ABU DHABI OIL REFINING COMPANY (TAKREER)

RUWAIS REFINERY EXPANSION (RRE) PROJECT

PROJECT NO. 5578 / AGREEMENT NO. 09-5578-E-4

EPC PACKAGE - 4 : TANKAGE AND ASSOCIATED INTERCONNECTING PIPING

DOCUMENT / DRAWING COMMENTS SHEET

COMMENTS TO BE RETURNED TO:
COMPANY/PMC

FAX NO.:

BY DATE:

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Contractor Transmittal No.	**T-DH-5578-E4-1587**	**Recd. Date**	**29 Oct 2010**
Document No.	**5578-E4-HSE-HU-00021**	**Rev. Date**	**27 Oct 2010**
Document Title	**Water Quality Control Procedure**	**Rev**	**0**

COMMENTS:

By: **Signed** **Date**

Review Code:

1. REJECTED : REVISE AND SUBMIT ☐
2. COMMENTS AS NOTED : WORK MAY PROCEED SUBJECT TO COMPLIANCE WITH AND INCORPORATION OF COMMENTS ☐
3. NO COMMENTS : WORK MAY PROCEED ☐
4. INFORMATION ONLY. : ACCEPTED FOR INFORMATION ONLY ☐

No. of Pages attached to this form :

WATER QUALITY CONTROL 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 All previous issues are hereby superseded and are to be destroyed.

DOC. CLASS: T/1

DIST. CODE: 18/19

REV	DATE	REASON FOR ISSUE	PREP	CHKD	REVD	APP'D	COMPANY
0	27 Oct 2010	Issued For Construction	D. Bhandari	A. Mesquita	DY Kim	M Heo	
A	16 August 10	For Review and Approval	C Wardman	DY Kim	J Brand	M Heo	
SIGNED (Initials)							

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

CONTENTS

1. INTRODUCTION

1.1 Purpose

The purpose of this procedure is to define the responsibility and obligations of CONTRACTOR and its Subcontractors regarding the minimum requirements for the quality of water that will be utilized in the camp and site for drinking and sanitary purposes on the Ruwais Refinery Expansion Project.

1.2 Scope

This procedure is applicable to all CONTRACTOR and Subcontractor personnel on the Ruwais Refinery Project, both in the Camp and on Site.

1.3 Objectives

The objective of this procedure is to establish a clear procedure regarding water quality control on the Ruwais Refinery Expansion Project and to ensure that all persons are familiar with their respective roles and responsibilities.

2. DEFINITIONS

Water Quality Control - is the procedure for minimum requirements for the quality of water use on projects in their camp area, as well as site.

The location, specification, construction, testing, inspection, operation and maintenance of the water well, water treatment facilities, and water distribution network are not part of this control.

Company	Abu Dhabi Oil Refining Company (TAKREER)
Contractor	Daewoo Engineering and Construction Company Ltd.
PMC	Mott Macdonald

3. RESPONSIBILITIES

3.1 Project Manager

Has the overall responsibility to arrange the potable drinking water which meets the standards and required associated tests need to be carried out which are mentioned herein this procedure to maintain a healthy work environment. He shall provide all necessary support including assigning suitable staff and arrangement of water resources.

3.2 Environmental Engineer

Environmental Engineer shall ensure that the water samples are collected and tested as specified in Section 4 in order to determine whether the physio-chemical and bacteriological parameters of the treated water are in compliance with COMPANY standards.

The report of the analysis shall be filed by the Environmental Engineer and made available for the purpose of inspection or audit by Company or Government Regulatory bodies.

4. PROCEDURE

4.1 Water Quality Specification

(1) Organoleptic (visual) parameters

NO	Parameters	Maximum Acceptable Concentration
1	Odor	Un-objectable
2	Taste	Un-objectable
3	Turbidity	5(1)NTU
4	Color	15
5	Total Dissolved Solids(TDS)	500mg/I

(2) General parameters

NO	Parameters	Maximum Acceptable Concentration/Value
1	PH(units)	6.5 – 8.0
2	Total hardness ,mole/l	200 mg/l
3	Residual Chlorine	0.2 – 1.0 mg/l

(3) Inorganic and Organic compounds

NO	Parameters	Maximum Acceptable Concentration
1	Aluminum	0.2 mg/l
2	Ammonia Nitrogen	1.5 mg/l
3	Arsenic	0.01(P) mg/l

4	Barium	0.7 mg/l
5	Benzene	0.01 mg/l
6	Boron	0.5(P) mg/l
7	Cadmium	0.003 mg/l
8	Chlorides	250.0 mg/l
9	Chromium total	0.05(P) mg/l
10	Chloro-benzine	0.02 mg/l
11	Copper	2..0(P) mg/l
12	Dichloro dlphenyl trichloroethane(DDT)	0.002 mg/l
13	Ethylen benzine	0.03 mg/l
14	Fluorides	1.5 mg/l
15	Hexachlorocyclohexane(Lindane)	0.002 mg/l
16	Hydrocarbon	0.1 mg/l
NO	Parameters	Maximum Acceptable Concentration
17	Iron total	0.3 mg/l
18	Lead	0.01 mg/l
19	Magnesium	50.1 mg-eqv/l
20	Manganese	0.5(P) mg/l
21	Mercury	0.001 mg/l
22	Nickel	0.02(P) mg/l
23	Nitrate	50.0 mg/l
24	Nitrite	3.0 mg/l
25	Phenols	0.2 mg/l
26	Potassium	200.0 mg/l
27	Sodium	200.0 mg/l
28	Styrene	0.02 mg/l

29	Sulphates	250.0 mg/l
30	Toluene	0.7 mg/l
31	Xilene	0.05 mg/l
32	Zinc	3.0 mg/l
33	2.4 D(Methoxone)	0.003 mg/l

(4) Radiological parameters

NO	Parameters	Maximum Acceptable Concentration
1	Gross alpha activity	0.1 Bq/l
2	Gross alpha activity	1.0 Bq/l

(5) Bacteriological Quality

Organisms	Guidelines
All Water intended for drinking E.coli or thermotolearnt coliform bacteria(b)	 Must not be detectable in any 100-ml sample
Treated water entering the distribution system E.coli or thermotolearnt coliform bacteria(b) Total coliform bacteria	 Must not be detectable in any 100-ml sample Must not be detectable in any 100-ml sample
Treated water in the distribution system E.coli or thermotolearnt coliform bacteria(b) Total coliform bacteria	 Must not be detectable in any 100-ml sample Must not be detectable in any 100-ml sample

Immediate investigative action must be taken if E.coli or total coliform bacteria are detected.

The minimum action in the case of total coliform bacteria is repeat sampling. If the bacteria are detected in the repeat sample, the case must be determined by immediate further investigation.

Although E.coli is the more precise indicator of fecal pollution, the court of thermo tolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests must be carried out. A coliform bacterium is not an acceptable indicator of the sanitary quality of rural water supplies, particularly in tropical areas where various bacteria of no sanitary significance occur in almost all untreated supplies.

The classification of drinking water according to bacteriological test is

Class	Grade	Presumptive (per 100ml)	E.coli (per 100ml)
	Excellent	0	0

	Satisfactory	1-3	0
	Suspicious	4-10	0
	Unsatisfactory	>10	0.1 or more

4.2 Sampling and Frequency of Examinations

Where	Frequency	Tested for	Tested at
Well head	Completion of the well	- Organoleptic(visual) parameters - General parameters - In-organic and Organic compounds - Radiological parameters - Bacteriological Quality*	Approved Laboratory
Raw Water Storage Tank	Every six months**	- Organoleptic(visual) parameters - General parameters - In-organic and Organic compounds* - Bacteriological Quality	Approved Laboratory
Treated Water Storage Tank	Daily	- Residual Chlorine - Total Dissolved Solids(TDS) - pH	Site (Test Kit)
	Monthly	- Bacteriological Quality - Color - Turbidity - TDS - Residual Chlorine - Temperature - pH - Nitrates - Nitrites - Iron - Manganese	Site (Test Kit) Approved Laboratory
Distribution Network***	Daily	- Residual Chlorine - Color	Site (Test Kit)

(Four location e.g., kitchen, and toilets, and washrooms		- pH	
	Monthly	- Bacteriological Quality - Color - Turbidity - TDS - Residual Chlorine - Temperature - pH - Nitrates - Nitrites - Iron - Manganese	Site (Test Kit) Approved Laboratory
Treated Water Storage Tank and Distribution Network	After maintenance or repairs requiring the opening of the system (i.e., storage tanks, treatment package and distribution network)	- Bacteriological Quality - Color - Turbidity - TDS - Residual Chlorine - Temperature - pH - Nitrates - Nitrites - Iron - Manganese	Approved Laboratory

Note:

- Following the initial water analysis (well head), testing parameters will be reviewed.
- Testing frequency will be reviewed after six months to determine whether the frequency needs to be increased or should be reduced.
- Locations to be the furthest possible form each other in order to cover the entire network and to be regularly changed.

4.3 Containers and Volumes

When taking water sample for analysis, care must be taken in the following:

- Bacteriological

The bottle, jar or flask for taking bacteriological samples must be capable or sterilization, preferably of glass, with a wide mouth, a securely closing cap or stopper and capacity of no less than 120 milliliters.

- Physical

  The sample containers used in this group of analysis can be plastic (polyethylene or polypropylene) or glass, of half – liter capacity, carefully washed with detergent and rinsed with abundant water.

- Chemical

  The sample containers used in this analysis group can be plastic (polyethylene or polypropylene) or glass, of one – liter capacity. The washing procedure is similar to the previous one, except that the cleaning with hydrochloric acid must be even more thorough.

4.4 Quality Assurance

- Due emphasis shall be given on proper collection and prompt transportation of the specimen.
- Refrigerate the water specimen for a maximum of 48 hours if not immediately processed.
- Ensure the reliability of media and instruments.
- Interpret the results properly.