responsible for all jobs executed under their control involving the manual handling to be carried out as per this procedure to avoid any kind of injury. He will ensure that all of his crews attend the HSE training before carry out this activity.

3. TRAINING OF PERSONNEL

Personnel allocated to tasks involving manual lifting and handling of material shall be given instruction in the safe method of manual lifting and handling. Training will also include instruction in the handling of specific products that are accompanied by a material safety data sheet. Personnel will not be permitted to handle any hazardous products without first being briefed on the safe handling procedures and instructed in the use of appropriate personal protective equipment.

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4. PROCEDURE

4.1 General Requirements

The following requirements are to be applied to all material handling activities:

- Personnel shall be aware of the proper methods of lifting and moving heavy or awkward load, either manually or with mechanical assistance.
- Suitable protective clothing to avoid pinching or cutting of hands, injury to head or feet, inhalation of dust, etc. shall be worn, as necessary.
- Storage shall be arranged to minimize the amount of handling.
- Storage shall be kept tidy and shall not obstruct roadways, walkways, and work areas escape routes from hazardous areas, fire protection equipment or other emergency devices and equipment.
- Where handling of materials is done in conjunction with cranes and lifting gear, reference shall be made to this procedure.

4.2 Principal Hazards

Typical accidents that may occur from handling materials include:

- Crush injuries from falling loads, collapsing stacks, etc.
- Mechanical damage to storage containers, leaking and spillage of chemicals with the risk of toxic contamination or fire.
- Cuts, falls, back injuries, pulled muscles, etc. from poor lifting methods or careless storage.

4.3 Manual Handling

Care should be taken when lifting or moving a load and the following guidelines should be followed:

- Visually check route prior to lifting and carrying
- If a trolley is available - use it.
- Seek assistance when lifting heavy loads.
- Be sure that the load is within your lifting capabilities and ensure that the Centre of Gravity (C of G) of the load is nearest to you
- Always lift using the leg and not with your back.
- Never twist your body when carrying a heavy load.

Body posture is very important when lifting. Correct positioning will reduce the risk of back and muscle injuries during lifting.

Stance: Face the direction of travel, stand over the weight. Feet slightly apart and one in front of the other. This position enables you to keep your balance.

Back: Keeping a reasonably straight back lets the powerful leg muscles do the work, and also protects the spinal column.

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Chin: Before lifting, raise the head slightly and tuck the chin in. This helps to keep the back in an upright posture.

Grip: Take a proper hold. Grip with the palms of the hand and the roots of the fingers. Never lift using only the finger tips.

Arms: Keep arms as close to the body as possible. The body itself then takes some of the weight instead of just the arms and hands.

Feet: The feet should be apart the width of the hips and the leading foot should always point in the direction you intend to move off in.

Body: Use your body as a counterweight to save energy and muscular effort.

4.4 Handling Precautions

Drums

Drums contain various liquids and powders and are often of a size which makes them awkward to handle. The following precautions shall be observed:

- Drums shall never be handled manually up or down stairways, elevated areas or into excavations.
- Mechanical handling aids (e.g. drum trolleys) shall be used, where appropriate.
- In open storage areas, drums shall be stored lying down to prevent water collecting in the top rim, but these must be secured against movement (e.g. chocks or racks).
- When located in areas other than in a designated storage area, drums shall be left in a position so as not to cause an obstruction.
- Where drums are located for dispensing their contents, drip trays shall be provided to prevent liquids causing a slipping hazard to personnel walking past, or a fire hazard from flammable liquids.

All empty drums shall be removed from working areas.

Pipe Storage

Pipes and casings are particularly heavy items, and even when moving slowly present a risk of serious crushing incidents because of the high amount of weight inertia involved. Handling and storage of such heavy items must be conducted in accordance with this procedure.

Pipes shall be stacked in horizontal layers, supported, if necessary, with suitable packing materials between them. The following precautions apply to pipe storage:

- Pipes shall slope towards the back of a storage area so that they cannot roll off the support rack.
- Pipes shall never protrude into roadways, walkways and escape routes, or be stacked so they can fall through guardrails in the event of displacement.
- Pipe storage areas shall never be overloaded.

Sheet Metal

Falling of metal sheets and plates can cause particularly severe crushing or guillotine injuries. The following precautions shall be taken:

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- Personnel handling sheet metal shall always wear suitable protective gloves (e.g. chrome leather with armored palms).
- Where possible, metal sheets shall be handled mechanically.
- Vertical stacking of small sheets can save valuable floor space and prevent obstructions, but precautions shall be taken to prevent them slipping or falling over (e.g. Kevlar Gloves).
- Where sheets are stored horizontally, larger sheets shall be placed at the bottom and spacing blocks should be placed between the sheets to ensure easier handling, battens shall be used where necessary.

Pallets

Incorrect use of pallets can lead to unsafe lifting operations or to collapse of material stacks. Precautions to be observed are:

- Pallets shall only be used for the purpose they were intended, bearing in mind their construction, and correctly loaded.
- Pallets shall not be used if damaged.
- Pallets shall be kept in designated areas, with precautions taken to prevent collapse or tilting.
- Pallet stacks shall not exceed 4 pallet loads.