

KINGDOM OF SAUDI ARABIA
ROYAL COMMISSION FOR JUBAIL AND YANBU



ROYAL COMMISSION ENVIRONMENTAL REGULATIONS

2015

Volume II

ENVIRONMENTAL PERMIT PROGRAM

Environmental Protection and Control Department

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LIST OF UNITS & ABBREVIATIONS

APHA	-	American Public Health Association
AWWA	-	American Water Works Association
COD	-	Chemical Oxygen Demand
BOD	-	Biochemical Oxygen Demand
BTU	-	British thermal unit
C	-	degrees Centigrade
d	-	day
dBA	-	A-weight sound pressure level in decibels
DRE	-	Destruction and Removal Efficiency
dscm	-	dry standard cubic meter
EIA	-	Environmental Impact Assessment
EPC	-	Environmental Permit to Construct
EPO	-	Environmental Permit to Operate
ESQ	-	Environmental Screening Questionnaire
EERP	-	Environmental Emergency Response Plan
h	-	hour
H _t	-	Net heating value of a gas combusted in a flare
J	-	joule (equivalent to 0.239 calories)
kg	-	kilogram
kJ	-	kilojoules (equivalent to 1000 joules)
kPa	-	kilo Pascals
l	-	liter
L ₁₀	-	noise level in decibels exceeded 10% of the time
lb	-	pound
lb/MBTU	-	pound per million British Thermal Units
min	-	minute
ml	-	milliliter
mm	-	millimeter
MPN	-	Most Probable Number
MW	-	Megawatt (equivalent to 10 ⁶ watts of electricity)
NMHC	-	Non- methane hydrocarbon
NMOC	-	Non-methane organic carbon
NTU	-	Nephelometric Turbidity Unit
Pa	-	Pascal, a unit of pressure expressed as Nm ⁻²
pH	-	-log ₁₀ (hydrogen ion concentration moles/l)
PAP	-	Permit Application Package
POHC	-	Principal Organic Hazardous Constituent
POM	-	Polycyclic Organic Matter
PME	-	Presidency of Meteorology & Environment.
ppm	-	parts per million (mass)
ppmv	-	parts per million volume
ppt	-	parts per thousands
psi	-	pounds per square inch (gauge)
psia	-	pounds per square inch (absolute)
s	-	second
SAR	-	Sodium Adsorption ratio unit
scm	-	standard cubic meter
t	-	tonne (equivalent to 1000 kilograms)
TDS	-	Total Dissolved Solids
TKN	-	Total Kjeldahl Nitrogen
TOC	-	Total Organic Carbon
TPH	-	Total Petroleum Hydrocarbons
TSS	-	Total Suspended Solids

UST	-	Underground Storage Tank
Watt	-	Unit of power (equivalent to one joule per second)
WEF	-	Water Environment Federation
WMF	-	Waste Management Facility
WRF	-	Waste Recycling Facility

GLOSSARY

Abatement	reduction or lessening (of pollution) or doing away with (a nuisance) by legislative or technical means, or both
Acid gas flare	a flare used exclusively for the incineration of hydrogen sulfide and other acidic gases derived from natural gas sweetening processes
Affected facility	any stationary source that is affected by a standard regulation
Ambient air	air outside a facility boundary
Appurtenance	an adjunct or appendage which is an integral part of a tank, unit or apparatus
BAT	Best Available Techniques (BAT) is the application at facilities of the most effective and advanced production processes, methods/ technologies or operational practices to prevent and, where that is not practicable, to reduce emissions or discharges and other impacts to the environment as a whole. BAT must as a minimum achieve emission or discharge standards in these Regulations taking into account energy, environmental and economic impacts and other costs to the facility.
BIF	boiler or Industrial Furnace that burns liquid or solid hazardous materials other than fossil fuels.
Central Treatment Facility	the city Industrial Wastewater Treatment Plant (IWTP) or the city Sanitary Wastewater Treatment Plant (SWTP)
Component (VOC service)	pumps, valves, compressors and pressure relief valves which are in contact with streams containing >10 wt% VOC
Component (organic HAP service)	flanges, connectors, pumps, valves, compressors and pressure relief valves which are in contact with streams containing >5 wt% organic HAP
Connector	flanged, screwed, welded, or other joined fittings used to connect two pipe lines or a pipe line and a piece of equipment.
Day	Day refers to Working Day
Dredged Material	material excavated from the marine waters, including rock, gravel, sand, silt/clay, and mud
Dredging	the process of removing sediments beneath the surface waters by mechanical or hydraulic means
Duct burner	a device that combusts fuel and that is placed in the exhaust duct from another source, such as a stationary gas turbine, internal combustion engine, kiln, etc., to allow the firing of additional fuel to heat the exhaust gases before the exhaust gases enter a heat recovery steam generating unit.
DRE	standard which verifies that a combustion unit is destroying the organic components found in hazardous waste.
Emission	the process of discharging into the atmosphere or the material being discharged
Emission inventory	the systematic compilation, either by measurement or estimation, of detailed information on pollutant emissions in a given area or facility
Emission standard	the amount of pollutant permitted to be discharged from a pollutant source

GLOSSARY (Continued)

Existing facility	any facility which has received environmental approval from the Royal Commission before the effective date of these Regulations or a facility that is contracted for prior to the effective date of these Regulations provided that RC is informed.
Facility	any apparatus, installation, equipment or grouping thereof which is subject to an applicable standard or regulation
Flare	the flame produced by the disposal, in an arrangement of piping and a burner, of surplus or residual combustible gases
Fossil fuel	coal, petroleum, natural gas and any form of solid, liquid or gaseous fuel derived from such materials for the purpose of creating useful heat
Fugitive emission	any gaseous or particulate contaminant entering the atmosphere which could not reasonably pass through a stack, chimney vent, or other functionally equivalent opening designed to direct or control its flow
Generator	any operator of a facility whose process produces hazardous waste as defined in these Regulations or whose act first causes the hazardous waste to become subject to regulation.
Guideline	guideline values are for information, reference and study purposes
Habitat	an area occupied by an organism, population, or community that includes living and nonliving elements with specific characteristics including the basic needs for shelter and food.
HAP	Hazardous air pollutant (as specified in Table 2C).
Inhalable particulate	any substance dispersed in the atmosphere in the form of individual solid or liquid particles each of which is less than 10 microns in diameter.
Industrial City	All Industrial Cities under RC jurisdiction
Leachate	any liquid, including any suspended components in the liquid, that has percolated through or drained from solid waste.
Major upset	an unscheduled occurrence or excursion of a process or operation that results in an emission that contravenes the regulations or standards and is beyond immediate control, or a release that is initiated to protect life in the immediate or adjacent areas.
Modification	any physical change to, or change in the method of, an existing facility which increases the unit capacity or contribution to pollution emitted into the atmosphere OR results in an impact to the environment not previously occurring.
Modified facility	any facility which is subject to modification as follows: a. production increases greater than 10% b. 10% increase in emissions or discharges from a facility c. new pollutants are emitted or discharged.
New facility	any new facility/ project or plant
NOx	oxides of nitrogen, representing nitric oxide and nitrogen dioxide.
Nuisance	an act which causes material inconvenience, discomfort or harm and is persistent and likely to re-occur.

GLOSSARY (Continued)

Opacity	the degree to which an emission of air contaminants obstructs the transmission of light expressed as a percent of light obstructed as per EPA Method 21.
Operator	any entity who operates or controls a facility at a given location to whom decisive economic power over the technical functioning of the facility has been delegated.
Point source	an individual air emission / pollutant source originating from a specific location.
POHC	selected "Principal Organic Hazardous Constituent" (POHC) which are high in concentration and difficult to burn, that are monitored to ensure its destruction and removal efficiency in a hazardous waste combustion units.
POM	Polycyclic Organic Matter.
Potable Water System	all facilities, including the desalination plants, groundwater abstraction systems and blending plants, producing water for the potable water network and the potable water storage and distribution systems connecting to these facilities to the end users.
Process Commissioning	Commissioning refers to the startup of the plant or unit after it has been designed and installed as per EPC conditions. A commissioning process may be applied not only to new <u>projects</u> but also to existing units and systems subject to expansion, <u>renovation</u> or <u>revamping</u> .
Process construction	construction in process areas. It excludes geo technical surveys, installation of fencing or construction of non-process facilities.
Pyro metallurgical processes	heating processes such as smelting, melting, roasting and refining used for the recovery of metals.
RCER	Royal Commission Environmental Regulations.
Reconstructed facility	any facility that is dismantled, damaged or destroyed and is intentionally reconstructed following the original design in the same or different location.
Source	the point of emission or discharge of an air pollutant or effluent.
TEQ	releases of dioxins and furans are reported in units of toxic equivalence (TEQ) relative to the most toxic type of dioxin, 2,3,7,8-tetrachlorodibenzo-p-dioxin.
Third Party	the "Third Party" contractor is one who shall be selected on the basis of ability and absence of any conflict of interest.
Type I Facility	a facility that has significant potential for environmental harm including permanent or irreversible damage to public health or the environment during construction or operation. Type I facility typically includes primary industries and some larger secondary industries.
Type II Facility	a facility that has potential for moderate impacts to public health or the environment during construction or operation. Type II facility typically includes secondary industries and some larger support industries.
Type III Facility	a facility that has negligible or no impact on public health or the environment during construction or operation. Type III facility is typically support industries and commercial establishments.

GLOSSARY (Continued)

True vapor pressure	the vapor pressure of a volatile substance under actual conditions of storage or transfer.
Used oil	any oil that has been refined from crude oil, or any synthetic oil, that has been used and as a result of such use is contaminated by physical or chemical impurities.
Variance stream	a non-cooling water discharge to the seawater cooling system.
VOC	<p>Volatile Organic Compound - any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.</p> <p>The following have been determined to have negligible photochemical reactivity, and are not VOCs:</p> <ul style="list-style-type: none"> • methane; ethane; acetone; cyclic, branched or completely methylated siloxanes; methylene chloride (dichloromethane); perchloroethylene (tetrachloroethylene); 1,1,1-trichloroethane (methyl chloroform); 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113); trichlorotrifluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (HCHC-22); trifluoromethane (HFC-23); 1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114); Chloropentafluoroethane (CFC-115); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123); 1,1,1,2-tetrafluoroethane (HFC-134a); 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124); 1,1,2,2-tetrafluoroethane (HFC-134); 1,1,1 trifluoroethane (HCFC-143a); 1,1-difluoroethane (HFC-152a); parachlorobenzotrifluoride (PCBTF); 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca); 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb); 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee); and perfluorocarbon compounds which fall into these classes: <ul style="list-style-type: none"> • cyclic, branched or linear completely fluorinated alkanes • cyclic, branched or linear completely fluorinated ethers with no unaturations • cyclic, branched or linear completely fluorinated tertiary amines with no unaturations • sulphur containing perfluorocarbons with no unaturations and with sulphur bonds only to carbon and fluorine.
WMF	Waste Management Facility which stores, treats, disposes of wastes using physical, chemical, thermal, landfilling and other techniques
WRF	Waste Recycling Facility which recover all recoverable and resalable materials out of wastes before disposing the residual wastes

INTRODUCTION

The Royal Commission (RC) is an autonomous organization of the Saudi Arabian Government established by Royal decrees in 1975 and 2009, with an authority within the boundaries of industrial cities, Jubail, Yanbu and Ras Al-Khair having a wide array of responsibilities as city administrator (manager) including regulating environment, community, industrial, infrastructure, seaports, recreation and other related services.

The RC is also an environmental regulating body, responsible for controlling pollution associated with the development and operation of its industrial cities. The Royal Commission has, thus, developed and adopted regulations, standards and guidelines to control all types of substances emitted, discharged, or deposited, and noise generated within sources inside the industrial cities.

The RCER-2015 Volume I includes all regulations, standards and guidelines required to protect the environment of the industrial city from adverse impacts. The Volume II of the RCER-2015 presents the Environmental Permit Program which covers procedures and forms for applying for an "Environmental Permit to Construct" (EPC) and "Environmental Permit to Operate" (EPO). The Volume III describes a Penalty System which has been designed to ensure compliance with regulations to further assist in accomplishing the goals of the Royal Commission by deterring violations and encouraging voluntary compliance with the Environmental Regulations.

The Volume II is divided into two sections. Section 1 describes the RC policy regarding the "Environmental Permit Program" and the procedures to apply for permits to construct and operate an industrial facility. Section 2 presents the forms used to complete the permit application package.

Further in this volume, various procedures and guidelines are addressed as given below:

- Appendix A: Environmental Screening Questionnaire (ESQ)
- Appendix B: Best Available Techniques (BAT) Analysis required under Articles 1.1.11 & 1.1.12 of the RCER-2015, Volume I)
- Appendix C: Environmental Impact Assessment (EIA) Guidelines
- Appendix D: Environmental Emergency Response Plan (EERP) Guidelines
- Appendix E: Groundwater Monitoring Guidelines
- Appendix F: Guidelines for Testing of Stacks and Fugitive Emissions
- Appendix G: Guidelines for Continuous Emission Monitoring System (CEMS) Calibration Methodologies
- Appendix H: Guidelines for Installing Auto Sampling System Inside Facility Fence
- Appendix I: Guidelines for Asbestos Dismantling, Removal, Transport and Disposal

SECTION 1

THE ENVIRONMENTAL PERMIT PROGRAM

This section describes the RC policy concerning the "Permit Program" as well as procedures to obtain the Environmental Permits.

1.1 Royal Commission Policy

This Environmental Permit Program (EPP) governs all applications, reviews and approval procedures associated with obtaining the necessary "Environmental Permit to Construct" (EPC) and "Environmental Permit to Operate" (EPO).

The purpose of the permit application package is to provide the background information necessary for Royal Commission to evaluate the environmental impact of the facility, and the environment and the community and issue the required environmental permits.

It is through the implementation of the EPP, RC ensures that industries are complying with all Royal Commission Environmental Regulations (RCER). This program also governs surveillance, inspection, continuous monitoring, environmental impact assessment (EIA), environmental emergency response plan (EERP), best available techniques (BAT) analysis, performance and stack testing as well as auditing plans.

1.2 Categories of Facilities

Facilities are categorized into three different types based on their size, type of activities, raw materials and products, as well as the potential for air emissions, using process water and cooling water, generating wastewater and waste materials and noise during their construction and operation. Such categorization is given below:

Type I Facility: A facility in this category would have the greatest potential for significant adverse environmental impacts including permanent and irreversible damage to the public or the environment during construction and/ or operation.

Type II Facility: A facility in this category would have potentially moderate impacts and may result in relatively moderate harm to the environment.

Type III Facility: A facility in this category would have negligible or no impact to the environment at any time.

1.3 Permit Procedure for Industrial Facilities

All facilities are required to submit soft and hard copies of Environmental Screening Questionnaire (ESQ) which is a part of RC's Industrial Site Allocation Request (SAR). A copy of ESQ is included in Appendix A. Based on the criteria developed by the RC for project categorization, the RC will review the ESQ and will determine the category of the facility. A flow chart describing the steps of permitting process is shown in Figure 1.

1.3.1 Issuance of Environmental Permit to Construct

All Facilities

- i. All facilities are required to submit a complete permit application package (PAP) with all applicable forms. Further, all of the relevant engineering data shall be provided based on the proposed technology.

Recommendations resulting from the EIA study (for Type-I & Type-II only) shall be incorporated into the design of the plant, emission control systems, wastewater treatment options, etc. Further, if results of EIA required changes in the design, these changes shall be included in the final design phase. (All drawings and related documents shall be submitted in hard copies in A3 sizes and soft copies(y) in PDF formats only. Also, the related attachments in PAP shall be clearly identifiable, and the drawings shall highlight the related information.

- ii. In addition to submitting the completed application package, the applicant is also required to prepare a detailed environmental impact assessment (EIA) report (for Type-I & Type-II only) as per the RC requirement to evaluate the impact of one or more components of the proposed facility on the environment.

The environmental impact assessment / modeling studies shall be carried out to identify the adverse impacts of the proposed facility on the atmospheric conditions, the marine life including coral reefs, ground water or any other area of environment, which is likely to be adversely affected.

Modeling studies shall consider all the existing topographical, geological and meteorological conditions in air and water quality simulations. These studies will consider normal situation as well as all the possible worst-case scenarios, as these cases will be used to evaluate the maximum possible damage to the environment during such situations. The environmental impact assessment (EIA) report submitted for these facilities, will also suggest what precautionary/mitigation measures to be taken during such circumstances to minimize the expected damage.

- iii. Facilities may also be required to conduct health risk assessment study on a case-by-case basis.
- iv. When RC is satisfied that an adequate abatement/control system has been designed for all pollutants generated, along with guarantees that the facility will comply with all environmental regulations, an "Environmental Permit to Construct" will be prepared and sent to the investor.

- v. The Permit to construct will contain a list of special conditions that are required to be carried out during the construction period before commencing of operations.
- vi. Investor will sign a lease with the Royal Commission only after the “Environmental Permit to Construct” is issued.
- vii. During the construction stage, periodic inspections to the development site will be conducted by RC to ensure compliance with agreed permit stipulations and environmental standards.
- viii. “Environmental Permit to Construct ” (EPC) issued to the facility gives authorization for starting their construction. This EPC will expire automatically one day before the effective date of EPO.
- ix. If investor decided to change technology /technology supplier (s), RC shall be notified and the PAP shall be updated accordingly.

Type III Facilities

- i. In order to fully evaluate environmental impacts relating to a facility's operations, RC may require information supplementary to that presented in the ESQ. RC may request the facility to complete the applicable permit application forms as needed.
- ii. When RC is satisfied that facility will comply with all environmental regulations, an “Environmental Permit to Construct” will be issued.

1.3.2 Issuance of Environmental Permit to Operate

- i. After the completion of construction, the facility management shall apply for the issuance of the “Environmental Permit to Operate”.
- ii. Prior to the issuance of the Environmental Permit to Operate, RC will conduct a site inspection to confirm compliance to all permit conditions specified in the Environmental Permit to Construct. If there are no issues preventing its issuance, the “Environmental Permit to Operate” will be prepared and sent to the investor.
- iii. Start-up operations are not allowed until the Royal Commission issues the Environmental Permit to Operate.
- iv. The permit will contain a list of special conditions that are required to be carried out during the operation of the facility.
- v. Industrial facilities are required to monitor emissions or waste streams and report results to RC as required by the permit and RCER. RC reserves the right to verify such data through its own sampling and monitoring programs.
- vi. RC shall impose penalties as per RC Penalty System, if any non-compliance with RCER is observed.
- vii. The environmental Permit to Operate is issued for a period of five (5) years for all facilities.

1.4 Permit Procedure for Industrial Facilities not covered by Royal Commission Lease

1.4.1 For some of the industries that might not be covered by Lease Agreement with the Royal Commission, but exist within the Royal Commission boundaries are also required to obtain Environmental Permits.

1.4.2 Categorization of facilities in to respective types, the review of process, submittal requirements etc. are the same as described for industrial facilities above.

1.5 Permit procedures for Commercial Establishments/ Infrastructure Developments

All commercial establishments / infrastructure developments are required to obtain an environmental permit, if the proposed facility has any environmental concerns.

1.6 Renewal of "Environmental Permit to Operate"

1.6.1 Industries are required to submit updated permit applications and air emission inventory for renewal of the "Environmental Permit to Operate", six (6) months before the expiry of the existing permit to operate. Along with the permit applications, industries have also to submit a detailed account of all the modifications carried out during the last permit period.

1.6.2 RC will review the application to confirm whether the industrial facility is in compliance with all regulations and stipulated permit conditions or not. An inspection of the facility shall be carried out.

1.6.3 When RC is satisfied of provided information a renewed "Environmental Permit to Operate" will be prepared.

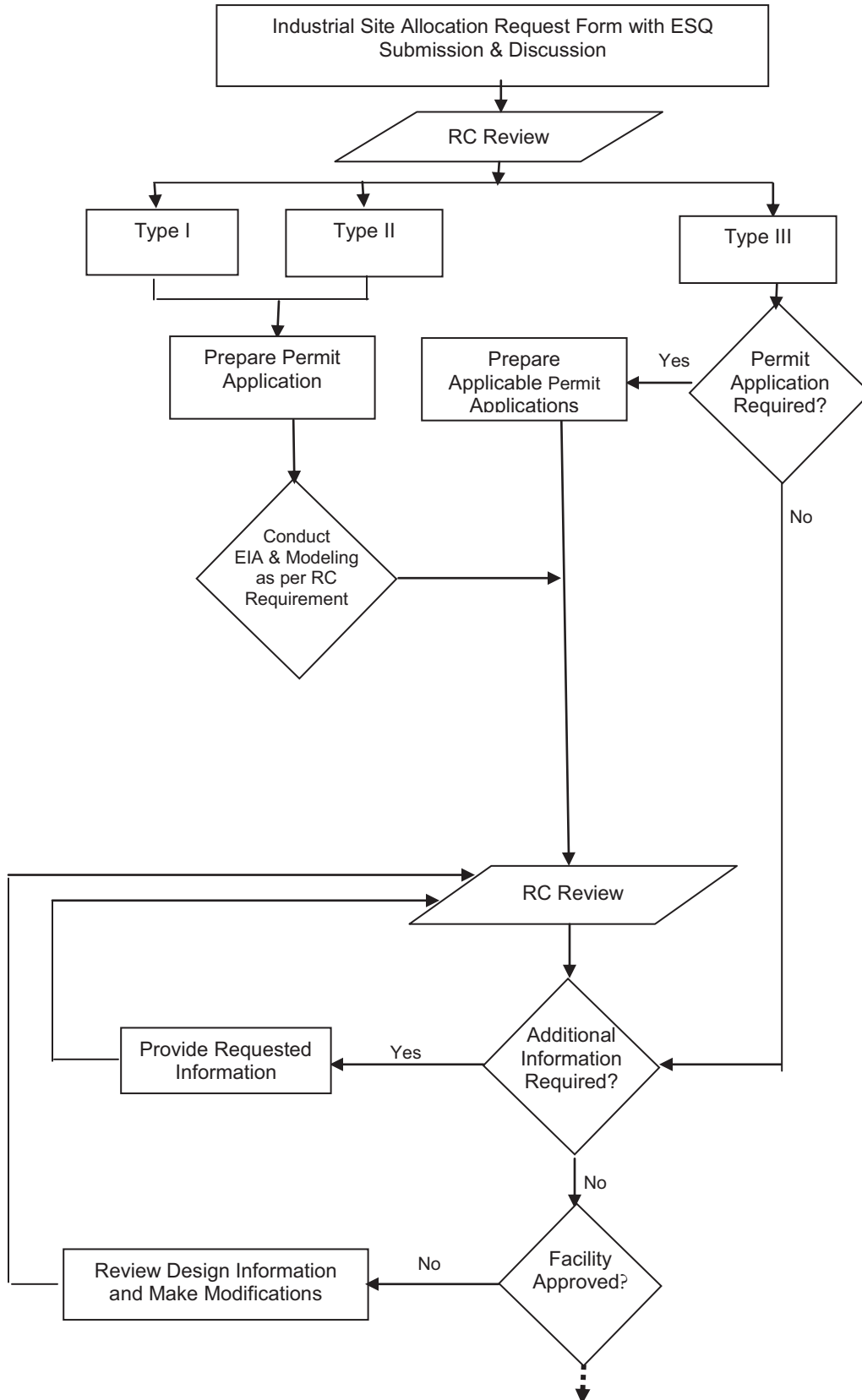
1.7 Amendment to Existing Environmental Permit to Operate

1.7.1 The facility shall submit an amended permit application package 6 months in advance in case of a major expansion or significant change to the process or scope of operation after the issuance of EPO in accordance with Section 1 of RCER-2015, Volume I.

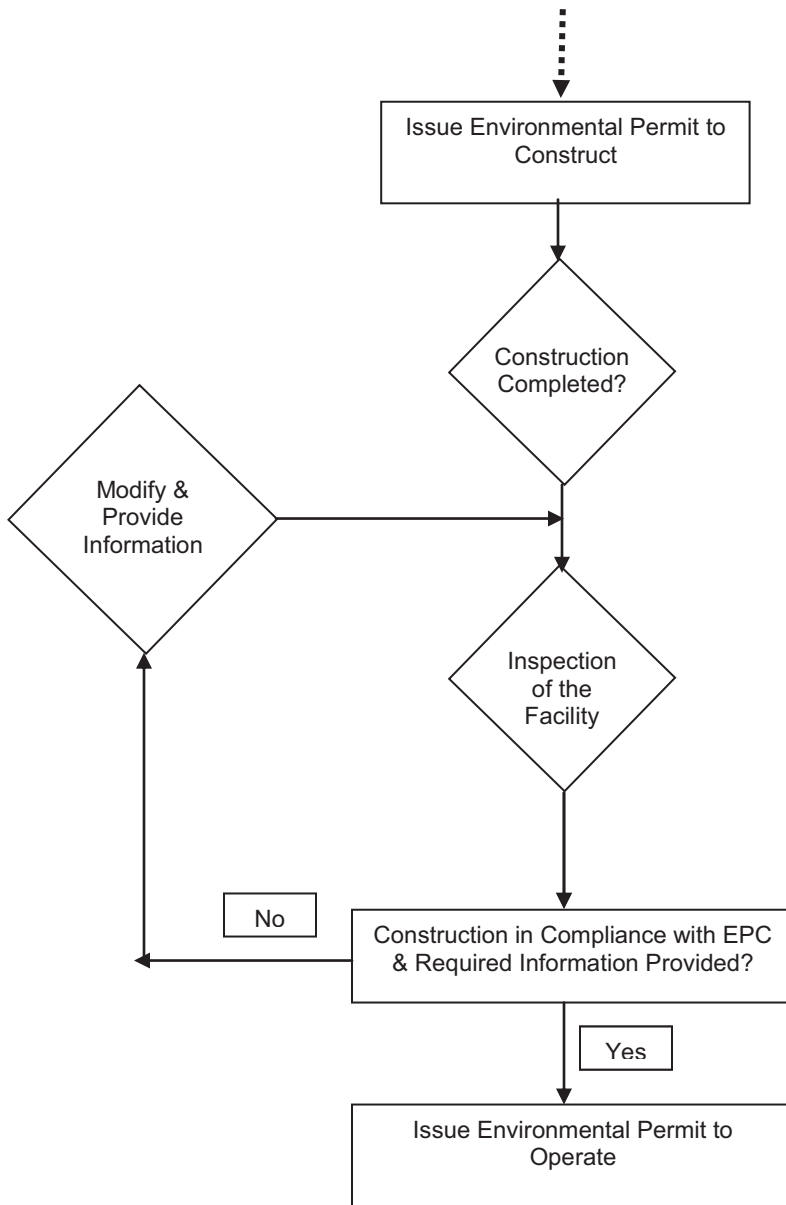
1.7.2 As per RC requirement, the facility is required to submit an environmental impact assessment (EIA) report for Type I and II facilities to evaluate the impact of one or more components of the proposed facility on the environment. After approval of permit applications and EIA report, an Environmental Permit to Construct will be issued for undertaking the modification/ expansion activities incorporating necessary conditions for compliance with RCER.

1.7.3 Amendments to the "Environmental Permit to Operate" will be prepared and sent to the facility management. The amendments automatically expire on the same day, as the "Environmental Permit to Operate".

FIGURE 1: Environmental Permitting Process for New, Reconstructed and Modified Facilities



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SECTION 2

PERMIT APPLICATION PACKAGE

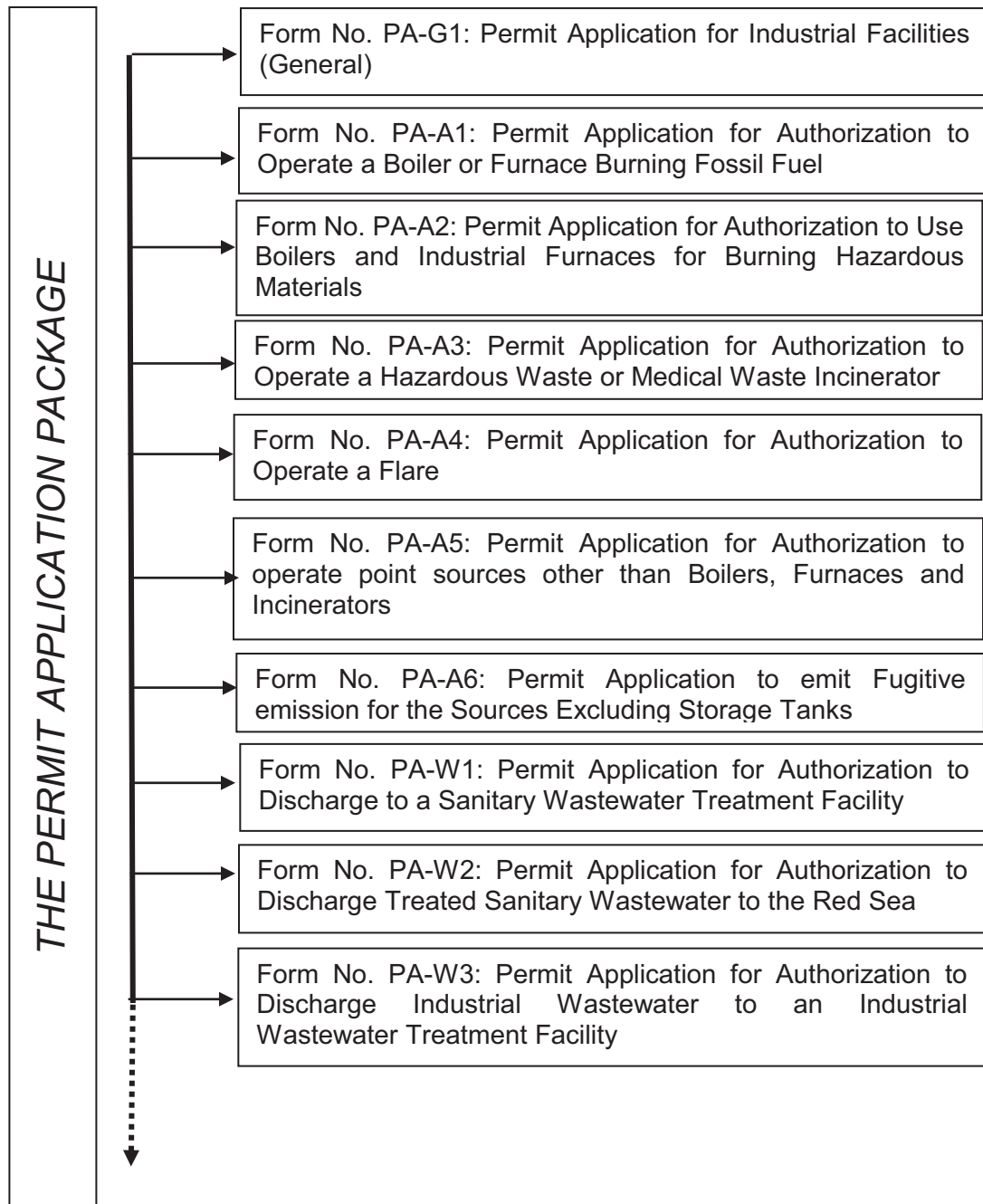
This section provides permit application forms needed to apply for an Environmental Permit to Construct and Environmental Permit to Operate.

2.1 Instructions for Completing Permit Application Package

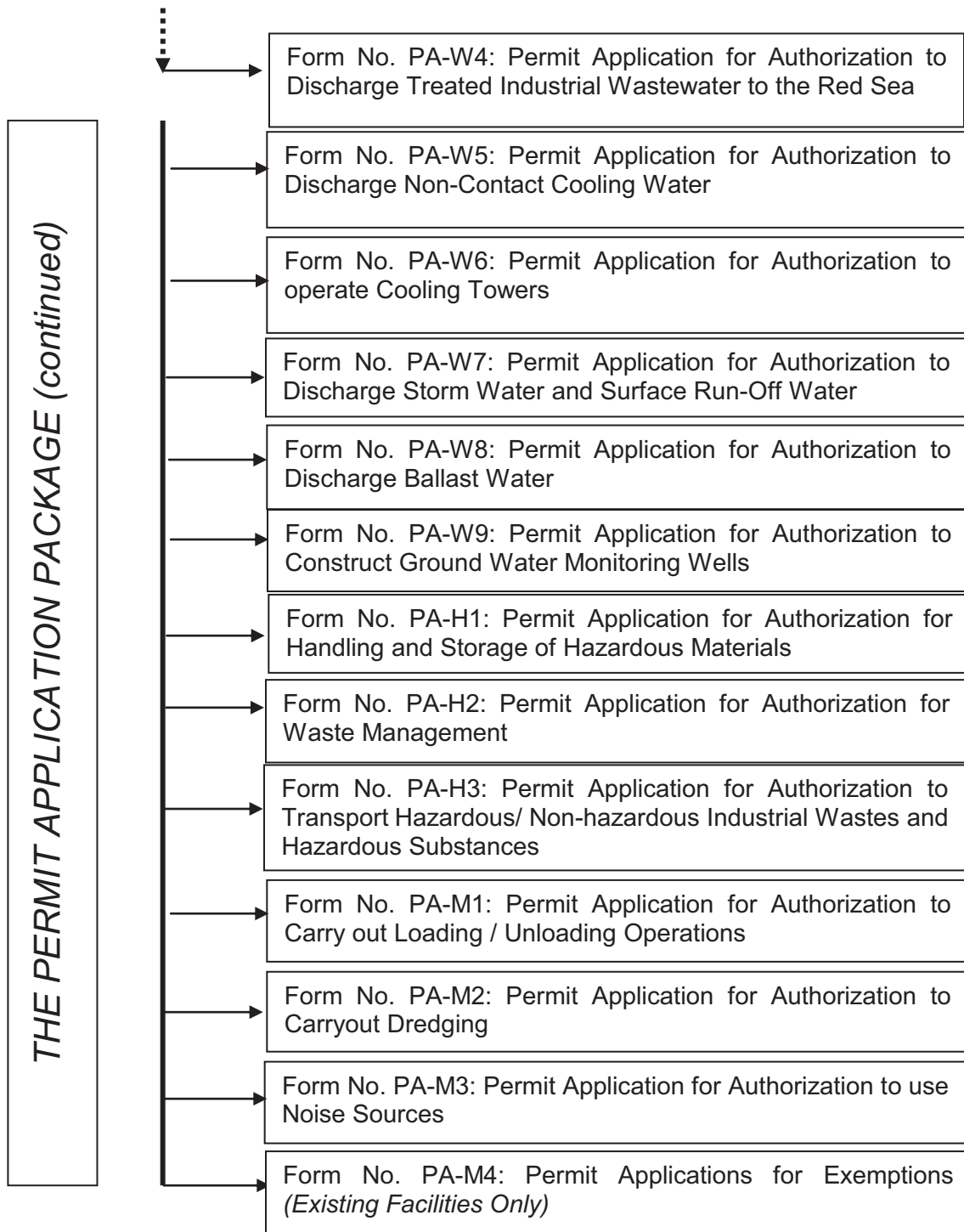
Figure 2 summarizes the entire application package. In following paragraphs, important points are described which would help in completing the application forms required to submit for obtaining permits to construct and to operate industrial facilities.

- a) This application package must be submitted by a facility which intends to operate or develop and operate a commercial (if required) or industrial facility in the Industrial City.
- b) All information requested in these application forms must be provided. Do not leave any space uncompleted. If a question does not apply, answer with "None" or "NA".
- c) An authorized representative of the facility must sign and stamp the STATEMENT OF CERTIFICATION in application package before being returned to the Royal Commission.
- d) The completed applications have to be submitted in electronic form (a Compact Disc) as well as in printed form. An electronic copy of the forms can be obtained from the Royal Commission. The printed document must bear the signature of the authorized representative.
- e) PAP forms shall be organized in the same order as presented in Figure 2.
- f) Submit Environmental Emergency Response Plan (EERP) as per "Guidelines" provided in Appendix D, covering issues hazardous material management (as per Clause 4.3.20 of RCER-2015, Volume I), hazardous waste management, loading/ unloading operations and other potential emergencies.

FIGURE 2: The Permit Application Package



(Continued on next page)



2.2 Checklist for Permit Applications and Statement of Certification

<input type="checkbox"/> PA-G1. General	<input type="checkbox"/> PA-W6. Cooling Towers
AIR ENVIRONMENT	<input type="checkbox"/> PA-W7. Storm Water
<input type="checkbox"/> PA-A1. Boilers and Furnaces	<input type="checkbox"/> PA-W8. Ballast Water to Sea
<input type="checkbox"/> PA-A2. Boilers and Furnaces burning Hazardous Materials	<input type="checkbox"/> PA-W9. Ground Water
<input type="checkbox"/> PA-A3. Incinerators	HAZARDOUS MATERIALS AND WASTE
<input type="checkbox"/> PA-A4. Flare	<input type="checkbox"/> PA-H1. Hazardous Substance Storage
<input type="checkbox"/> PA-A5. Other Point Sources	<input type="checkbox"/> PA-H2. Waste Management
<input type="checkbox"/> PA-A6. Fugitive Emissions	<input type="checkbox"/> PA-H3. Transportation of Wastes and Hazardous Substances
WATER ENVIRONMENT	MISCELLANEOUS
<input type="checkbox"/> PA-W1. Sanitary Wastewater	<input type="checkbox"/> PA-M1. Loading & Unloading
<input type="checkbox"/> PA-W2. Sanitary Wastewater to Red Sea	<input type="checkbox"/> PA-M2. Dredging
<input type="checkbox"/> PA-W3. Industrial Wastewater	<input type="checkbox"/> PA-M3. Noise
<input type="checkbox"/> PA-W4. Industrial Wastewater to Red Sea	<input type="checkbox"/> PA-M4. Exemptions
<input type="checkbox"/> PA-W5. Cooling Water (once through system)	

STATEMENT OF CERTIFICATION

On behalf of the facility , I hereby declare that I am familiar with all processes and operating plans of this facility and certify that the environmental information provided above is accurate to the best of my knowledge. I understand that the submission of incorrect information is considered a highly serious issue and could lead to subsequent withdrawal of any permit issued and issuance of penalties. Notification on any changes will be submitted to the Royal Commission. Also I am fully committed to implement and comply with Royal Commission Environmental Regulations.

Name of the Facility : _____

Signature of Facility Representative

Date

Name

Title

Facility
Stamp

PERMIT APPLICATION FORMS

PERMIT APPLICATION FORMS

General



FORM PA-G1
PERMIT APPLICATION FOR INDUSTRIAL FACILITIES - GENERAL

1. APPLICANT

Name of Industrial Facility: English: _____

Name of the Project : English : _____

Name of Industrial Facility: Arabic: _____

Name of the Project : Arabic: _____

Owner(s) of the Facility: _____

(Attach a copy of Commercial Registration and Industrial License)

(Attach a copy of Saudi Energy Efficiency Center (SEEC) Certificate complying with SEEC's standards and requirements for new facilities including facilities to be reconstructed, modified or expanded)

Operator of the Facility: _____

Applicant Address: _____

Project Coordinator: _____

Title: _____

Tel: _____ Fax: _____

E-mail: _____

Technical Contact: _____

Title: _____

Tel: _____ Fax: _____

E-mail: _____

Area of the Facility: _____ Hectares / Square Meters.

Facility Status (Tick the option)



New Existing In Case of renewal of EPO, attach the expiring EPO and its conditions.

Modification In Case of modification complete the following:

Name of Plant	Before Expansion				After Expansion				
	Production Capacity	Number of Air Emission Sources	Industrial Wastewater Quantity (m ³ /day)	Hazardous Waste Quantity TPY	Production		Number of Air Emission Sources	Industrial Wastewater Quantity (m ³ /day)	Hazardous Waste Quantity TPY
					Capacity	% Change			

Item	Before Expansion	After Expansion
Raw Material Consumption		
Production Capacity		

2. OPERATIONAL ACTIVITIES:

2.1 Operations / Process Description

- a. Describe the proposed operations at the facility including the main chemical reactions and process units involved

List the relevant section/ page numbers in the addendum

- b. Provide a block flow diagrams outlining the main process units

List the relevant section/ page numbers in the addendum

- c. Provide mass / material balance calculations indicating inputs and outputs of process units including air, water and waste releases.

List the relevant section/ page numbers in the addendum

- d. Provide detailed process flow diagrams (PFDs) with stream summaries.

Drawings No _____

e. Are there any loading and unloading operations at the port

[] Yes

[] No

List the relevant section/ page numbers in the addendum

--

2.2 Operating Schedule

- a. Operating hours of the facility per day : _____ Hours/day
- b. No. of Shifts/day _____ Shifts
- c. Scheduled operating days per calendar year: _____ Days
- d. No. of employees:
 - i. Admin: _____
 - ii. Technical (Production, Tech. Services, Maintenance) & others: _____
 - iii. Total: _____

2.3 Raw Materials and Product Description

Provide detailed description of raw materials used, products and by-products.

a. Raw Materials Used Directly in Production *(Insert more rows if needed)*

Material	Process	Delivery and Storage Method	Hourly Consumption (Unit)	Annual Consumption (Unit)	Maximum Storage Capacity (Unit)	Country of Origin

b. Other Materials Used *(Insert more rows if needed)*

Material	Process	Delivery and Storage Method	Hourly Consumption (Unit)	Annual Consumption (Unit)	Maximum Storage Capacity (Unit)	Country of Origin

c. Raw Materials available from the Industrial City.

Material	Process	Delivery and Storage Method	Hourly Consumption (Unit)	Annual Consumption (Unit)	Maximum Storage Capacity (Unit)	City of Origin

d. Final Products *(Insert more rows if needed)*

Process	Product	Hourly Production (Unit)	Annual Production (Unit)	Storage/ Delivery to end users Method	Maximum Storage Capacity (Unit)	End Users Name & Location

e. By-Products *(Insert more rows if needed)*

Process	Product	Hourly Production (Unit)	Annual Production (Unit)	Storage/ Delivery to end users Method	Maximum Storage Capacity (Unit)	End Users Name & Location

2.4 Process Technology Suppliers for Major Process Units e.g. Catalytic Cracking, Catalytic Reforming, Polymerization, Thermal Cracking, etc.

Process Name	Technology Supplier	Country of Origin

2.5 Energy Requirements

Type	Units	Average Consumption	Annual Consumption
Electricity	kVA		
Oil	tones/day		
Gas	scm		
Other (specify)			

2.6 Water Consumption

Type of water used / required	Average	Maximum
Desalinated water for process (m ³ /day)		
Drinking water for Process (m ³ /day)		
Reclaimed water (IWTP Effluent) for process (m ³ /day)		
Reclaimed water (SWTP Effluent) for process (m ³ /day)		
Non-Contact Cooling Seawater (m ³ /hr)		
Other water (m ³ /day)		
Drinking water (m ³ /day)		
Irrigation water (m ³ /day)		

2.7 Wastewater Generation

Type of wastewater	Average	Maximum
Process wastewater (m ³ /day)		
Sanitary wastewater (m ³ /day)		
Other wastewater (m ³ /day)		

3. SITE PLANS:

Provide site plans indicating the following:

- a. Buildings

Drawing No. _____

- b. Plant facility boundaries

Drawing No. _____

- c. Specific process areas
Drawing No. _____
- d. All sanitary and industrial effluent discharge sources to the wastewater collection system.
Drawing No. _____
- e. All non-contact cooling water discharge sources
Drawing No. _____
- f. All wastewater and storm water lagoons and surface impoundments
Drawing No. _____
- g. Storm water drainage plan
Drawing No. _____
- h. All effluent treatment facilities
Drawing No. _____
- i. All atmospheric emission point sources emitting greater than 10 tons/year of any hazardous air pollutant (see RCER-2015, Volume I, Table 2C) and all point sources emitting greater than 100 tons/year of any ambient air standards pollutant (see RCER-2015, Volume I, Table 2A).
Drawing No. _____
- j. All air pollution control equipment locations
Drawing No. _____
- k. Areas of hazardous waste storage, treatment or disposal
Drawing No. _____

4. LAND USE PLANNING *(for new or modified facilities within the boundaries of an existing site)*

Indicate on the Site Plan the following:

- a) Areas subject for development _____ SQ. M.
- b) Areas potentially contaminated with previous activities or storage of materials.
_____ SQ. M.
- c) Areas with known or potential groundwater contamination.



Drawing No. _____

5. CONSTRUCTION ACTIVITIES

- a. Estimated length of the construction period _____
- b. Anticipated volume of dredged material, if any, during construction? cu. m. _____
- c. Describe below, any site dewatering which will be required during construction of the facility, including anticipated dewatering and disposal rates? m³/day. _____
- d. Describe the type, quantities and disposal methods of municipal wastes during construction of the facility.

- e. Describe the type, quantities and disposal methods of industrial wastes during construction of the facility.

- f. Provide the details of any temporary construction activities.

PERMIT APPLICATION FORMS

AIR ENVIRONMENT

**FORM PA-A1
PERMIT APPLICATION FOR AUTHORIZATION TO OPERATE A BOILER OR
FURNACE BURNING FOSSIL FUEL**

Note: A separate application has to be filled for each combustion source, unless they are identical.

1. DESCRIPTION

a. Provide the following information on each boiler/furnace

DESCRIPTION	UNITS	DATA
Number of Identical Units	Nos.	
Maximum Design Capacity	MW MBTU/Hour	
Operating Capacity	% of design capacity	
Operating Schedule		
Normal	Hours/day	
	Days/year	
Maximum	Hours/day	
	Days/year	

b. Provide a description of the design of the boiler/ Furnace in an attachment. The description should include details such as:

- i. Use of the boiler/ furnace and process description
- ii. Type of boiler or furnace:
- iii. Fuel feed
- iv. Make and type of burners
- v. Number of burners
- vi. Type of atomization
- vii. Start-up and shut down including emergency procedures and their frequency
- viii. Manufacturer's Name and Model Number.
- ix. Expected useful life

List the relevant section/ page numbers in the attachment

--

c. Provide the following drawings

- i. Layout indicating the location of the boiler/ furnace and the stack.
Drawing No. _____
- ii. Line diagram identifying all sources feeding the boiler and outputs
Drawing No. _____

d. Operational Philosophy: Tick the appropriate one

Continuous Cold standby Hot standby

2. COMBUSTION INFORMATION

- a. Enclose complete fuel composition report giving a complete description of the fuel used for this combustion source

	Liquid Fuel	Gaseous Fuel
Type of fuel		
Type of firing		
Average feed rate (Nm ³ /h) or (kg/h)		
Max feed rate (Nm ³ /h) or (kg/h)		
Density		
Heat Input (Joules/h)*		
Total Heat Input*		
Heat Release Rate (Joules/sec-m ³)*		
High Heating Value (kJ/m ³)		
Air Intake rate (Nm ³ /h)		
Fuel Composition (wt%) <i>Please specify each constituent including:</i> - Sulfur content (wt %) - Nitrogen content (wt %) - H ₂ S Content (wt %) for gaseous fuels		

* Provide Sample Calculations

- b. Are there any other streams other than fossil fuels being combusted in the unit?

Yes No

If yes, complete form PA-A2 "Permit Application for Authorization to Use Boilers or Industrial Furnaces (BIF) for Burning Hazardous Materials"

3. EMISSIONS CONTROL

- a. Are there any emission control devices

Yes No

- b. If yes, specify type of the control device



Source	Control Device*	Control Unit ID	Expected useful life	No. of units	Arrangements Series/parallel	Dedicated / common	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)	Waste Generation		
											Quantity (tons/yr)	Important properties	Disposal Method

* Choose one of the following control devices

- Low NOx Burners (LNB)
- Ultra Low NOx Burners (ULNB)
- Flue Gas Recirculation (FGR)
- Water/ Steam Injection
- Selective Catalytic Reduction (SCR)
- Other: _____
- Selective Non-Catalytic Reduction (SNCR)
- Acid / Caustic Scrubber
- Activated Carbon Adsorber
- Electrostatic Precipitator (ESP)
- Wet FGD System (FGD Wet)
- Dry FGD System (FGD Dry)

Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the attachment

4. BEST AVAILABLE TECHNIQUES (BAT) ANALYSIS

- a. Do any boilers or furnaces have the potential to emit more than 100 TPY of pollutants as listed in Table 2-A of RCER-2015, Volume I before emission control (*for new and modified facilities only*)
 - Yes
 - No
- b. Do any boilers or furnaces have potential to emit more than 10 TPY of hazardous air pollutants (HAP) as listed in Table 2-C of RCER-2015, if before emission control (for new and modified facilities only)
 - Yes
 - No
- c. Are any boilers or furnaces currently non-compliant with point source emission standards as listed in Table 2-B of RCER-2015 (for existing or modified facilities)
 - Yes
 - No

If the answer to any of the above questions is yes, provide BAT analysis to justify the selection of each relevant emission control device.

List the relevant section/ page numbers in the attachment

--

5. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Stack ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. ng/J or lb/Mbtu	Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*

* Provide a sample calculation for emission estimates. Emission estimation must be based on one of the following

- EF: Emission Factors; MB: Material Balance
- ST: Stack testing or monitoring; EC: Engineering Calculation

STACK INFORMATION

a) Enclose a line diagram identifying all sources, which discharge from or vent to this stack. Briefly describe all source units identified on the line diagram. The line diagram should also include the gas flow rate (Nm³/hr) and pollutants emitted to the atmosphere (g/sec).

Drawing No. _____

b) Provide the following information (add additional columns if necessary)

Stack ID	Dedicated/ Common	Stack height above ground (m)	Stack height above adjacent structure (m)	Inside stack diameter (m)

6. FLUE GAS CHARACTERISTICS

Stack ID	Flow Rate (Nm ³ /hr)	Exit Temp (C)	Flue Gas Density (kg/m ³)	Spec. Heat Cal/g- C ⁰	Exit Velocity (m/s)	Heat Emission Rate (J/Nm ³)	Percent Moisture (%)	Oxygen Content (%)

7. SAMPLING/ ANNUAL TESTING

a) Provide list of emissions monitored annually:

Source	Pollutant

b) Provide drawing of the sampling ports and platforms

Drawing No. _____

c) Provide diameter of sampling port and its distance from the last disturbance point: -

(Note: Sampling port diameter and location shall be as per USEPA requirement)

8. CONTINUOUS MONITORING

Provide the following information *(add additional rows if necessary)*

Source	Pollutant	Type of Monitoring Devices

Provide information on measures in place for monitoring, recordkeeping, calibration and maintenance of continuous emission monitoring systems.

List the relevant section/ page numbers in the attachment

--



FORM PA-A2
PERMIT APPLICATION FOR AUTHORIZATION TO USE
BOILERS OR INDUSTRIAL FURNACES (BIF) FOR BURNING HAZARDOUS
MATERIALS

Note: A separate application has to be filled for each combustion source, unless they are identical.

1. DESCRIPTION

a. Provide the following information on the BIF

- i. Name of the source _____
- ii. Number of identical units: _____
- iii. Expected useful life _____
- iv. Manufacturer's name & Model _____
- v. Maximum Heat Input _____ MW
- vi. Heat Input from Fuel Min _____ % Max _____ %
- vii. Heat Input from Waste Min _____ % Max _____ %
- viii. Operating Schedule
 - Normal _____ h/day _____ days/year
 - Maximum _____ h/day _____ days/year

b. Provide a description of the design of the BIF in an attachment. The description should include details such as:

- i. Type of BIF
- ii. Use of the BIF and process description
- iii. Feed system for the hazardous materials
- iv. Fuel feed
- v. Blending procedures prior to firing
- vi. Type of firing
- vii. Make and type of burners
- viii. Type of atomization
- ix. Excess air (%)
- x. Start-up and shut down procedures and their frequency

List the relevant section/ page numbers in the attachment

c. Provide the following drawings

- i. Layout indicating the location of the BIF and the stack.

Drawing No. _____



- ii. Detailed process flow diagram identifying all waste sources feeding the unit and outputs

Drawing No. _____

- iii. Drawing of the combustion chamber showing feed of fuel and hazardous materials

Drawing No. _____

d. Operating Data

- i) Primary combustion chamber Temperature (°C) _____
- ii) Secondary Combustion chamber Temperature (°C) _____
 - Max _____ °C
 - Average _____ °C
- iii) Description of automatic feed cut-off system _____
- iv) Secondary Combustion chamber residence time _____ Sec
- v) Destruction rate efficiency for organic and chlorinated organic waste _____ %

2. FUEL FEED

Enclose complete fuel composition report giving a complete description of the fuel used for this combustion source

Item	Primary Fuel	Secondary Fuel
Type of fuel		
Normal fuel feed rate (kg/h)		
Maximum fuel feed rate (kg/h)		
Heat Content of the fuel (BTU/lb)		
Fuel Composition (wt%) Please specify each constituent including: - Sulfur content (wt %) - Nitrogen content (wt %) - H2S Content (wt %) for gaseous fuels		

3. WASTE FEED

Provide all process units that are connected to the BIF (add additional lines if necessary)

Process	Material to be Combusted	Physical Properties	Chemical Composition

Item	Waste Streams*			
	Waste Stream 1	Waste Stream 2	Waste Stream 3	Waste Stream 4
Name/ Source				
Waste composition (wt%) - Please specify each constituent				
Physical state				
Heat content (BTU/lb)				
Normal feed rate (kg/h)				
Max feed rate (kg/h)				
DRE – Normal loads** (%)				
DRE – Maximum loads** (%)				

* Add more columns if necessary

** DRE: Destruction and Removal Efficiency

4. EMISSIONS CONTROL

a. Are there any emission control devices

Yes

No

b. If yes, please specify type of the control device

Source	Control Device *	Control Unit ID	Expected useful life	No. of units	Arrangements Series/parallel	Dedicated / common	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)	Waste Generation		
											Quantity (tons/yr)	Important properties	Disposal Method



* Choose one of the following control devices

- | | |
|---|---|
| <input type="checkbox"/> Low NOx Burners (LNB) | <input type="checkbox"/> Ultra Low NOx Burners (ULNB) |
| <input type="checkbox"/> Flue Gas Recirculation (FGR) | <input type="checkbox"/> Water/ Steam Injection |
| <input type="checkbox"/> Selective Catalytic Reduction (SCR) | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Selective Non-Catalytic Reduction (SNCR) | |
| <input type="checkbox"/> Acid / Caustic Scrubber | |
| <input type="checkbox"/> Activated Carbon Adsorber | |
| <input type="checkbox"/> Electrostatic Precipitator (ESP) | |
| <input type="checkbox"/> Wet FGD System (FGD Wet) | |
| <input type="checkbox"/> Dry FGD System (FGD Dry) | |

Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the attachment

5. BEST AVAILABLE TECHNIQUES (BAT) ANALYSIS

a. Does any BIF have the potential to emit more than 100 TPY of pollutants as listed in Table 2-A of RCER-2015, Volume I before emission control *(for new and modified facilities only)*?

- Yes No

b. Does any BIF have potential to emit more than 10 TPY of hazardous air pollutants (HAP) as listed in Table 2-C of RCER 2015, Volume I if before emission control *(for new and modified facilities only)*?

- Yes No

c. Is any BIF currently non-compliance with point source emission standards as listed in Table 2-B of RCER 2015, Volume I *(for existing or modified facilities)*?

- Yes No

If the answer to any of the above questions is yes, please provide BAT analysis to justify the selection of each relevant emission control device.

List the relevant section/ page numbers in the attachment

6. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Stack ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. in Regulated Unit		Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*
					Conc.	Unit			

* Provide a sample calculation for emission estimates. Emission estimation must be based on one of the following

- EF: Emission Factors
- MB: Material Balance
- ST: Stack testing or monitoring
- EC: Engineering Calculation

7. STACK INFORMATION

a) Enclose a line diagram identifying all sources, which discharge from or vent to this stack. Briefly describe all source units identified on the line diagram. The line diagram should also include the gas flow rate (Nm³/hr) and pollutants emitted to the atmosphere (g/sec).

Drawing No. _____

b) Please provide the following drawings (*add additional columns if necessary*)

Stack ID	Stack height above ground (m)	Stack height above adjacent structure (m)	Inside stack diameter (m)



8. FLUE GAS CHARACTERISTICS

Stack ID	Flow Rate (Nm ³ /hr)	Exit Temp (°C)	Flue Gas Density (kg/m ³)	Spec. Heat Cal/g- °C	Exit Velocity (m/s)	Heat Emission Rate (J/Nm ³)

9. SAMPLING/ ANNUAL STACK TESTING

a) Provide list of emission tests conducted annually:

Source	Pollutant

b) Provide drawing of the sampling ports and platforms

Drawing No. _____

c) Provide diameter of sampling port and its distance from the last disturbance point:

(Note: Sampling port diameter and location shall be as per USEPA requirement)

10. CONTINUOUS MONITORING

Provide the following information *(add additional rows if necessary)*

Source	Pollutant	Type of Monitoring Devices

Also, provide information on measures in place for monitoring, recordkeeping, calibration and maintenance of continuous emission monitoring systems.

List the relevant section/ page numbers in the attachment

--

FORM PA-A3
PERMIT APPLICATION FOR AUTHORIZATION TO OPERATE A HAZARDOUS WASTE
OR MEDICAL WASTE INCINERATOR

A separate application/ section is required for each incinerator in the facility unless they are identical.

1. DESCRIPTION

- a. Number of identical incinerators: ____ Units
- b. Type
- | | |
|---|--|
| <input type="checkbox"/> Single Chamber | <input type="checkbox"/> Multiple Chamber |
| <input type="checkbox"/> Controlled Air | <input type="checkbox"/> Fixed Hearth |
| <input type="checkbox"/> Stepped Hearth | <input type="checkbox"/> Rotary Kiln |
| <input type="checkbox"/> Liquid Injection | <input type="checkbox"/> Other (<i>specify</i>): _____ |
- c. Manufacturer's Name & Model No: _____
- d. Expected Useful Life : ____ Years
- e. Type of charging the waste
- | | |
|-------------------------------------|--------------------------------|
| <input type="checkbox"/> Continuous | <input type="checkbox"/> Batch |
|-------------------------------------|--------------------------------|
- f. Design Maximum Charging Rate ____ kg/h
- | | |
|---------------------------------|-------------------------------|
| <input type="checkbox"/> Solid | <input type="checkbox"/> kg/h |
| <input type="checkbox"/> Liquid | <input type="checkbox"/> kg/h |
| <input type="checkbox"/> Sludge | <input type="checkbox"/> kg/h |
| <input type="checkbox"/> Gases | <input type="checkbox"/> kg/h |
- g. Thermal Capacity ____ kJ/h
- h. Operating Schedule
- | | | |
|---------|------------|----------------|
| Normal | ____ h/day | ____ days/year |
| Maximum | ____ h/day | ____ days/year |
- i. Provide a description of the incinerator. The description should include details such as:
- i. Incinerator design
 - ii. Waste charging methods
 - iii. Residue removal system
 - iv. Wastewater generated and methods of disposal
 - v. Start-up and shut down procedures and their frequency
 - vi. Automatic material feed cut off system
 - vii. Procedure for emergency shut down and the use of the emergency dump stack

List the relevant section/ page numbers in the amendment

- j. Provide the following drawings
- i. Layout indicating the location of the incinerator and the stack.
Drawing No. _____
 - ii. Process flow diagram
Drawing No. _____
 - iii. Line diagram identifying all source feeding waste to the incinerator
Drawing No. _____

2. COMBUSTION INFORMATION

- a. Provide the following information on the supplementary fuel:

	Combustion Temperature °C	Residence Time (sec)
Primary Chamber		
Secondary Chamber		

- b. Calculation of the residence time of the exhaust gas in the secondary chamber

List the relevant section/ page numbers in the amendment

--

3. FUEL

- a. Provide a description of the incinerator fuel source(s)

	Primary Fuel	Secondary Fuel
Type of fuel		
Density (kg/m ³)		
Max feed rate (Nm ³ /h) or (kg/h)		
High Heating Value (kJ/m ³)		
Air Intake rate (Nm ³ /h)		
Excess air (%)		
Fuel Composition (wt%) <i>Specify each constituent including:</i> - Sulfur content (wt %) - Nitrogen content (wt %) - H ₂ S Content (wt %) for gaseous fuels		

b. Is the incinerator equipped with a heat recovery system?

Yes, energy production rate ____ kW No

If yes, please specify type of the heat recovery system

Recuperative Regenerative other: _____

4. INFORMATION ON WASTE TO BE BURNT

Normal waste feed rate (kg/h)	
Maximum waste feed rate (kg/h)	

a. Provide all process units that are connected to the incinerator (add additional lines if necessary)

Process	Material to be Burnt	Physical Properties	Chemical Composition	Hazardous Properties*

* Indicate if any radio active material is present in the waste

Item	Waste Streams*			
	Waste Stream 1	Waste Stream 2	Waste Stream 3	Waste Stream 4
Source				
Waste composition (wt%) - Please specify each constituent				
Heat content (MJ/scm)				
Min feed rate (kg/h)				
Max feed rate (kg/h)				
Quantity of fuel needed (m ³ /h)				
DRE – Normal loads** (%)				
DRE – Maximum loads** (%)				

* Add more columns if necessary

** DRE: Destruction and Removal Efficiency

b. Include energy and mass balance for each type of waste stream

List the relevant section/ page numbers in the amendment

--



5. EMISSIONS CONTROL

a. Are there any emission control devices

Yes

No

b. If yes, specify type of the control device

Source	Control Device*	Control Unit ID	Expected useful life	No. of units	Arrangements Series/parallel	Dedicated / common	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)	Waste Generation		
											Quantity (tons/yr)	Important properties	Disposal Method

* Choose one of the following control devices

Acid Gas Removal

Particulate Removal

Post Combustion Reaction Control

Organic Removal

Other: _____

Acid / Caustic Scrubber

Activated Carbon Adsorber

Electrostatic Precipitator (ESP)

Wet FGD System (FGD Wet)

Dry FGD System (FGD Dry)

Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the amendment

6. BEST AVAILABLE TECHNIQUES (BAT) ANALYSIS

c. Does the incinerator have the potential to emit more than 100 TPY of pollutants as listed in Table 2-A of RCER-2015, Volume I, before emission control *(for new and modified facilities only)*

Yes

No

d. Does the incinerator have potential to emit more than 10 TPY of hazardous air pollutants (HAP) as listed in Table 2-C of RCER-2015, Volume I, if before emission control *(for new and modified facilities only)*

[] Yes [] No

e. Is the incinerator currently non-compliant with point source emission standards as listed in Table 2B of RCER-2015, Volume I *(for existing or modified facilities)*

[] Yes [] No

If the answer to any of the above questions is yes, please provide BAT analysis to justify the selection of each relevant emission control device.

List the relevant section/ page numbers in the report

--

7. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Stack ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. in Regulated Unit		Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*
					Conc.	Unit			

* Provide a sample calculation for emission estimates. Emission estimation must be based on one of the following:

EF: Emission Factors; MB: Material Balance; ST: Stack testing or monitoring;
EC: Engineering Calculation

8. STACK INFORMATION

Provide the following information *(add additional columns if necessary)*

Stack ID	Stack height above ground (m)	Stack height above adjacent structure (m)	Inside stack diameter (m)

9. FLUE GAS CHARACTERISTICS

Stack ID	Flow Rate (Nm ³ /hr)	Exit Temp (°C)	Flue Gas Density (kg/m ³)	Spec. Heat Cal/g- °C	Exit Velocity (m/s)	Heat Emission Rate (J/Nm ³)	Percent Moisture (%)	Oxygen Content (%)

10. SAMPLING/ ANNUAL STACK TESTING

a) Provide list of emissions tested annually:

Source	Pollutant

b) Provide drawing of the sampling ports and platforms

Drawing No. _____

c) Provided diameter of sampling port and its distance from the last disturbance point:

(Note: Sampling port and location shall be as per USEPA requirement)

11. CONTINUOUS MONITORING

Provide the following information *(add additional rows if necessary)*

Source	Pollutant	Type of Monitoring Devices

Also, provide information on measures in place for monitoring, recordkeeping, calibration and maintenance of continuous emission monitoring systems.

List the relevant section/ page numbers in the amendment

--

FORM PA-A4
PERMIT APPLICATION FOR AUTHORIZATION TO OPERATE A FLARE

A separate application/ section is required for each flare in the facility unless they are identical

1. USE OF FLARE

- a) Indicate the number and type of flares (including emergency flares, if any) which are planned for the proposed plant.

- | | |
|---|--|
| <input type="checkbox"/> Normal | <input type="checkbox"/> Upset |
| <input type="checkbox"/> Emergency/ Power Failure | <input type="checkbox"/> Start-up |
| <input type="checkbox"/> Turnaround and shutdown | <input type="checkbox"/> Off-spec material |

Number of Identical Flares: _____ Units

Flare ID: _____

- b) Provide a description of the design of the flare. The description should include details regarding
- Gas collection system.
 - Knock-out drum.
 - System to prevent flash back.
 - Ignition and flame detection systems.
 - Flare assisted by Steam / Air
 - Source of steam/ air.
 - Competing demands for steam/air under normal conditions and in emergencies.
 - Manufacturer's name and model number.
 - Type of Metering System for measuring fluids to be flared

List the relevant section/ page numbers in the attachment

- c) Provide the following drawing

- Location of the flare: Drawing No: _____

- The flare header system presenting sources of materials to be flared

Drawing No. _____

- The knock-out drum

Drawing No. _____

- The flare tip

Drawing No. _____

2. INFORMATION ON THE FLARE

Provide the following information to describe the flare:

Type (elevated, ground flare, etc)	
Height above ground level (m)	
Effective release height (m)	
Flame length (m)	
Cross sectional area (m ²)	
Average design feed rate (kg/hr)	
Maximum design feed rate (kg/hr)	
Combustion Temperature (°C)	
Destruction Removal efficiency (%)	
Exit Temperature (°C)	
Air assistance feed rate (m ³ /hr)	
Steam assistance feed rate (kg/hr)	
Maximum smokeless design flow rate (kg/hr)	
Maximum exit velocity at the tip of flare (m/sec)	

3. SUPPLEMENTARY FUEL

Provide the following information on the supplementary fuel:

Fuel type	
Use (start-up, shutdown, emergency, etc.)	
Average fuel feed rate (m ³ /hr)	
Max. fuel feed rate (m ³ /hr)	
Heat content	
Sulfur content	
H ₂ S content (g/dscm)	
Nitrogen content (wt%)	

4. FLUIDS FLARED/ FLARING SCENARIOS

Provide all process units / sources that are connected to the flare (*add additional lines if necessary*)

Process / Source	Main Fluids Flared	Scenarios *	Frequency of Flaring (No of hrs/day)	Flaring Rate (kg/hr)

* Fill all scenarios for flaring that may occur (normal, start-up, emergency, off-spec raw material or product, process upsets, power failure, etc.)

5. INFORMATION ON THE FLUIDS TO BE FLARED

Provide information on the composition of fluids to be flared for each scenario

Item	Scenarios			
	Normal	Power Failure	Start-up	Shut-down
Name & Composition of Fluid				
1 <i>Hydrocarbons</i>				
2 <i>Sulfur (S)</i>				
3 <i>Water (H₂O)</i>				
4 <i>Nitrogen (N)</i>				
5 <i>Carbon Monoxide (CO)</i>				
6 <i>Carbon Dioxide (CO₂)</i>				
7 <i>Inert gases</i>				
Heat content (MJ/scm)				
Max feed rate (kg/h)				
Total heat release rate (kcal/sec)				
Quantity of steam available (kg/h)				
Quantity of air available (m ³ /h)				
Excess air (%)				
Combustion efficiency				
Volume of flue gases (scm/sec)				

6. RADIATION ISOPLETHS:

Enclose radiation isopleths superimposed on facility layout and adjacent areas.

7. NOISE

Indicate noise levels 100m from the center of the flare during:

	Noise Level (dBA)
Emergency	
Start-up	

8. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Pollutant	Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*

* Provide a sample calculation for emission estimates. Emission estimation must be based on one of the following

EF: Emission Factors

ST: Stack testing or monitoring

MB: Material Balance

EC: Engineering Calculation

9. CONTINUOUS IMAGING (DIGITAL RECORDING) SYSTEM

a. New Facility

Provide the details of the System

b. Existing Facility

Provide the details of the system, if installed.

FORM PA-A5
PERMIT APPLICATION FOR AUTHORIZATION TO OPERATE POINT SOURCES
OTHER THAN BOILERS, FURNACES, FLARES AND INCINERATORS

1. EMISSION SOURCES

- a) Sources Other than Boilers, Furnaces, Flares, Incinerators e.g. scrubber, cyclone separator, process vents, etc.

List of Sources emitting air pollutants that are not covered in PA-A1, PA-A2, PA-A3 and PA-A4 (*add additional rows if necessary*).

Source	Unit ID	Stack ID

- b) Provide the following drawings

- Detailed process flow diagram identifying all emission sources

Drawing No. _____

- Layout indicating the location of the sources and point where they are emitted to the atmosphere

Drawing No. _____

2. EMISSIONS CONTROL

Are there any emission control systems in place?

Yes

No



If yes, specify type of the control device

Source	Control Device	Control Unit ID	Expected useful life	No. of units	Arrangements Series/parallel	Dedicated / common	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)	Waste Generation		
											Quantity (tons/yr)	Important properties	Disposal Method

Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the attachment

3. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Stack ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. in Regulated Unit		Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*
					Conc.	Unit			

* Provide a sample calculation for emission estimation. Emission estimation must be based on one of the following

- EF: Emission Factors
- MB: Material Balance
- ST: Stack testing or monitoring
- EC: Engineering Calculation

4. STACK INFORMATION

Please provide the following drawings *(add additional columns if necessary)*

Stack ID	Stack height above ground (m)	Stack height above adjacent structure (m)	Inside stack diameter (m)

5. FLUE GAS CHARACTERISTICS

Stack ID	Flow Rate (Nm ³ /hr)	Exit Temp (°C)	Exit Velocity (m/s)	Heat Emission Rate (J/Nm ³)	Percent Moisture (%)	Oxygen Content (%)

6. SAMPLING/ ANNUAL STACK TESTING

a) Provide list of emissions monitored annually:

Source	Pollutant

b) Provide drawing of the sampling ports and platforms

Drawing No. _____

c) Provide diameter of sampling port and its distance from the last disturbance point:

(Note: Sampling port diameter and location shall be as per USEPA requirement)



7. CONTINUOUS MONITORING

Please provide the following information *(add additional rows if necessary)*

Source	Pollutant	Type of Monitoring Devices

Also, please provide information on measures in place for monitoring, recordkeeping, calibration and maintenance of continuous emission monitoring systems.

List the relevant section/ page numbers in the attachment

8. BEST AVAILABLE TECHNIQUES (BAT) ANALYSIS

- a) Are there any sources (other than boilers, furnaces and incinerators) with the potential to emit more than 100 TPY of pollutants as listed in Table 2A of RCER-2015, Volume I, before emission control *(for new and modified facilities only)* ?

Yes

No

- b) Are there any sources (other than boilers, furnaces and incinerators) with the potential to emit more than 10 TPY of hazardous air pollutants (HAP) as listed in Table 2-C of RCER-2015, Volume I, if before emission control *(for new and modified facilities only)* ?

Yes

No

- c) Are there any sources (other than boilers, furnaces and incinerators) that are currently non-compliant with point source emission standards as listed in Table 2-B of RCER-2015, Volume I *(for existing or modified facilities)* ?

Yes

No

If the answer to any of the above questions is yes, provide BAT analysis to justify the selection of each relevant emission control device.

List the relevant section/ page numbers in the attachment



FORM PA-A6
PERMIT APPLICATION FOR AUTHORIZATION TO EMIT FUGITIVE EMISSIONS
FOR THE SOURCES EXCLUDING STORAGE TANKS

1. FUGITIVE EMISSIONS SOURCES

- a) Provide a list of Volatile Organic Compounds (VOC) processed at the facility (*add additional rows if necessary*)

- b) Provide a list of Hazardous Air Pollutants (HAP) processed at the facility (*add additional rows if necessary*)

- c) Provide a list of Dust Sources at the facility (*add additional rows if necessary*)

2. FUGITIVE EMISSION MONITORING PROGRAM

Provide an outline of fugitive emission monitoring and maintenance program to be adopted by the facility to control emissions from the affected components.

List the relevant section/ page numbers in the attachment

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3. FUGITIVE EMISSION ESTIMATES

- a) Provide an estimate in accordance with USEPA AP42 Emission Factor (latest revision) of the quantity of fugitive emissions of streams containing more than 10 wt% of VOCs.

VOC Source		Component Count	Mass Fraction of Organics (%)	SOCMI Uncontrolled Avg. Emission Factors	Un-controlled Emissions (kg/h)	Control Efficiency (%)	Controlled Emissions (kg/h)	Controlled Emissions (tons/year)
Valves	Gas							
	Light Liquid							
	Heavy Liquid							
Pumps	Gas							
	Light Liquid							
	Heavy Liquid							
Flanges/ Connectors	Gas							
	Light Liquid							
	Heavy Liquid							
Pressure Relief Valves	Gas							
	Light Liquid							
	Heavy Liquid							
Compressors	Gas							
	Light Liquid							
	Heavy Liquid							
Pump Seals	Gas							
	Light Liquid							
	Heavy Liquid							
Others (specify)	Gas							
	Light Liquid							
	Heavy Liquid							
TOTALS								

- b) Provide an estimate in accordance with USEPA AP42 Emission Factor (latest revision) of the quantity of fugitive emissions of streams containing more than 5 wt% of Hazardous Air Pollutants (HAP):



HAP Source		Component Count	Mass Fraction of Organics	Uncontrolled Emission Factors	Uncontrolled Emissions (kg/h)	Control Efficiency (%)	Controlled Emissions (kg/h)	Controlled Emissions (tons/year)
Valves	Gas							
	Light Liquid							
	Heavy Liquid							
Pumps	Gas							
	Light Liquid							
	Heavy Liquid							
Flanges/ connectors	Gas							
	Light Liquid							
	Heavy Liquid							
Pressure Relief Valves	Gas							
	Light Liquid							
	Heavy Liquid							
Compressors	Gas							
	Light Liquid							
	Heavy Liquid							
Pump Seals	Gas							
	Light Liquid							
	Heavy Liquid							
Others (specify)	Gas							
	Light Liquid							
	Heavy Liquid							
TOTALS								

4. FUGITIVE EMISSIONS/ ODOURS FROM OPEN WASTEWATER SYSTEMS

- a) Estimate the emissions from open wastewater systems (e.g. aeration tanks, lagoons, API separators etc) in tons/year using USEPA AP 42 or Water 9 (USEPA approved procedure)

Fugitive Emission Source	Pollutant	Type of Compound (VOC/ HAP)	Quantity Emitted (t/y)

- b) Describe the potential for odors from open wastewater systems (e.g. aeration tanks, lagoons, API separators etc)

List the relevant section/ page numbers in the attachment

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- c) Describe systems used to control the losses of VOCs from open wastewater systems

List the relevant section/ page numbers in the attachment

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5. FUGITIVE DUST EMISSIONS FROM OPEN AREA SOURCES

Estimate the emissions from open area sources (e.g. open storage of solid materials; such as ores, sand etc.) in tons/year using USEPA AP 42 or Other USEPA approved procedure

Fugitive Emission Source	Pollutant		Quantity Emitted (t/y)*	Emission Estimation Technique
	PM ₁₀	PM _{2.5}		

* Provide a sample calculation for emission estimates. Emission estimation must be based on one of the following

EF: Emission Factors

MB: Material Balance

ST: Stack Testing or Monitoring

EC: Engineering Calculations

PERMIT APPLICATION FORMS

WATER ENVIRONMENT

FORM PA-W1
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE SANITARY
WASTEWATER TO A SANITARY WASTEWATER TREATMENT FACILITY

1. DISCHARGE RATES OF SANITARY WASTEWATER

Average discharge rate (m ³ /day)		Maximum Design Discharge rate (m ³ /day)	
Maximum discharge rate as expected during normal operation (m ³ /hour)			

2. DISCHARGE OF OTHER STREAMS

- a) Is there any wastewater other than sanitary wastewater that will be discharged of to the sanitary system?

[] Yes

[] No

If yes, complete both (b) and (c).

- b) Describe the sources and justify why they are being discharged to the sanitary system

List the relevant section/ page numbers in the addendum

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Source/ Process	Average Quantity (m ³ /day)	Maximum Quantity (m ³ / hr)

- c) Complete the following table providing information on each constituent that will or may be present in the wastewater

Parameter*	Average Concentration (mg/l)	Maximum Concentration (mg/l)

* As per Table 3B of RCER-2015 Volume I and other Parameters if any



3. MODE OF SANITARY WASTE WATER DISCHARGE

Will the wastewater be discharged to the SWTP?

Yes, via sewer

Yes, via tanker

No

If via sewer, provide pump station number: _____

If no or via tanker, provide justification

List the relevant section/ page numbers in the attachment

FORM PA-W2
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE TREATED
SANITARY WASTEWATER TO THE RED SEA (*Yanbu Only*)

1. DISCHARGE RATES

Source (s)	Average Quantity (m ³ /day)	Maximum Discharge Quantity (during normal operation) (m ³ /hour)	Maximum Design Quantity (m ³ /day)

2. SANITARY WASTEWATER TREATMENT SYSTEM

Describe the wastewater treatment system (including the effluent handling units, data on design loading rates and design pollutant removal efficiencies)

List the relevant section/ page numbers in the attachment

Provide a flow diagram of the sanitary wastewater treatment system

Drawing No. _____

Site plan indicating the discharge point at the plant and the location of discharge to the Red Sea (Note: Provide RC and UTM coordinates of discharge location)

Drawing No. _____

3. WASTE WATER OTHER THAN SANITARY WASTE WATER TO THE SYSTEM

Whether the facility will discharge any waste water stream other than sanitary sewage to the sanitary waste water treatment system?

[] Yes [] No

If yes, provide quality parameters for the influent stream

4. QUALITY PARAMETERS OF INFLUENT AND EFFLUENT FROM THE TREATMENT SYSTEM

Complete the following table providing information on each constituent that will or may be present in the wastewater stream (influent to the treatment system and treated effluent).

Parameter *	Influent concentration (mg/l)**		Effluent concentration (mg/l)	
	Daily Average	Daily Maximum	Daily Average	Daily Maximum

* As per Table 3C of RCER 2015 Volume I and other parameters if any

**Provide the influent concentration only if other waste water streams are also joining in the sanitary waste water treatment system.

5. SLUDGE GENERATION

Details of sludge generated from the effluent handling and treating units shall be provided in the following table (*Insert more rows if there is a need*).

Type of Sludge	Quantity (t/y)	Properties	Method of on-site storage	Disposal Method	Frequency of Disposal



FORM PA-W3
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE INDUSTRIAL WASTEWATER TO AN INDUSTRIAL WASTEWATER TREATMENT FACILITY

1. INDUSTRIAL WASTEWATER GENERATION:

Provide schematic flow diagrams showing rate of wastewater generation including the flow rate (m³/day) and significant quality parameters concentration from each process unit or source.

Diagram No. _____

2. DISCHARGE RATE OF INDUSTRIAL WASTEWATER:

Average discharge rate (m ³ /day)		Maximum design discharge rate, (m ³ /day)	
Maximum discharge rate during normal operation (m ³ /hour)			
Discharge point location (RC and UTM coordinates)			

Sources and quantity of wastewater being discharged

Source (s)	Average Quantity (m ³ /day)	Maximum Quantity (m ³ /hour)

3. WASTEWATER PRE-TREATMENT SYSTEM:

a) Is there a wastewater pre-treatment system: [] Yes [] No

If the answer is no, go to question 4

b) Provide Best Available Techniques (BAT) analysis for the wastewater pre-treatment (for new and modified facilities only)

List the relevant section/ page numbers in the attachment

c) Describe the wastewater pre-treatment system including:

i. Process description for the pretreatment plant.

List the relevant section/ page numbers in the attachment

- ii. Design details of all the effluent handling units with associated PFD's (include data on design loading rates and design pollutant removal efficiencies)

List the relevant section/ page numbers in the attachment

--

Process Flow Diagram No. _____

- iii. Treatment chemicals (if any) and the quantity to be used (*Insert more rows of there is a need*)

iv.

Chemical (s)	Average Quantity (kg/day)	Maximum Quantity (kg/hr)

- v. Will the pre-treatment of the wastewater lead to any source of air emissions

Yes No

If yes, confirm that air emissions are included in Form PA-A6 “Fugitive Emissions”

Yes No

4. WASTEWATER QUALITY – NORMAL OPERATIONS:

Complete the following table providing information on the composition of the wastewater effluent during normal operations. Where a pre-treatment system is used, include the influent composition to the pre-treatment system.

Parameter*	Influent concentration (mg/l)		Effluent concentration (mg/l)	
	Daily Average	Hourly Maximum	Daily Average	Hourly Maximum

*As per Table 3B of RCER-2015, Volume I and other parameters if any

5. INDUSTRIAL WASTEWATER QUALITY - UPSET CONDITIONS/TURNAROUNDS

- a) Provide details on the wastewater generated during upset conditions or turnarounds

Frequency of upsets _____ times every _____ year(s)
 Frequency of turnarounds _____ times every _____ year(s)

Average discharge rate (m ³ /day):		Maximum discharge rate (m ³ /hour):	
---	--	--	--

- b) Sources and quantity of wastewater being discharged during such conditions

Source (s)	Average Quantity (m ³ /day)	Maximum Quantity (m ³ /hour)

- c) Procedures for ensuring that wastewater generated meets RC criteria:

List the relevant section/ page numbers in the attachment

--

- d) Complete the following table providing information on the composition of the wastewater effluent during upset conditions/ turnarounds. Where a pre -treatment system is used, include the influent composition to the pre-treatment system:

Parameter*	Influent concentration (mg/l)		Effluent concentration (mg/l)	
	Daily Average	Hourly Maximum	Daily Average	Hourly Maximum

* As per Table 3B of RCER-2015, Volume I and other parameters if any

6. HOLDING POND

- a) Provide information on the holding pond that will retain 72 hours of industrial wastewater

Maximum discharge quantity in 3 days (m ³):		Capacity of the Holding Pond (m ³):	
---	--	---	--

- b) Provide design details of the Pond(s):
- i. Construction/design basis
 - ii. Dimensions
 - iii. Inlet and outlet structures
 - iv. Liner characteristics
 - v. Oil/water or solids separation devices

List the relevant section/ page numbers in the attachment

Design Drawing No. _____

7. INDUSTRIAL WASTEWATER DISCHARGE LOCATION

Will the industrial wastewater be discharged to the IWTP?

- Yes, via sewer Yes, via tanker No

If via sewer, provide pump station number and RC and UTM coordinates

If no or via tanker, provide justification

List the relevant section/ page numbers in the attachment

8. SAMPLING

- a) Provide location of sampling points, flow meter, flow totalizer, auto-sampling system and any continuous monitoring analyzers

Drawing No. _____

- b) Provide the construction plan for of the cabin to be built outside facility boundary for housing the auto-sampling system

Drawing No. _____

- c) Provide details of any continuous monitoring analyzers used for effluent monitoring

List the relevant section/ page numbers in the attachment

- d) Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports

Parameter*	Frequency

* As per Table 3B of RCER-2015, Volume I and other parameters if any

9. SLUDGE GENERATION

Provide details of the sludge generated from the system *(Insert more rows if necessary.)*

Type of Sludge	Quantity (t/month)	Hazardous properties	Hazardous Constituents	Method of On-site Storage	On site Treatment	Disposal Method	Frequency of Disposal

Will this sludge lead to any source of air emissions?

Yes No

If yes, confirm that air emissions are included in Form PA-A6 “Fugitive Emissions”.

Yes No

FORM PA-W4
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE TREATED INDUSTRIAL WASTEWATER TO THE RED SEA (Yanbu Only)

1. INDUSTRIAL WASTEWATER GENERATION:

Provide schematic flow diagrams showing rate of wastewater generation including the flow rate (m³/day) and significant quality parameters concentration from each process unit or source.

Diagram No. _____

2. DISCHARGE POINT COORDINATES (RC and UTM Coordinates)

North:

East:

3. DISCHARGE RATE OF INDUSTRIAL WASTEWATER:

Average discharge rate (m ³ /day)		Maximum design discharge rate (m ³ /hour)	
Maximum discharge rate during normal operation (m ³ /hour)			

Sources and quantity of wastewater being discharged

Source (s)	Average Quantity (m ³ /day)	Maximum Quantity (m ³ /hour)

4. WASTEWATER TREATMENT SYSTEM

a) Is there a wastewater pre-treatment system

Yes

No

If the answer is no, go to question 5

b) Provide Best Available Techniques (BAT) analysis for the wastewater treatment (*for new and modified facilities only*)

List the relevant section/ page numbers in the attachment

- c) Describe the wastewater treatment system including:
- i. Process description for the treatment plant.

List the relevant section/ page numbers in the attachment

--

- ii. Design details of all the effluent handling units with associated PFD's (include data on design loading rates and design pollutant removal efficiencies)

List the relevant section/ page numbers in the attachment

--

Diagram No. _____

- iii. Treatment chemicals (if any) and the quantity to be used *(Insert more rows of there is a need)*

Chemical (s)	Average Quantity (kg/day)	Maximum Quantity (kg/hr)

- iv. Will the treatment of the wastewater lead to any source of air emissions

Yes No

- v. If yes, confirm that air emissions are included in Form PA-A6 “Fugitive Emissions”

Yes No

5. WASTEWATER QUALITY – NORMAL OPERATIONS:

Complete the following table providing information on the composition of the wastewater effluent during normal operations. Where a treatment system is used, include the influent composition to the treatment system.

Parameter*	Influent concentration (mg/l)		Effluent concentration (mg/l)	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum

* As per Table 3C of RCER-2015, Volume I and other parameters if any

6. INDUSTRIAL WASTEWATER QUALITY - UPSET CONDITIONS/ TURNAROUNDS

a) Provide details on the wastewater generated during upset conditions or turnarounds

Frequency of upsets _____ times every _____ year(s)
 Frequency of turnarounds _____ times every _____ year(s)

Average discharge rate (m ³ /day)		Maximum discharge rate (m ³ /hour)	
---	--	--	--

b) Sources and quantity of wastewater being discharged during such conditions

Source (s)	Average Quantity (m ³ /day)	Maximum Quantity (m ³ / hour):

c) Procedures for ensuring that wastewater generated meets RC criteria:

List the relevant section/ page numbers in the attachment

--

d) Complete the following table providing information on the composition of the wastewater effluent during upset conditions/ turnarounds. Where a treatment system is used, include the influent composition to the treatment system:

Parameter*	Influent concentration (mg/l)		Effluent concentration (mg/l).	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum

* As per Table 3B of RCER-2015, Volume -I and other Parameters if any



7. HOLDING POND

- a) Provide information on the holding pond that will retain 72 hours of industrial wastewater

Maximum discharge quantity in 3 days (m ³):		Capacity of the Holding Pond (m ³):	
---	--	---	--

- b) Provide design details of the Pond(s):
- i. Construction/design basis
 - ii. Dimensions
 - iii. Inlet and outlet structures
 - iv. Liner characteristics
 - v. Oil/water or solids separation devices

List the relevant section/ page numbers in the attachment

Drawing No. _____

8. MEANS OF TREATED INDUSTRIAL WASTEWATER DISCHARGE

- a. What are the means to be used for discharging the treated industrial wastewater to the Red Sea?

Via pipeline Via tanker Other means

If via pipeline, provide pump station number and RC and UTM coordinates _____

If via tanker or other means provide justification

List the relevant section/ page numbers in the attachment

- b. Site plan indicating the proposed location (also RC and UTM coordinates) of the discharge point to the Red Sea

Drawing No: _____



9. SAMPLING

- c. Provide location of sampling points, flow meter, flow totalizer, auto-sampling system and any continuous monitoring analyzers

Drawing No. _____

- d. Provide details of the cabin to be built outside facility boundary for housing the auto-sampling system

Drawing No. _____

- e. Provide details of any continuous monitoring analyzers used for effluent monitoring

List the relevant section/ page numbers in the attachment

--

- f. Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports

Parameter	Frequency

10. SLUDGE GENERATION

Provide details of the sludge generated from the system *(Insert more rows if necessary).*

Type of Sludge	Quantity (t/month)	Physical Properties	Chemical Composition	Hazardous Constituents	Method of On-site Storage	Disposal Method	Frequency of Disposal

Will this sludge lead to any source of air emissions?

Yes

No

If yes, confirm that air emissions are included in Form PA-A6 “Fugitive Emissions”.

Yes

No

FORM PA-W5
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE
NON-CONTACT COOLING WATER

1. NON-CONTACT COOLING WATER

Provide a schematic flow diagram of the non-contact cooling water system including inlet, heat exchangers, distribution and discharge.

Diagram No. _____

2. RATE OF NON-CONTACT COOLING WATER

Average discharge rate (m ³ /day)		Maximum design discharge rate (m ³ /hour)	
Maximum discharge rate during normal operation (m ³ /hour)			

3. TEMPERATURE

What is the estimated increase in temperature of the non-contact cooling water passing through the system?

Daily average increase in Temp (°C) :		Maximum increase in Temp (°C) :	
---	--	------------------------------------	--

4. ADDITIVES

a) Will supplementary chlorination be used?

Yes

No

b) Will any chemical(s) be introduced in the non-contact cooling water system on a continuous or intermittent basis?

Yes

No

If the answer is "No" go to Question (5)

c) If yes, provide information on the chemical(s):

Chemical	Composition	Application Rate/ Frequency	Conc. in Final Discharge (mg/l)

d) Submit Material Safety Data Sheets (MSDS) of all the additives (except for chlorine)

List the relevant section/ page numbers in the addendum

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5. CHARACTERISTICS OF VARIANCE STREAMS (JUBAIL)/ BRINE DISCHARGES TO THE RED SEA (YANBU)

a) Any wastewater stream(s) will be introduced to the non-contact cooling water system on a continuous or intermittent basis:

Yes No

If the answer is “No” go to Question (6)

b) If yes, complete the following tables providing information on each constituent that will or may be present in the non-contact cooling water stream (Variance Stream) which will be introduced either continuously or intermittently

Source	Avg. Discharge Rate (m ³ /hour) Continuous	Average Discharge Rate (m ³ /day) Intermittent	Maximum discharge rate (m ³ /hour)	Frequency of Discharge Intermittent

Quality of the variance stream/ brine prior to mixing with the return cooling water

Parameter*	Average Concentration (mg/l)	Maximum Concentration (mg/l)

* As per Table 3C of RCER-2015, Volume I and other Parameters if any

6. SAMPLING

a) Provide location of sampling points, flow meter, flow totalizer and temperature measurement for the seawater cooling return.

Drawing No. _____

b) Provide location of sampling points, flow meter, flow totalizer, auto-sampling system and any continuous monitoring analyzers for the variance stream/ brine prior to mixing with the seawater cooling return

Drawing No. _____



- c) Provide details of the cabin(s) to be built for housing any auto-sampling system(s)

Drawing(s) No. _____

- d) Provide details of any continuous monitoring analyzers used for variance stream/ brine

List the relevant section/ page numbers in the attachment

--

- e) Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports for seawater cooling return

Parameter	Frequency

- f) Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports for variance streams/ brine

Name of Variance Stream	Parameter	Frequency

- g) Provide a site plan indicating the proposed location (also RC and UTM coordinates) of the outfall to the Red Sea

Drawing(s) No. _____

FORM PA-W6
PERMIT APPLICATION FOR AUTHORIZATION TO OPERATE
COOLING TOWERS

Note: A separate application has to be filled for each cooling tower, unless they are identical.

1. NON-CONTACT COOLING WATER

Provide a schematic flow diagram of the non-contact cooling water system including inlet, heat exchangers, distribution and discharge.

Diagram No. _____

2. TYPE OF WATER USED IN COOLING TOWER

- Seawater
 Reclaimed Water
 Other (e.g. raw water, drinking water, desalinated water): _____

3. TYPE OF COOLING TOWER

- Fan Assisted Natural Draught (FAND)
 Mechanical Draught (MD)

4. DESIGN DETAILS OF COOLING TOWER

Length (m)		Width (m)	
Height (m)		No. of cells	
Temp. In (°C)		Temp. Out (°C)	
Total Water Circulation Rate in the System (m ³ /hour)		Drift Losses (% of total circulated water)	
Makeup Water (m ³ /h)		Air Velocity (ft/s)	

Provide plot plan indicating the location of the cooling towers and their associated inlet and outlet flow of water.

Diagram No. _____

5. DISCHARGE RATE OF COOLING TOWER BLOW DOWN

Average discharge rate (m ³ /day)		Maximum discharge rate (m ³ /hour)	
--	--	---	--

6. LOCATION OF BLOW DOWN DISCHARGE

- Industrial Wastewater Treatment Plant (IWTP)
 Seawater Cooling Return

7. ADDITIVES

a) Will supplementary chlorination be used

Yes No

b) Will any chemical(s) be introduced in the cooling water system on a continuous or intermittent basis?

Yes No

If the answer is no, go to question 8

c) Provide information on the chemical(s):

Chemical	Composition	Application Rate/ Frequency	Conc. in Final Discharge (mg/l)

d) Submit Material Safety Data Sheets (MSDS) of all the additives (except for chlorine)

List the relevant section/ page numbers in the addendum

--

8. CHARACTERISTICS OF VARIANCE STREAMS (JUBAIL)/ BRINE DISCHARGES TO THE RED SEA (YANBU)

a) Any wastewater stream(s) will be introduced to the cooling water return system on a continuous or intermittent basis:

Yes No

If the answer is no, go to question 9

Source	Avg. Discharge Rate (m ³ /hour)	Maximum discharge rate (m ³ /hour)	Frequency of Discharge



b) Quality of the variance stream/ brine prior to mixing with the return cooling water

Parameter*	Average Concentration (mg/l)*	Maximum Concentration (mg/l)*

* As per Table 3-C of RCER-2015, Volume I and other parameters if any

9. SAMPLING

a) Provide location of sampling points, flow meter, flow totalizer and temperature measurement for the cooling tower blowdown.

Drawing No. _____

b) Provide location of sampling points, flow meter, flow totalizer, auto-sampling system and any continuous monitoring analyzers for the variance stream/ brine prior to mixing with the seawater cooling return

Drawing No. _____

c) Provide details of the cabin(s) to be built for housing any auto-sampling system(s)

Drawing(s) No. _____

d) Provide details of any continuous monitoring analyzers used for variance stream/ brine

List the relevant section/ page numbers in the attachment

--

e) Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports for cooling tower blow-down

Parameter	Frequency



- f) Identify a list of parameters to be regularly monitored and reported to the Royal Commission in the monthly self-monitoring reports for variance streams/ brine

Name of Variance Stream	Parameter	Frequency

10. LOCATION OF THE OUTFALL TO THE RED SEA

Provide a site plan indicating the proposed location (also RC and UTM coordinates) of the outfall to the Red Sea

Drawing(s) No. _____

11. COOLING TOWER BOTTOM SLUDGE

Provide the following information regarding the cooling tower bottom sludge

Quantity (ton)	Hazardous properties	Hazardous Constituents	Method of On-site Storage	On site Treatment	Disposal Method	Frequency of Disposal



FORM PA-W7
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE STORMWATER
AND SURFACE RUN-OFF WATER

1. STORM WATER DISCHARGES

Provide details of the site drainage and storm water collection system. Include the followings:

- a. Drawing showing the drainage from the process and non-process areas. Indicate the point where the plant’s storm water will meet the storm water channel outside the boundary fence

Drawing No. _____

- b. The size of process and non–process areas on-site

Process Area (m ²)	
Non-Process Area (m ²)	

- c. Estimate the first flush surface run off volume (m³) from both process and non-process surface areas for a 30 mm storm event:

Volume from Process Area (m ³)	
Volume from Non-Process Area (m ³)	
Total Volume (m ³)	
Capacity of the Storm water Pond (m ³)*	

*Process area only

2. STORMWATER COLLECTION AND DISPOSAL:

- a. Is the stormwater system separated from the industrial wastewater collection system?

Yes No

If no, provide justification for not separating both collection systems

List the relevant section/ page numbers in the attachment

- b. Describe the proposed method of collecting the first flush and diverting the stormwater in excess of the first flush:

List the relevant section/ page numbers in the attachment

- c. If the water is found to be contaminated, what measures will be taken to dispose of it as per Table 3B of RCER-2015, Volume I?

List the relevant section/ page numbers in the attachment

3. STORMWATER POND

- a. Provide design details of the stormwater pond:

- i. Construction/design basis
- ii. Dimensions
- iii. Inlet and outlet structures
- iv. Impermeable liner characteristics
- v. Oil/water or solids separation devices

List the relevant section/ page numbers in the attachment

- b. Provide a drawing of the stormwater pond showing its design details

Drawing No. _____



**FORM PA-W8
PERMIT APPLICATION FOR AUTHORIZATION TO DISCHARGE
BALLAST WASTEWATER**

1. BALLAST WATER SYSTEM

Provide schematic flow diagrams for the ballast water treatment system

Diagram No. _____

2. DESIGN DISCHARGE RATE OF TREATED BALLAST WASTEWATER

Average discharge rate (m ³ /day):		Maximum discharge rate (m ³ /day):	
--	--	--	--

3. DISCHARGE OF THE FINAL EFFLUENT

- a) Site plan of the facility indicating the exact location of the proposed discharge using RC and UTM Coordinates.

Drawing No. _____

North (m)	
East (m)	

- b) Process description for the treatment system

List the relevant section/ page numbers in the attachment

- c) Design details of all the effluent handling units with associated drawings

List the relevant section/ page numbers in the attachment

Drawing No. _____

4. QUALITY PARAMETERS OF INFLUENT AND EFFLUENT FROM THE TREATMENT PLANT

Complete the following table providing information on each constituent that will or may be present in the final discharged ballast water.

Parameter*	Influent Concentration (mg/l)	Effluent Concentration (mg/l)

* As per Table 3E of RCER-2015, Volume I and other Parameters if any

5. SLUDGE GENERATION

Details of sludge generated from the effluent handling and treating units shall be provided in the following table (Insert more rows if there is a need).

Type of Sludge	Quantity (t/y)	Physical Properties	Chemical Properties	Hazardous Properties	Method of On-Site Storage	Disposal Method	Frequency of Disposal

Will this sludge lead to any source of air emissions?

Yes No

If yes, confirm that air emissions are included in Form PA-A6 "Fugitive Emissions".

Yes No

**FORM PA-W9
PERMIT APPLICATION FOR AUTHORIZATION TO CONSTRUCT
GROUNDWATER MONITORING WELLS**

1. BASELINE GROUNDWATER QUALITY

- a) Provide the location of the monitoring wells used to conduct the baseline groundwater study

Drawings No. _____

- b) Complete the following table providing information on the baseline groundwater quality constituent that will or may be present in the groundwater.

Parameter*	Concentration (mg/l)

*As per Groundwater Monitoring Guidelines (RCER-2015, Volume II, Appendix E)

- c) Provide the flow pattern of the groundwater flow marked with directions and superimposed on the facility map.

2. PROPOSED LOCATION OF THE PERMANENT MONITORING WELLS

Provide the location (also RC and UTM coordinates) of the permanent monitoring wells

Drawings No. _____

3. DESIGN AND CONSTRUCTION DETAILS OF GROUNDWATER MONITORING WELLS

Provide the Design details of the monitoring wells proposed to be constructed

Drawings No. _____

(Note: Refer to Groundwater Monitoring Guidelines in Appendix E)

PERMIT APPLICATION FORMS

HAZARDOUS MATERIALS AND WASTE

FORM PA-H1
PERMIT APPLICATION FOR AUTHORIZATION FOR HANDLING AND STORAGE
OF HAZARDOUS MATERIALS

1. HAZARDOUS MATERIALS HANDLING

Provide the following information on all hazardous substances (raw materials/feed stocks, products / by products additives, catalysts, fuels, solvents, lubricants, and any other chemicals or materials) to be used at the facility and stored in quantities in excess of 50 kg.

Hazardous Substance/ Major Hazardous Constituents	Physical Properties	Hazardous Materials Classifications	Process/ Unit Used	Maximum Storage Quantity (kg)	Transport/ Storage Methods*

* Above ground storage tank, underground storage tanks, ISO Container, cylinder, tote, drum, stockpile or surface impoundment, other

- a. Provide Material Safety Data Sheet (MSDS) for all hazardous substances to be handled

List the relevant section/ page numbers in the attachment

--

- b. Provide details of any radioactive materials handled by the facility.

--

2. HAZARDOUS MATERIALS STORAGE – MOBILE STORAGE

- a. Complete the following table for all hazardous materials stored in above ground storage tanks

Hazardous Material	Type of Storage ¹	No. of Units	Capacity of Unit (m ³)	Storage Temperature ²	True Vapour Pressure at Storage Temp (kPa)	Storage Area ³

1. ISO container, tote, drum, bags, cylinder, other

2. Ambient temperature = 40 °C

3. Warehouse, yard or other

- b. Provide design details, specifications and drawing for the secondary containment where the containers for each area where these units are stored. Details must include
 - i. Capacity of the area
 - ii. Construction materials
 - iii. Impervious liner characteristics
 - iv. Drainage, if any.

List the relevant section/ page numbers in the attachment

Drawing No. _____

3. HAZARDOUS MATERIALS STORAGE – ABOVE GROUND STORAGE TANKS

- a. Complete the following table for all hazardous materials stored in above ground storage tanks

Hazardous Material	Tank ID	Capacity (m ³)	Shape ¹	Dimensions (m)	Storage Temp (°C)

>>> table continued

True Vapor Pressure at Storage Temp (kPa) ²	Type of Tank ³	Secondary Containment Capacity (m ³)

- 1. Cylindrical, Horizontal, vertical, rectangular,
- 2. if storage is at ambient temperature then provide True Vapor Pressure @ 40 °C
- 3. Fixed roof, Fixed Roof w/Internal Floating Roof, Pressurized Tank, External Floating Roof

- b. Provide the following for each type of storage tank
 - i. Design details, specifications and materials of construction for each storage tank
Drawing No. _____
 - ii. Overspill and leak detection systems
 - iii. Secondary containment including construction material and impervious liner characteristics and drainage, if any.



- iv. Inspection criteria including floating roof as well as primary and secondary seal inspections

List the relevant section/ page numbers in the attachment

- c. Provide description of the process that use or generate above hazardous substances

List the relevant section/ page numbers in the attachment

4. HAZARDOUS MATERIALS STORAGE – UNDERGROUND STORAGE TANKS

- a. Complete the following table for all hazardous materials stored in underground storage tanks

Hazardous Material	Tank ID	Capacity (m ³)	Dimensions (m)

>>> table continued

Storage Temperature	True Vapor Pressure at Storage Temp (kPa)	Secondary Containment Capacity (m ³)

- b. Provide the following for each type of underground storage tank
 - i. Justification for using underground storage
 - ii. Design details, specifications and materials of construction for each storage tank
Drawing No. _____
 - iii. Tank corrosion protection and structural integrity
 - iv. Overspill and leak detection systems
 - v. Secondary containment including construction material and impervious liner characteristics and drainage, if any.
 - vi. Inspection criteria

List the relevant section/ page numbers in the report



- c. Provide description of the process that use or generate above hazardous substances

List the relevant section/ page numbers in the attachment

5. EMISSIONS CONTROL

- a. Provide calculations for storage tank emissions using USEPA AP-42 Methods for both static losses and during tank turnovers

List the relevant section/ page numbers in the attachment

- b. Are there any emission control devices?

[] Yes

[] No

If yes, specify type of the control device *(add additional rows if necessary)*

Source	Control Device	Control Unit ID	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)

- b. Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the attachment

6. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. in Regulated Unit		Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*
				Conc.	Unit			

* Provide a sample calculation for emission estimation. Emission estimation must be based on one of the following

- EF: Emission Factors – USEPA AP 42 MB: Material Balance
 EC: Engineering Calculation

7. TANK EMISSION CALCULATIONS

Provide emission estimates for all storage tanks (Fixed Roof, External / Internal Floating Roof using the US EPA AP-42 Emission Calculation. Also provide the data as required in the following tables.

a. Fixed Roof Tanks: (insert more columns if necessary)

Fixed Roof Tanks	1	2	3
Tank Identification No.			
Total number of identical tanks			
Type of tank			
Name of material stored in the tank			
Tank Diameter (Ft)			
Color of the a) Roof b) Shell			
Tank Capacity (gallons)			
Total throughput per year (gallons)			
Number of turnover per year			
Height of tank			
Average vapor space height (ft)			
Avg. temperature of storage liquid , Ts. (°F)			
True vapor pressure of storage liquid at the storage temperature (Ts) in Pisa			
Molecular weight of vapor in storage tank at 82 °F , (lb/lb mole)			



(b). Floating Roof Tanks: (insert more columns if necessary)

Floating Roof tanks	1	2	3
Tank Identification No.			
Total number of identical tanks			
Name of material stored in the tank			
Type of tank (Internal floating/ External floating roof)			
Type of seal (Fill as per Note-1)			
Tank Diameter (Ft)			
Color			
a) Roof			
b)Shell			
Condition of shell (light rust/ Dense rust /Gunite lined)			
Number of columns (for Int. fl. Tanks)			
Effective column diameter (Ft) (= Column perimeter/ 3.14)			
Tank Capacity (gallons)			
Total throughput per year (gallons)			
Number of turnover per year			
Avg. temperature of storage liquid , Ts. (°F)			
True vapor pressure of storage liquid at the storage temperature (Ts) in Pisa			
Average density of the liquid stored (lb/gallon)			
Molecular weight of vapor in storage tank at 60 °F (lb/lb mole)			

- Note 1:**
- A - Metallic shoe seal with primary seal only
 - B - Metallic shoe seal with shoe mounted secondary seal
 - C - Metallic shoe seal with rim mounted secondary seal
 - D - Liquid mounted resilient seal with primary seal only
 - E - Liquid mounted resilient seal with weather shield
 - F - Liquid mounted resilient seal with rim mounted secondary seal
 - G - Vapor mounted resilient seal with primary seal only
 - H - Vapor mounted resilient seal with weather shield
 - I - Vapor mounted resilient seal with rim mounted secondary seal

(c). Internal Floating Roof Tanks (insert more columns if necessary)

Deck fittings			
Deck fitting type (Fill as per Note -2)			
Number of such deck fittings			
Total length of deck seams (ft)			
Area of Deck (ft ²)			

- Note 2 :**
- A - Access hatch, Bolted cover, Gasketed
 - B - Access hatch, Unbolted cover, Gasketed
 - C - Access hatch, Unbolted cover, Ungasketed
 - D - Automatic gauge float well, Bolted cover, Gasketed
 - E - Automatic gauge float well, Unbolted cover, Gasketed
 - F - Automatic gauge float well, Bolted cover, Ungasketed
 - G - Column well , Built-up column-sliding cover, Gasketed
 - H - Column well , Built-up column-sliding cover, Ungasketed
 - I - Column well , Pipe column-flexible fabric sleeve seal
 - J - Column well , Pipe column-sliding cover, Gasketed
 - K - Column well , Pipe column-sliding cover, Ungasketed
 - L - Ladder well, Sliding cover, Gasketed
 - M - Ladder well, Sliding cover, Ungasketed
 - N - Roof leg or hanger well, Adjustable
 - O - Roof leg or hanger well, Fixed
 - P - Sample pipe or well, Slotted pipe-sliding cover, Gasketed
 - Q - Sample pipe or well, Slotted pipe-sliding cover, Ungasketed
 - R - Sample pipe or well, Sample well-slit fabric seal, 10% open area
 - S - Stb drain, 1 Inch diameter
 - T - Vacuum breaker, Weighted mechanical actuation, Gasketed
 - U - Vacuum breaker, Weighted mechanical actuation

**FORM PA-H2
PERMIT APPLICATION FOR AUTHORIZATION FOR WASTE MANAGEMENT**

1. MUNICIPAL WASTE GENERATION AND DISPOSAL

If municipal waste is generated, please fill the following information *(add additional rows if necessary)*

Process/ Source	Type/ Name	Maximum Quantity (t/y)	Classification ¹	Mode of Transportation	Disposal/ Recycling Method ²	Disposal/ Recycling Location

¹ Municipal (e.g. office, canteen), inert, construction, waste

² Disposal (landfilling), recycling or reuse, etc.

2. NON-HAZARDOUS INDUSTRIAL WASTE GENERATION

If non-hazardous waste is generated, please fill the following information *(add additional rows if necessary)*

Process/ Source	Type/ Name	Maximum Quantity (t/y)	Physical Form	Chemical Composition	Mode of Transportation	Disposal/ Recycling Method ¹	Disposal/ Recycling Location

1. Stabilization, Landfilling, Recycling or Reuse, etc.

3. (a) HAZARDOUS INDUSTRIAL WASTE GENERATION

If hazardous waste is generated, please fill the following information *(add additional rows if necessary)*

Process/ Source	Type/ Name	Maximum Quantity (t/y)	Physical Form	Chemical Composition	Hazard Classification ¹	Hazardous Constituents

>>> Table continued

Mode of Transportation	Treatment Disposal / Recycling & Disposal Method ²	Disposal/ Recycling Location
------------------------	--	---------------------------------

1. In accordance to the United Nations Chemical Hazard Classification System

2. Disposal (evaporation, incineration, stabilization/ Class II landfill, Class I landfill), Recycling or Reuse etc.

3 (b). Identify the waste(s) which could be recycled, reused or regenerated (add additional rows if necessary)

Waste Name / type	Quantity (t/y)	Method of Recycling / Reuse / Regeneration	Location of Recycling / Reuse / Regeneration facility

3 (c). Provide detail characteristics of the waste.

4. HAZARDOUS & NON HAZARDOUS INDUSTRIAL WASTE ANALYSIS DATA

Provide a detailed chemical and physical analysis of a representative sample of hazardous substance or waste to be disposed at or by this facility as required in the table below. (Published or documented data on the hazardous substance or wastes can also be given).

Waste Description	Physical form & pH	Moisture content %	Chemical Composition *	Organic content, %	Calorific value, kcal/kg	Volatiles @100 °C

>>>>Table continued

TCLP Test Results	Loss on Ignition %	Hazardous properties and constituents** Heavy metals (Ba, Cd, Cr, Pb, Hg, Ag, As, Se, Cu, Fe, Mn, Ni, V)

* Proximate analysis

** Actual Hazardous constituents including metals

5. WASTE HANDLING AND STORAGE

a. Provide following information for all wastes stored at the facility.

Waste Description	Storage methods (tanks/ drums/ surface impoundments, etc)	Material of construction	Number of units	Storage capacity of each unit

b. Provide design and liner details of any surface impoundments used for storing hazardous wastes

List the relevant section/ page numbers in the attachment

c. Provide a drawing showing the location of the waste handling and storage area(s)
Drawing No. _____

d. Provide a drawing showing design details of the waste handling and storage area(s)
Drawing No. _____

e. Provide details of secondary containment used to prevent overflow from spills/ leaks around hazardous wastes storage areas.

List the relevant section/ page numbers in the attachment

6. WASTE PRE-TREATMENT AND DISPOSAL

a. Provide the following information for each treatment technique and/ or waste/ substance treated at the facility.

Waste Description	Pre-treatment technique	Pre-treatment efficiency, %	Treatment chemicals	Disposal method

b. Waste treatment facilities: Complete design, drawings and operational details for all the treatment techniques/ processes employed at the facility.

List the relevant section/ page numbers in the attachment

Drawing No. _____

- c. Waste Disposal facilities: Complete design, drawings and operational details for all the disposal methods employed at the facility

List the relevant section/ page numbers in the attachment

Drawing No. _____

FORM PA- H3
**PERMIT APPLICATION FOR AUTHORIZATION TO TRANSPORT HAZARDOUS/
NON-HAZARDOUS INDUSTRIAL WASTES / HAZARDOUS SUBSTANCES**

1. APPLICANT

Name of Transporter: _____

Owner(s): _____

Operator (s): _____

Applicant Address: _____

Contact Person: _____

Title: _____

Tel: _____

Fax: _____

E-mail: _____

Transporter Status: New

Existing

2. APPLICANT ACTIVITY

An industrial facility, which will be transporting hazardous substances or wastes offsite that are produced in the course of its own daily operations:

A contracting entity whose primary activity involves transporting hazardous substances for other commercial or industrial facilities:

Note: Submit Commercial Registration Certificate for the activity.

3. INFORMATION ON THE TRANSPORTED MATERIALS

Provide information on the hazardous and non-hazardous materials and wastes that will be transported

- Bulk Solids
- Liquid
- Sludge
- Drums
- Other: _____

4. INFORMATION ON THE MEANS OF TRANSPORTATION

a) Indicate the type of transportation activity for which authorization is sought:

- Vehicle/ Trucks
- Road Tanker
- Ship
- Other _____

b) Provide information required in the following table:

Registration No. *	Vehicle Type & Model.	Year of manufacture	Materials to be Transported	Capacity (tons/ drums)	Operating Area/ Region

* Submit copy of vehicle registration details and Motor Vehicle Periodic Inspection –MVPI (Fahas Al-Daoury) in support of the above.

c) Are all transportation system covered for collision, liability or other applicable insurance?

- Yes No

If 'Yes', then complete the following table:

Name of the insurance* company	Address of the insurance company	Type of Insurance

* Submit copy of insurance document in support of the above.

d) Is an emergency response plan available for transportation system?

Yes

No

If 'No', when will such plan be available?

e) Is an employee health/ safety / training plan available for transportation system?

Yes

No

If 'No', when will such plan be available?

f.) Will the facility transport waste outside the industrial city (after approval of RC)?

Yes

No

If 'Yes', provide a copy of PME Certificate

PERMIT APPLICATION FORMS

MISCELLANEOUS

**FORM PA-M1
PERMIT APPLICATION FOR AUTHORIZATION TO CARRY OUT
LOADING/ UNLOADING OPERATIONS**

1. DESCRIPTION OF LOADING / UNLOADING OPERATIONS

a. Is there loading/ unloading of fluids that may contain Volatile Organic Compounds (VOC) or Organic Hazardous Air Pollutants (HAP) at the facility?

Yes No

b. Is there loading/ unloading of fluids that may contain Volatile Organic Compounds (VOC) or Organic Hazardous Air Pollutants (HAP) at the port?

Yes No

c. Is there loading/ unloading of bulk materials that may emit dust or suspended particulate matter at the facility?

Yes No

d. Is there loading/ unloading of bulk materials that may emit dust or suspended particulate matter at the port?

Yes No

If the answer to any of the above questions is yes, provide details on the loading/ unloading operations.

List the relevant section/ page numbers in the attachment

--

e. Provide a site plan indicating the locations of loading / unloading assemblies

Drawing No. _____

2. DETAILS ON MATERIALS TO BE LOADED/ UNLOADED (GAS):

(add additional rows if necessary)

Material	Maximum Quantity loaded/ unloaded (t/d)	Average Quantity loaded/ unloaded (t/y)	Frequency	Molecular Weight	Temperature of gas loaded/ unloaded (°C)



3. DETAILS ON MATERIALS TO BE LOADED/ UNLOADED (SOLID):

(add additional rows if necessary)

Material	Maximum Quantity loaded/ unloaded (t/d)	Average Quantity loaded/ unloaded (t/y)	Frequency	Density (kg / m ³)

* Average size of the unpacked solid materials.

4. DETAILS ON MATERIALS TO BE LOADED/ UNLOADED (LIQUID):

(add additional rows if necessary)

Material	Maximum Quantity loaded/ unloaded (t/d)	Average Quantity loaded/ unloaded (t/y)	Frequency	Density (kg / m ³)	Temperature of the liquid material loaded / unloaded (°C)	True vapor pressure of liquid at temp. of loading (kPa)

5. DETAILS ON THE METHOD OF LOADING/ UNLOADED

- a. Type of Cargo
 - Road Tanker Ship
 - ISO Container
 - Other (*specify*): _____

- b. Method of Loading/ Unloading
 - Submerged Vapor balance
 - Splash
 - Other (*specify*): _____

- c. Tanks Loaded/ Unloaded
 - Dedicated Multiple use
 - Ship
 - Other (*specify*): _____

6. EMISSIONS CONTROL

Are there any emission control systems in place?

Yes No

If yes, please specify type of the control device

Source	Control Device	Control Unit ID	Pollutant	Pollutant Inlet Conc. (mg/m ³)	Pollutant Inlet Load (t/y)	Control Efficiency (%)

Provide technical information, design details along with vendor guarantees for each control device

List the relevant section/ page numbers in the attachment

7. AIR POLLUTANTS

Complete the following table for all emission sources. For sources that are equipped with an emission control device, provide data after the emission control.

Source	Unit ID	Pollutant	Max Conc. (mg/m ³)	Max. Conc. in Regulated Unit		Max. Emission Rate (kg/hr)	Avg. Emission Rate (t/yr)	Emission Estimation Technique*
				Conc.	Unit			

* Provide a sample calculation for emission estimate. Emission estimation must be based on one of the following:

- EF: Emission Factors
- MB: Material Balance
- ST: Stack testing or monitoring
- EC: Engineering Calculation

8. ADDITIONAL INFORMATION FOR USEPA AP-42 CALCULATIONS

Provide the following information for each liquid material loaded/unloaded which is used for AP 42 Calculations *(insert more columns if necessary)*

Source			
Name of material loaded			
Type of cargo (Trucks/Ships/Barges)			
Type of loading (Fill as per note-1 below)			
Number of loading arms (if applicable)			
Molecular weight of vapor at 60°F (lb/lb-mole)			
Temperature of liquid loaded, Deg F			
Vapor pressure of liquid at the above temperature, psia			
Average loading rate for each arm, ton/hr			

Note-1: Type of loading:

- A - Submerged loading of a clean cargo tank
- B - Submerged loading with dedicated normal service
- C - Submerged loading with dedicated vapor balance service
- D - Splash loading of a clean cargo tank
- E - Splash loading with dedicated normal service
- F - Splash loading with dedicated vapor balance service
- G - Submerged loading into ship
- H - Submerged loading into barge

FORM PA-M2
PERMIT APPLICATION FOR AUTHORIZATION TO CARRY OUT DREDGING

1. DREDGING

Type of Dredging Maintenance Capital

Method of Dredging Mechanical Hydraulic

Dredging Volume _____ cubic meters

Dimensions of Dredged Site _____ m Long x _____ m wide x _____ m deep

Proposed Period of Dredging From _____ to _____

Location: Northing _____ Easting _____

Provide a site map indicating the approximate location of the dredging area, its topography, bathymetry, including area proposed for access causeways, dredging, filling and spoil disposal. The habitat of marine organism and the area that might be affected by dredging activity (if any) shall be included in the map.

Drawing No. _____

Describe the proposed dredging activity including its purpose and methodology and the proposed control systems

List the relevant section/ page numbers in the attachment

2. IMPACTS OF DREDGING OPERATIONS

- a) Provide details on the assessment of the impact of the dredging operations, which must include seasonal factors such as weather and marine life (spawning and migration), flora and fauna and factors that could influence the preferred timing of the dredging activity. Also, include the effects on costal erosion, water circulation, depth, current pattern, water fluctuation and water temperature.

List the relevant section/ page numbers in the attachment

- b) Describe type of material to be dredged including potential source of contamination present in the sediment

List the relevant section/ page numbers in the attachment

- c) Describe the proposed pollution mitigation measures

List the relevant section/ page numbers in the attachment

- d) Describe the temporary storage and final disposal of dredged materials

List the relevant section/ page numbers in the attachment

- e) Describe how the dredged material as well as the water that contains silt and clay would be contained and disposed at the disposal site:

List the relevant section/ page numbers in the attachment

- f) Provide details if any explosives are proposed to be used at any point during the overall operation (e.g. to remove coral knolls)

List the relevant section/ page numbers in the attachment

- g) In the space provided below, describe any maintenance operations which are anticipated and their frequency:

List the relevant section/ page numbers in the attachment

- h) Prior to dredging provide Sediment Sampling Plan (Number of core samples, sediment grain size or its composition and chemical analysis on the proposed dredging site as well as its sampling procedures and sample handling protocols).

FORM PA-M3
PERMIT APPLICATION FOR AUTHORIZATION TO USE NOISE SOURCES

1. NOISE SOURCES/ LEVELS

- a. Provide a list of all equipment which has potentially sources of noise (> 85dB) (*add additional lines if necessary*)

Source	Noise Level (dBA)	Duration	Frequency

List the relevant section/ page numbers in the attachment

- b. Provide a plot plan showing location of equipment/ sources with noise levels > 85 dBA

Drawing No. _____

- c. Provide a boundary noise model and/or survey

2. NOISE CONTROL

Provide a description of all proposed attenuation processes or specific measures to assure compliance with the regulations (*add additional lines if necessary*).

Source	Proposed Noise Control Device	Resulting Noise Level (dBA)

FORM PA-M4
PERMIT APPLICATION FOR EXEMPTIONS

1. NON COMPLIANCE (for existing facilities only)

Provide the following information on non-compliance issues at the facility (*add additional lines if necessary*)

Compliance Issue No	Process/ Unit	Regulation/ Standard Not Met	Compliance Issue	Extent of non-compliance	BAT Analysis Reference*	Compliance Plan Reference*

* List the relevant section/ page numbers in the attachment

2. EXEMPTIONS (for existing facilities only)

Complete the following table (*add additional lines if necessary*)

Compliance Issue No	Previously Exempted		Measures Taken to Address Issue*	Reason for Exemption ¹	Justification*	Final Compliance Date
	Yes	No				
	Yes	No				
	Yes	No				
	Yes	No				

¹ Choose of the following: Technical, Hazardous/ Safety, Financial, Other

* List the relevant section/ page numbers in the attachment

Appendix A

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

Facility
Name: _____

Date: _____

This questionnaire has been designed to identify the environmental issues related to the proposed industrial facilities. Additional information or a detailed application may be required. If additional space or lines are required, please add as needed.

1. Facility Information: *Provide the following on separate sheets.*

- a. *Brief proposed process / technology description. Please submit a two page summary explaining the process / technology in brief starting from raw material until final product is obtained including all potential pollution sources and their control measures.*
- b. *Process flow or block flow diagram showing all raw materials and auxiliaries used, water consumption per process, wastewater generation, emission points as well as solid and hazardous waste generation.*
- c. *Does the promoter have finalized the technology supplier for their project?* Yes No
- d. *If yes, provide the name and address of the technology supplier(s).*
- e. *Does the plant use any technology that has not been used elsewhere?* Yes No
- f. *How many similar plants are currently operating in Saudi Arabia or in other parts of the world using the same technology that is being planned in the industrial city?*
- g. *Does the facility operation involve bulk material handling of raw materials or products which are fine powder in nature? If yes, provide estimated quantities of such materials.*
- h. *Does the facility operation involve trucking of solid/liquid/waste materials or raw materials or products? If yes, provide estimated number of trucks that will be employed per day.*

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

2. Raw Materials: Complete the following table relating to all raw materials/ feedstock used in the proposed facility.

Raw Material/ Feedstock	Process	Delivery Method	Storage Method	On-Site Storage Quantity	Max. Hourly Consumption (unit)	Annual Consumption (unit)

3. Other Materials/ Auxiliaries Used: Complete the following table relating to other materials used in the proposed facility.

Material	Process	Delivery Method	Storage Method	On-Site Storage Quantity	Max. Hourly Consumption (unit)	Annual Consumption (unit)

4. Products/ By-Products: Complete the following table relating to all products or materials produced by the proposed facility.

Process	Product/ By-Product	Max. Hourly Production (unit)	Annual Production (unit)	Storage/ Delivery Method	Maximum Storage Capacity

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

5. Hazardous Materials:	Hazardous Substance/ Constituent	Physical Properties	Hazardous Material Classification¹	Process/ Unit Used	Max. Storage Quantity (kg)	Delivery/ Storage Method	Surplus Disposal Method
(a) Does the facility use or generate any radio active materials? If yes, provide details of type and quantities of such materials.							
(b) Does the facility use or generate highly toxic materials such as methyl isocyanate, phosgene, hydro fluoric acid (HF), mercury compounds, arsenic compounds, cyanides, etc.? If yes, list the name of the materials with quantities.							
(c) Does the facility use or generate carcinogenic materials such as benzene, carbon tetrachloride, vinyl chloride, hydrazine, PCBs (Polychlorinated biphenyls), etc? If yes, list the name of the materials with quantities.							
(d) Complete the following table relating to all hazardous materials to be utilized by the facility. Include fuels, oils, paints, coating materials, solvents, degreasing agents, cleaning materials, acids, alkalis, oxidizing agents, reducing agents, batteries, toxic compounds, refrigerants etc.							

¹ According to RCER- 2015, Volume I, Section 4.1 – Hazardous Material Classification

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

6. Fuels:						
(a) Complete the following table relating to processes using fossil fuels (Crude oil, Fuel oil, Natural Gas, LPG, etc.)						
Process	Fuel Type with Composition	Fuel Consumption (unit)	Alternative Fuels Used? (Y/N) <i>If yes, please specify type</i>			
7. Air Emissions - Point Sources:						
(a) Are there any point sources that have potential to emit more than 100 tons/year (before the use of abatement equipment) of any air pollutant listed in Table 2A of RCER-2015, Volume I? <i>If yes, list all such sources with estimated emission.</i>						
(b) Are there any point sources that have potential to emit more than 10 tons/year (before the use of abatement equipment) of any hazardous air pollutant listed in Table 2C of RCER-2015, Volume I? <i>If yes, list all such sources with estimated emission.</i>						
(c) Complete the following table relating atmospheric emissions from point sources. Include all point sources such as stacks, vents, extraction hoods, ducts etc. Pollutants should include any emissions that may contain gases, particulate emissions, volatile organic compounds, acid gases, toxic gases, fumes, visible emissions and odors.						
Source	Unit ID	Pollutant	Pollutant Concentration (unit) ²	Emission Rate (kg/hr)	Emission Height (m)	Emission Control Method/ Efficiency

²Unit of concentration should be the same as the unit of the point emission source standards in Table 2B of RCER- 2015, Volume I. If no point source emission standard exists for the particular component, the unit should be mg/m³.

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

8. Fugitive Air Emissions: Complete the following table relating to potential fugitive emissions. Include all potential emissions of volatile organic compounds, dust sources, toxic gases and odor sources (e.g. water treatment lagoons, etc.).				
VOC/HAP Source ³ (Name & Number)	Component	Uncontrolled Emission (kg/h)	Control Efficiency (%)	Controlled Emissions (kg/h)

³ As defined in RCER (glossary for VOC and Table 2C of RCER- 2015, Volume I for HAP)

9. Water Consumption: Complete the following table relating to water consumption.			
Process	Average Consumption (m ³ /hr)	Maximum Consumption (m ³ /hr)	Treatment Required? <i>If yes, please specify type of treatment</i>

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

10. Effluent/ Wastewater Discharges: (a) Does the facility operation involve generation of wastewater which cannot be pre-treated at their site to comply with RCER-2015, Volume I pretreatment standards? (b) Complete the following table relating to effluent discharges. Include all discharges of industrial wastewater, cooling water, liquid effluents and pre-treatment methods, if any.							
Source	Discharge Flow Rate (Ave)	Pollutant Concentration				Pre-Treatment Required? <i>If yes, please specify type of pre-treatment</i>	
		Temp. (°C)	pH	TDS mg/l	TOC mg/l		TSS mg/l
Process wastewater effluent to IWTP (m ³ /day)							
Return sea water cooling (m ³ /hr)							
Cooling tower blow down (m ³ /day)							
Other effluents (m ³ /day)							
Sanitary wastewater to SWTP (m ³ /day)							

11. Solid / Liquid Waste (Hazardous and Non Hazardous): Complete the following table relating to the production, storage and disposal of all solid, sludge and liquid wastes.			
Source	Amount Generated (tons/year)	Composition	Treatment, Disposal Methods and Location

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

12. Noise: Complete the following table relating to sources of noise from the facility.

Source	Noise Level Inside Premises (dBA)	Noise Level at Boundary Fence (dBA)	Control Methods

13. Flare: Complete the following table relating to flares of the facility.

Type (Elevated, Ground, Emergency, Regulated, Other Flares)	Number of Flares	Height of Flares (Meter)	Steam Assisted/ Air Assisted

14. Incinerator: Complete the following table relating to Incinerator of the facility.

Type of Incinerator	Number of Incinerators	Type of Auxiliary Fuel Used	Waste to be Burnt Provide hydrocarbon content and calorific value)

ENVIRONMENTAL SCREENING QUESTIONNAIRE (ESQ)

15. Loading / Unloading Operations: Complete the following table relating to Loading/Unloading Operation at Marine Terminals/Bulk Loading Terminal at the facility.

Is there loading/unloading of material containing "Volatile Organic Compounds" (VOCs) or "Hazardous Air Pollutants" (HAPs) at the FACILITY?	Is there loading/unloading of material containing "Volatile Organic Compounds" (VOCs) or "Hazardous Air Pollutants" (HAPs) at the PORT?	Is there loading/unloading of material that emit "Dust" or "Suspended Particulates" at the FACILITY?	Is there loading/unloading of material that emit "Dust" or "Suspended Particulates" at the PORT?
Yes/No	Yes/No	Yes/No	Yes/No

16. Dredging Operations: Complete the following table relating to Dredging Operation at the facility.

Does the facility construction involve any "Dredging" operation ? Yes/No

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17. Other Information:

Vehicle maintenance on site	[] Yes [] No
Indoor abrasive blasting	[] Yes [] No if yes, material used: _____
Outdoor abrasive blasting	[] Yes [] No if yes, material used: _____
Underground storage tanks	[] Yes [] No if yes, provide type, number, capacity and material stored.
Aboveground storage tanks	[] Yes [] No if yes, provide type, number, capacity and material stored.
Painting on site	[] Yes [] No
Hazardous materials storage area	[] Yes [] No if yes, provide a sketch of the area

Additional Information: please use the space below to add any other relevant information that may facilitate the issuance of the permit.

Appendix B

BEST AVAILABLE TECHNIQUE (BAT) ANALYSIS

Appendix B

BEST AVAILABLE TECHNIQUE (BAT) ANALYSIS NEW AND MODIFIED FACILITIES

In this section, the details concerning BAT analysis are provided.

Affected Sources

The operator of a facility shall substantiate, by providing BAT analysis, the selection of the BAT solution required under Clause 1.1.11, 1.1.12 and 1.1.13 of RCER-2015 Volume I for pollution control measures for the following facilities:

- a. For any source which does not meet the source emission or discharge standards.
- b. Any source emitting greater than 100 t/y before control of any of the parameters listed in RCER-2015, Volume 1, Table 2A
- c. Any source emitting greater than 10 t/y before control of any hazardous air pollutants identified in RCER-2015, Volume I, Table 2C
- d. Any industrial wastewater pretreatment prior to discharge to the Industrial Wastewater Treatment Plant

Application of BAT

The definition of the term BAT, and by reference its application to preparation of Permit Application Package is as follows:

Best- means the most effective in achieving a high general level of protection of the environment as a whole. There may be more than one set of techniques that achieve comparable effectiveness in preventing or rendering harmless polluting emissions. Thus there may be more than one set of “best” techniques.

Available- techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Kingdom, as long as they are reasonably accessible to the operator.

Techniques- shall include both the technology used and the way in which the installation is designed built maintained, operated and decommissioned.

The essence of BAT is that the selection of techniques to protect the environment should achieve an appropriate balance between realizing environmental benefits and costs incurred by operators. The act of balancing the benefits against the cost will be a judgment. The following considerations shall be taken into account.

- a) In general the greater the environmental damage the greater the costs of BAT that can be required before costs are considered excessive.
- b) Where similar cost solutions exist the presumption is made that the solution that provides the higher degree of environmental protection will be selected.

- c) The objective is to prevent damaging releases or to reduce such releases to the extent possible without imposing costs. If after applying BAT serious harm would still result, the issue of an Environmental Permit to Operate can still be denied.
- d) The concern is with what costs in general are excessive; the lack of profitability of a particular entity or its financial position should not effect the determination of the BAT solution.

For existing facilities there are some additional factors, which affect the determination of and implementation of BAT.

- a) The configuration of the existing plant, which may make it excessively costly, in relation to the harm, which would be avoided, to fit particular types of control technology.
- b) The disruption to existing operations that could arise if upgrading was required immediately. The establishment of timetables for upgrading to new standards or as near as possible to such standards will be required. The operators of existing facilities will be expected to ultimately achieve new plant standards.
- c) The harm that would result from delaying the achievement of the BAT solution weighed against the benefit or competitive advantage gained by the operator for allowing such a delay.
- d) The assessment of the length of the remaining life of the facility. For facilities which are unable to achieve new plant standards and which continue to cause harm to the environment, a timetable for replacement of the process in question, or closure of the facility, will need to be developed.

BAT Analysis

The BAT analyses should include the following:

- a) Identification of options considered for potential control technologies and techniques. Considerations to be taken into account when determining BAT bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention include:
 - i) the use of low-waste technology;
 - ii) the use of less hazardous substances;
 - iii) the furthering of recovery and recycling of substances generated and used in the process of waste, where appropriate;
 - iv) comparable processes, facilities or methods of operation which have been tried with success on an industrial scale;
 - v) technological advances and changed in scientific knowledge and understanding;
 - vi) the nature effects and volume of the emissions concerned;
 - vii) the commissioning dates for new or existing installations;
 - viii) the length of time needed to introduce the best available technique;
 - ix) the consumption and nature of raw materials (including water) used in the process and their energy efficiency;
 - x) the need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it;
 - xi) the need to prevent accidents to minimize the consequences for the environment
- b) The solution that is most effective in preventing, minimizing or rendering harmless polluting emissions should always be included as one of the options evaluated.

- c) Justification for elimination of the technically infeasible options.
- d) Ranking of the remaining technologies on the basis of control effectiveness, expected emission rate, expected reduction, energy and environmental impacts and economic impacts.

Appendix C

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

Appendix C

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

INTRODUCTION

These guidelines are intended for use by developers and consultants to gain a clear understanding of the process and objectives when conducting an environmental impact assessment (EIA), for proposed developments within the Royal Commission in accordance with Royal Commission Environmental Regulations-2015 (RCER-2015).

The objective of an EIA is to ensure the highest environmental standards are met by assessing the possible impacts, positive or negative, that a proposed development may have on the environment. A comprehensive EIA will identify and evaluate all predicted impacts while recommending mitigation measures to protect natural, social and economic aspects, prior to major decisions and commitments are made.

The EIA should be a standalone document containing sufficient information to avoid or minimize the need of search out previous or supplementary reports. The EIA should incorporate all supporting EIA studies or data which are directly related to the project.

The aim of the Royal Commission EIA guidelines are to promote the objectives of responsible planning in accordance with the Royal Commission Environmental Regulations-2015 (RCER-2015). Developers planning to establish Type I and II industries within the industrial city are required to conduct an EIA to ensure all the objectives are met according to regional, national and international standards. Proposed developments will be assessed by the Royal Commission based largely on their EIA submission to determine whether a development should be permitted and to ensure adequate design controls are utilized to avoid or mitigate against adverse effects by examination of the alternatives. The integration of the EIA into the design and evaluation process improves the overall environmental quality of new developments and increases its sustainability.

THE EIA PROCESS AND QUALIFICATION OF EIA CONSULTANT

The environmental impact assessment is a process by which information about the environmental effects of a development, is assembled, analyzed, commented upon and taken into account by the planning/regulatory authority, the developer, and consultants.

The EIA shall be prepared by a qualified "Third Party" environmental consultant. A "Third Party" is a consultant who does not have any known conflict of interest and has a team of experts who has performed several similar EIA projects. If the proposed development is significant in nature (e.g. petrochemical complexes, refineries), the consultant is required to have significant experience conducting such studies for that type of facility. Due to the multifaceted nature of a full comprehensive EIA, the consultant may enter into a joint venture with other consultants. The facility is required to submit a list of consultants with their previous EIA activity details who are being considered to conduct the EIA.

Once the assessment of impacts and potential mitigation measures are determined through the EIA process, the final design of the overall facility can be determined, not before. I.e., the results of the EIA consultation should be continually fed back into the design process and used to inform decision-making.

The developer is required to prepare the EIA report as well as Permit Application Package (PAP) in parallel since each of these tasks is dependent on other. However, the developer is required to consult RC-EPCD for preparation of scope of work before proceeding with EIA study. Both PAP and EIA are to be submitted in hard and soft copy format for getting the Environmental Permit to Construct (EPC).

THE NEED FOR AN EIA

Clauses 1.1.7, 1.1.8 and 1.1.9 of RCER-2015, Volume I regulate the requirements of conducting the EIA of all the new projects or the modification of the existing ones (if required by RC). First, all the facilities shall submit to the RC the ESQ (as provided in Appendix A) for any new project or modification to the existing project. Based on the information provided in ESQ, the RC will categorize the proposed project depending on their environmental impact.

The Type III does not, generally, need the EIA report if the RC determines that the impact on the environment is deemed negligible. However the Type I and Type II projects would require the submission of a detailed EIA reports to obtain the EPC.

THE SCOPE

The EIA Scope of work (SOW) shall be submitted to RC for prior approval before undertaking the EIA. The main tasks, issues, parameters and coverage of an EIA are referred to as the scope. The scope of the EIA shall be appropriate to the scale and nature of the proposed development and the risks to the environment. The future environmental impacts of the project are potentially significant, sensitive, diverse, or unprecedented, and cannot be readily identified, assessed or mitigated: There are expected adverse environmental impacts on human populations and natural habitats. The scope shall consider the following factors but not limited to:

- The scope shall focus the assessment while making sure that indirect, secondary and cumulative effects are not overlooked. The scope shall define the geographical study area, the range of topics to be studied, and the extent of the investigation (level of detail) and methodology.
- The level of detail shall match the level of importance of the issue in decision-making.
- The study domain to be considered shall cover the community area as well as surrounding areas (at least 30 km for Type II facility and 75km for Type I facility).
- Also location of sensitive receptors such as schools, hospitals, mosques, etc shall be taken in to consideration

If any specific standards for the EIA study are not available in RCER-2015, then any acceptable "Environmental Regulations" referred in WHO, US-EPA, EU, World Bank and IFC (handbooks on pollution prevention) shall be used.

THE REPORT FORMAT

The following sections follow a typical EIA format. Each consecutive section is designated a chapter, beginning with the executive summary which summarizes each chapter outlining the main points.

1. Executive Summary.

- A summary of the main findings of the report.

2. Introduction

- Project Understanding, Overview & Background
- Report Structure / Method. The procedures or methodology used should be clearly outlined.
- Justification: Describe the reason and/or need for the development.

3. Policy, Legal, and Administrative Framework

- International, National and Local Regulatory Policies, standards and conventions. The key environmental regulations and standards applicable are:
 - *“Royal Commission Environmental Regulations-2015 (RCER-2015) Volume I”* that includes all regulations, standards, and guidelines which industries operating in any of the RC industrial cities shall comply with.
 - *“Royal Commission Environmental Regulations-2015 (RCER-2015) Volume II”* that covers procedures and forms for applying to obtain *“Environmental Permit to Construct”* (EPC) and *“Environment Permit to Operate”* (EPO).
- Sustainable Development Policies
- World Bank
- Equator Principles
- Other Relevant Legislation
- Best Available Techniques (BAT)

4. Detailed Description and Layout of the Proposed Development

- Site & Layout plan(s) of the development showing buildings, stacks, storage areas, roads, parking, and infrastructure including all utilities, such as fuel filling station, power supply, water supply.
- Elevations, cross sections and plans of all built development supported by photomontages or similar to show the visual appearance proposed.
- A description of the extent and type of industrial development proposed including a description of the uses proposed and the processes to be used. This includes the following information:
 - List of machinery, process units, control devices etc – technical information (such as capacity and expected hours of operation) and operational control measures (emissions data such as NO_x, SO_x, particulates, CO, organic compounds, heavy metals, other pollutants, noise etc).

- An estimate of the essential types and expected consumption of raw materials and/or fuel types. This should include a description of the intention of reusing byproducts or waste products from other industries.
 - Proposed usage of water in the different industrial stages and sources of water supply and options for water recycling and reuse.
 - Quantities of solid and liquid waste generated and the arrangements for collection, recycling, storage, treatment and disposal (solid/ liquid and hazardous waste).
 - Transportation description including internal and external transport activities (transport of raw materials and product by truck, train and ship).
 - Description of unloading of raw materials and loading of product.
 - Details of storage facilities for raw materials, type of storage, size, number, surface coating, roofing, drainage.
 - Details of storage of any hazardous, toxic or inflammable substances.
 - Identification of the proposed means of surface (storm water) water drainage.
 - The expected project life span.
- Extent of implementation of Zero discharge of pollutants in to water bodies (sea, lake, groundwater etc)

5. Air Quality & Meteorology

All baseline meteorological and ambient air quality data (as background) shall be Locally sourced from the Royal Commission. At least, five years data shall be used where possible, including but not limited to the following parameters:

- Baseline Meteorology
 - wind speed and direction
 - rain fall and temperature
 - relative humidity etc.
- Ambient Air Quality: including but not limited to:
 - Natural sources e.g. particulate matter (PM10+PM2.5)
 - NOx (as Nitrogen Dioxide)
 - SOx (as Sulfur Dioxide) / H₂S
 - CO (Carbon monoxide)
 - NMHC, BTEX (benzene, toluene, ethyl benzene and xylene)

It is to be noted that for modeling purposes, the dataset for 'worst case' and "normal" scenarios shall be used. The choice of model must be US-EPA approved (or other RC accepted model), be appropriate to the issue being considered, and contain inherent replicability, reliability and consistency. It is recommended that the latest version of AERMOD model shall be used for a domain less than 50km and the latest version of CALPUFF shall be used for long-range domain (>50km). During impact assessment, the following factors shall be considered but not limited to:

- Impact Assessment on air quality from all sources (Point, line, area, volume etc) resulting from:
 - Construction/commissioning/operation/decommissioning

- Normal and abnormal operation conditions
- Odor: Odor assessment must be evaluated and compared with the environmental guidelines of EU or USA. This shall cover odor threshold limit of pollutants as well as their health impact level.
- Green House Gas emission annual estimation (tons per year). All greenhouse gases shall be estimated based on fuel consumption and an approved US-EPA method.
- Prevention of Significant Deterioration (PSD) of air quality shall be followed during air dispersion modeling. A brief of PSD is as follows:

The main purpose of Prevention of Significant Deterioration of air quality (PSD) Regulation is to demonstrate that new emissions emitted from a proposed major stationary source or major modification, in conjunction with other applicable emissions increases and decreases from existing sources, will not cause or contribute to a violation of any applicable PSD increments assigned by RC for respective air quality pollutants.

Generally, RC Best Available Technique (BAT) analysis for RC PSD will involve (1) an assessment of existing air quality, which may include ambient monitoring data and air quality dispersion modeling results, and (2) predictions, using dispersion modeling, of ambient concentrations that will result from the applicant's proposed project and future growth associated with the project, (3) selection of BAT control so that pollutant increase with a new source addition stays below PSD increments.

The RC Ambient Air Quality Standards (RCER-2015, Volume I, Table 2A) is maximum allowable concentrations "ceiling." A PSD increment, on the other hand, is the maximum allowable increase in concentration that is allowed to occur. An air quality deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. The PSD program requires:

- Air Quality Analysis (monitoring and modeling)
- Increment Analysis (modeling)
- Installation of Best Available Technique/Technology (BAT) Performing

Averaging Period	Pollutant	Allowable Increment Level *
Annual	SO ₂	25 % of Available Increment**
	NO ₂	
24 Hours	SO ₂	

* References: 40 CFR 51.166; 40 CFR Part 51 Appendix W and International Finance Corporation (IFC)

** Available Increment = Ambient AQ Std. – Background level

Example for Available Increment for XYZ Facility:

In following Table-1, the predicted modeled concentrations have been compared to 25% of the available increment. The available increment is defined for each pollutant as the difference between the baseline and the ambient air quality standard, as outlined in the IFC/WB Guidelines (World Bank, 2007). No XYZ facility modeled SO₂ concentrations exceed 25% of the available increment indicated in the tables below:

Table-1 Summary of Impact Predictions for SO₂					
Location	Baseline (µg/m ³)	Standard (µg/m ³)	Available Increment (µg/m ³)	25% of Available Increment	XYZ Facility Modeled (µg/m ³)
1-Hour Average					
Maximum	44.3	730	686	171	161
AQMS#6	44.3	730	686	171	97.3
Jubail Prison	44.3	730	686	171	77.8
Jubail Old Town	44.3	730	686	171	35.9
Construction Camps/Farms	44.3	730	686	171	70.8
Sabhkat al Fasl (Nesting Area)	44.3	730	686	171	31.6
JIC Community area I	44.3	730	686	171	30.9
JIC Community area II	44.3	730	686	171	41.7
24-Hour Average					
Maximum	30.2	365	335	83.7	44.6
AQMS#6	30.2	365	335	83.7	31.2
Jubail Prison	30.2	365	335	83.7	5.03
Jubail Old Town	30.2	365	335	83.7	4.20
Construction Camps/Farms	30.2	365	335	83.7	18.2
Sabhkat al Fasl (Nesting Area)	30.2	365	335	83.7	3.55
JIC Community area I	30.2	365	335	83.7	2.69
JIC Community area II	30.2	365	335	83.7	3.11
Annual Average					
Maximum	8.75	80.0	71.3	17.8	5.80
AQMS#6	8.75	80.0	71.3	17.8	3.01
Jubail Prison	8.75	80.0	71.3	17.8	0.38
Jubail Old Town	8.75	80.0	71.3	17.8	0.25
Construction Camps/Farms	8.75	80.0	71.3	17.8	1.25
Sabhkat al Fasl (Nesting Area)	8.75	80.0	71.3	17.8	0.13
JIC Community area I	8.75	80.0	71.3	17.8	0.14
JIC Community area II	8.75	80.0	71.3	17.8	0.12

*Values are taken as an example for XYZ Facility

Emissions from regulated sources of a new facility or major modification of existing facility shall not exceed any applicable RC Prevention of Air Quality Deterioration (PAQD) increment limits assigned by RC for each ambient air quality parameters (Table 2A). The PAQD increment of respective pollutant shall be less than 25% of available increment. The available increment is defined for each pollutant as difference between the background level (baseline) and the ambient air quality standard, as outlined in the World Bank's agency-International Finance Corporation criteria. This shall be reflected and validated in the air dispersion modeling results.

In the report, the presentation of the results shall include isopleths which should be plotted on industrial city geographic map for all averaging periods (e.g. 1-hour, 24-hour, annual). The submitted values for all source input data (such as emission quantities/ rates) for each source, must be clearly explained and should mirror the Permit Application. Hard and softcopies of all input files shall be submitted to the RC for approval before proceeding with studies. A temporary license shall be made available to the RC verification of the modeling results, if requested.

6. Terrestrial Environment

- Baseline Conditions including:
 - Groundwater: A comprehensive assessment of the existing groundwater conditions including chemical and biological analysis in accordance with the Royal Commission Groundwater Guidelines.
 - Hydrogeology: including geologic cross sectioning, gradient, permeability, flow rate, porosity etc.
 - Soil Quality – Chemical Analysis
- Impact Assessment
 - Groundwater Flow direction and Spill Modeling (for Type I Industries)
 - Construction/Commissioning/Operation/Decommissioning

7. Biological Resources

(Note: The requirement of this item will be decided by the RC on a case by case basis)

Habitats both natural and man-made for flora and fauna. - both on site and in the surrounding area. Their populations and their value which may reflect rarity, economic value and attractiveness.

- Baseline Assessment
 - General Description of Site and Surroundings
- Impact Assessment
 - Construction/Commissioning /Operation/Decommissioning
- Accidental Events
- Recommendations for Habitat Protection, Creation and Enhancement

8. Noise & Vibration

Noise levels are regulated according to RCER-2015 and include sensitive receptor locations e.g. residential, schools etc. The potential sources of noise associated with a development need to be identified. If any noise source is likely to be significant for particular receptor, an assessment will need to be made including:

- Baseline Conditions: Conduct noise and vibration study.
- Noise Impact Assessment (modeling)
 - Construction/Commissioning/Operation/Decommissioning
 - Emergency/abnormal Plant Operations

9. Waste Management

With an emphasis on waste that contains toxic or otherwise harmful compounds with resulting effects on amenity, water quality and land quality and potential adverse effects on human health:

- Waste Generated during Project Lifetime
 - Classification of Wastes
 - Construction/Operation/Decommissioning
 - Waste Management Approach with details of treatment and disposal methodologies
 - Wastewater Management
- Impact Assessment
 - Construction/commissioning/operation/decommissioning
 - Accidental Events

10. Water Quality Management

With an emphasis on the impacts on the environment and/or Wastewater treatment facilities due to various wastewater discharges including:

- Non contact cooling water
- Industrial waste water
- Sanitary wastewater
- Ballast water

Depending on the requirement of the RC, the developer shall perform EIA study for thermal pollution to the sea, chemical pollution to the sea or groundwater, pollutants released from cooling towers operations (emissions and blow down) using internationally approved models and accepted by RC.

11. Marine Environment

This parameter is required if the proposed project is near to coastal area or if direct discharge to sea, or where likely impacts are deemed significant. All coastal seawater models shall be approved by the RC and shall address the anticipated impacts on the marine environment. Existing water quality data can be obtained from RC. It is to be noted that if the study area is not located near an existing marine monitoring station, then additional investigations/sampling shall be undertaken.

The following factors shall be included during the impact assessment but not limited to :

- Baseline Conditions
 - Ambient Sea Water Quality
 - Marine Ecology
- Impact Assessment
 - Construction/commissioning/operation/decommissioning
 - Accidental Events

- Detailed Discussion
 - Mitigation Measures to avoid harmful alterations, modification, disruption and destruction of fish and fish habitat.
 - Effects on Spawning grounds, nurseries and migration corridors

12. Socio-Economic Aspects

(Note: The requirement of this item will be decided by the RC on a case by case basis)

- Baseline Social Setting
 - National Socio-Economic Data
 - National Economic Activity
 - National Utility Infrastructure
 - National Transportation Infrastructure
 - National Education
 - Regional and Municipal Socio-Economic Data
 - Construction/Commissioning/Operation/Decommissioning
- Impact Assessment

13. Traffic and transport infrastructure

The EIA shall include conducting traffic surveys and reviewing the current infrastructure and transport system. Based on these investigations, the assessments shall be made on impacts of the project on the usage and demands on public transport systems, railways, ports etc.

14. Utilities Infrastructure and Usage

The current utilities Infrastructure and their Usage shall be reviewed. The assessment shall anticipate the impacts of the project on the increased demands on existing utility infrastructure notably water supply, sewage and wastewater treatment, and electricity. Existing services and infrastructure may become overloaded adversely affecting existing users. If there are any significant benefits, where the development enables a major improvement to local infrastructure, those shall be explained clearly and reported.

15. Archaeology and Cultural Heritage

(Note: The requirement of this item will be decided by the RC on a case by case basis)

- Conduct a review of relevant literature and assess the implications regarding potential disturbance or damage to archaeological property.
- Assess potential impacts on the cultural heritage.

16. Health and Safety Aspects

- Baseline Assessment (Using records and statistics obtained from health organizations).
- Impact Assessment
 - Construction/ Commissioning/Operations/Decommissioning

17. Sustainable Development Assessment

- Describe the Sustainable Development Policies of the proposed development
- Integration of Sustainable Development Elements into the project:

18. Analysis of Alternatives

The consideration of alternatives (including alternative sites, alternative site layouts, alternative processes and alternative phasing of construction) is mandatory. The “do nothing” option (that is, the possibility of not carrying out the proposed development at all) should also be assessed. It is particularly important to justify convincingly why it was decided to choose the site proposed. The choice of the preferred alternative shall involve a comparison of the magnitude and significance of the effects of the alternatives considered. Where no alternative sites were considered, the reasons, as to why alternatives were not feasible, shall be explained.

An integral element of the assessment of alternatives is an assessment of all technologies available to the developer to demonstrate that the environmental impacts of alternatives have been considered. This is also considered an integral element of the design process to determine the best available techniques (BAT) that satisfies regulatory standards. The reasons for choosing the proposed technologies, taking account of the environmental effects, shall be justified.

- Site Alternatives
- Alternative Process Technology / Production Options and Plant Design
- Water Use Alternatives
- Wastewater Pre-Treatment Alternatives
- Pollution Control Alternatives
- Waste Management Alternatives
- “Do Nothing” Option

19. Cumulative Impacts Assessment

A detailed assessment of the following aspects in regards to the cumulative impacts with other existing projects taking into account of the existing baseline situation.

- Air Quality
- Water Quality
- Noise
- Waste Management
- Marine Environment

- Socio-Economic (if requested by RC)
- Community and Employee Health
- Detailed discussion of unavoidable adverse impacts

20. Determine the significance of effects

The most frequent method used here is the use of the Leopold Matrix which distinguishes between the nature, extent and magnitude of the predicted impacts, the significance of the consequent effects on each of the study parameters, and the seriousness of the effect.

The criteria for evaluating the significance of impacts and their effects shall be set in advance and shall be based on local standards wherever possible. Where these are not available, acceptable international standards shall be used (e.g. WHO, US EPA regulations/ guidelines, etc).

21. Mitigation Measures

This section investigates the potential mitigation measures for minimizing adverse effects and enhancing any beneficial effects. Where the predicted impacts exceed environmental quality standards or, there are stated or perceived uncertainties relating to the accuracy of the predicted effects, effective mitigation measures shall be adopted to control impacts.

As previously stated, the key to achieving effective mitigation, is early consultation between all parties. Making mitigation measures an integral part of the initial design phases provides opportunities to eliminate or reduce effects by, for example, layout modifications or industrial process selection. The incorporation of mitigation measures at a later stage may not be possible. As the design evolves, impacts shall be continually re-evaluated to check that mitigation will still be effective.

Mitigation strategies shall take into account the following factors but not limited to:

- Sustainability,
- Integration,
- Feasibility, and
- Compliance with statutory obligations under other licenses or approvals.

The key mitigation measure is the technology choice. Based on the BAT analysis, the chosen technology shall represent the best option taking into consideration practicality, potential impacts, cost and availability. The types of mitigation strategies identified, shall be reflected in the Permit application.

The potential mitigation measures shall include but not limited to:

- Water quality: Control and treatment of liquid effluent (e.g. recycling, cooling waters, cooling towers, oil separators, sand traps, ponds and clarifiers)

- Waste:
 - Waste recovery facilities,
 - Procedures for handling, storage, transport and disposal of waste for all hazardous and dangerous material (e.g. recycling of waste as raw material(dust) or fuel(chemicals), closed storages secured from storm water runoff.)
 - Control and disposal of solid waste (e.g. reused as fuel or at other industries).
- Air quality:
 - Control of stack emissions (e.g. burners, filtration technologies and scrubbers),
 - Control in fuel inputs (e.g. substitution of fuels with low emission specification)
 - Control of fugitive emissions (e.g. encapsulating/covering conveyors, water spraying)
- Noise:
 - Control of noise from plant and machinery to ensure compliance with relevant standards,
 - Sound attenuation measures such as wall and banks (e.g. maintenance on noisy machines, noise adsorbing claddings and encapsulation)

22. Environmental Management & Monitoring Plan (EMMP)

Effective implementation of the findings and recommendations of an EIA largely depends upon the environmental management and monitoring plans that includes clear performance benchmarks and indicators to enable effective monitoring and supervision of mitigation measures at the ground level. The EMMP shall cover the following:

- Management of construction impacts
- Management of operational impacts (e.g. hazardous materials and fuel management, transport and packing management, maintenance and site security plans, emergency and contingency plans),
- Strategies and action plans to feed information from monitoring into management practices,
- Environmental Awareness and training programs for operational staff,
- Indicators of compliance with licensing and approval requirements.

Appendix D

**ENVIRONMENTAL EMERGENCY RESPONSE PLAN (EERP)
GUIDELINES**

Appendix D

ENVIRONMENTAL EMERGENCY RESPONSE PLAN (EERP) GUIDELINES

INTRODUCTION

Development and implementation of Environmental Emergency Response Plans (EERP) are considered by the Royal Commission as a major part of any industrial operation. The emergency planning is also a national pre-requisite as set by the other local government agencies concerning industrial operation as well as an international requirement governed by the international agencies like the World Bank (*Disaster Risk Management Guidelines*), OSHA (*Hazardous waste operations and emergency response. - 1910.120, Standards - 29 CFR*) and USEPA (*Response Planning and Risk Management Guidelines*).

The importance of EERP is derived from its very name as being the planning and management of avoiding potential risks during the industrial operation. It involves preparing an integrated plan for tackling a disaster before it occurs as well as after it occurs i.e. disaster response e.g. emergency evacuation, quarantine and mass decontamination and rebuilding site etc.

The EERP concept is a continuous process by which RC as a legislator and industries operating in the industrial city manage hazards in an effort to avoid them or to eliminate their adverse impacts resulting from these hazards. Actions to be taken in an emergency depend in part on the type of the industry, its design, the capacity of the units, the hazardous materials to be released, location and perceived risk of those exposed. An effective emergency management relies on thorough integration of emergency plans at all levels of interactive actions.

Any facility operating in the industrial cities under RC jurisdiction shall develop its own EERP for all kinds of emergencies. The EERP shall be a high standard technical document which addresses, as a minimum, the following areas:

1. PURPOSE OF EMERGENCY PLAN

The main purpose of the EERP is to define procedures to be followed in the event of an accident or emergency at the facility premises. Scope of the plan covers natural incidents/operational accident scenarios such as spills, fire, and road accidents which may occur during the course of normal /abnormal operations. The aim of preparing emergency and contingency plan for facilities operating in RC boundaries is to have an effective procedure that can be followed by each facility in case of an unavoidable emergency, incident and accident at the site. The facility shall conduct safety analysis of all operational components considering it as a useful tool in designing emergency procedures.

RC will review and approve the EERP according to procedures and incorporate it together with the EERPs of other industries operating in the area as part of the RC's overall emergency planning procedures.

2. REGULATORY FRAMEWORK

The EERP shall be prepared in compliance with RCER-2015 Volumes I and II, and it shall be a supplement to Royal Commission Environmental Permit Application package (PAP) and Environmental Impact Assessment (EIA) study report in order to obtain Environment Permit to Construct (EPC) and Environment Permit to Operate (EPO).

The major task of EERP is preparation of an integrated preventive plan to stop a disaster before it occurs. Further, it also requires proper response planning such as emergency evacuation, quarantine, mass decontamination, etc for handling the disaster after its occurrence.

3. DESCRIPTION OF SITE

The facility shall include a brief description of the site with reference to final site plan as listed in PAP Form "PA-G1 (General)". Further, the site plan shall address all aspects of environment and safety in compliance with all applicable RC Regulations and Guidelines.

4. PROCESS RELATED RISKS

Priorities shall be set by the facility for identifying process related risks with greatest probability of occurring and greatest loss, and risks with lower probability of occurrence and lower loss are handled in descending order, as per technical design and manufacturer's guidelines for each unit.

5. TYPE OF EMERGENCIES

All potential emergency scenarios that apply to the facility in particular shall be discussed in detail and shall include but not limited to the following typical emergency scenarios:

- i. Incidents related to failure or malfunction of process equipment that may result in a sudden release of chemicals including hazardous substances.
- ii. Incidents/ Accidents that may result in environmental impacts, health hazard or material damage such as truck collision or flip over on highway or near plant, Industrial accident on-site, site entrance blockage, absence of key staff at one time, sudden breakdown of major units, machinery, vehicles, non-availability of badly needed maintenance /repair tools.
- iii. Medical emergencies related/not related to process; trauma, dermatitis, injury, exposure to hazardous substance, sickness, sunstroke, electrocution etc
- iv. Accidental spills or release of hazardous materials related/not related to process equipment failure that can lead to a medical emergency, environment impacts or material damage
- v. Natural events such as earthquakes, floods, sandstorm, lightning, heavy rainfall, etc.
- vi. Fires (small scale as well as large scale)

6. ROAD ACCIDENTS

The facility shall consider special provisions set by RC, PME or OSHA for transport of all toxic and hazardous chemicals including fuels, product, raw material, waste or if regulated under international standards including US Department of Transport (DOT) or USA National Fire Protection Association (NFPA).

Further the facility shall develop appropriate accident prevention program which will address issues related to: possibilities of minor major road accidents/flip over of fuel

tankers/trucks carrying raw material or product or waste, schedule of vehicle movement to avoid peak traffic and road accidents, driver's education on traffic rules and speed limits on-site and off-site, vehicle maintenance as per owner's manual and dealership maintenance program, etc.

7. FIRE FIGHTING

The facility shall identify all potential fire hazards on-site and fire hazard characteristics that apply to fuel, raw material, product, by-product, waste with reference to MSDS, plant design and OSHA (29 CFR Part 1910, Subpart L Fire extinguishing equipment).

The following shall be included in the fire response section :

- i. Locations of fire alarm/systems/extinguishers
- ii. Staff training in safe operation of fire extinguishers, isolation and extinguishing small fires.
- iii. Potential sources of fire
- iv. Fire hose reel locations
- v. External Support Services needed
- vi. Firefighting equipment should pass RC industrial security and Civil Defense specifications
- vii. Fire fighting measures/instructions for each material handled on-site as per MSDS
- viii. Emergency plant shutdown

8. INCIDENT / ACCIDENT MANAGEMENT

Facility shall prepare procedures for avoiding risks that include preventive measures/actions for preparing for disaster before it occurs, disaster response (e.g., emergency evacuation, quarantine, mass decontamination etc); and supporting, and rebuilding after natural or human-made disasters have occurred and shall also include Emergency Plant Shutdown to isolate equipment, process units, tanks, etc., from one another to prevent the spread of an emergency/hazardous situation.

9. ALARMS AND COMMUNICATION

Guidelines for communicating emergency messages/alarms shall be included in EERP and shall also be a part of training for all employees. Facility shall prepare a hot-line list of all concerned government authorities/organizations for contacting in an emergency by EERP team.

10. TRAINING PRACTICES

All technical/administrative/skilled labor/non-skilled labor and other on-site/offsite employees of the facility shall receive initial site induction into the safety rules and basic emergency response procedures.

As a result of emergency training, all employees shall be well versed with available options when responding to emergency situations so that rational and intelligent decisions can be made.

11. ENVIRONMENTAL EMERGENCY RESPONSE PERSONNEL (EERP Team)

The EERP Team is a group of workers who prepare for and respond to any emergency incident, although under certain circumstances the team may be an ad-hoc group of willing volunteers after approval from the facility.

Procedures shall be set-up for selecting a designated EERP team, and developing a Emergency Response Planning Organization (structure, authorities & responsibilities, emergency personnel names and contact numbers).

The EERP team members shall be trained and prepared to fulfill the roles required by each specific situation.

For large events, where external assistance is sought by the facility, the EERP Team shall be required to work jointly in a unified command system with RC and any other concerned government agency.

12. SAFETY, HEALTH AND ENVIRONMENT (SHE)

The facility shall incorporate SHE aspects into the EERP, and shall identify various health hazards; hazard ID, health effects hazard characteristics of each material stored/handled on-site, exposure control, Personal Protective Equipment (PPE), conditions to avoid, waste on-site with reference to plant design, technical supplier specs, Material Safety Data Sheet (MSDS) and other factors.

A specific log, hazard symbol signage notice boards and labeling system for all site components in plant shall be developed according to conditions in each working area.

All hazardous material shall be clearly marked with USA National Fire Protection Association (NFPA) diamond labels, and selection of signs design and contents shall be prepared in general with applicable regulations and guidelines from U.S EPA, OSHA, NESHAP, HAZOP and HAZWOPER.

13. IMMEDIATE RESPONSE MEASURES

The facility shall prepare easy to follow step-by-step actions in the form of a written procedures for the ERP team to respond, contain or stop the cause of the emergency effectively immediately with no delay; response to material damage Incidents, response to medical emergencies, response to process failure emergencies.

14. EMERGENCY PROCEDURES

All the emergency procedures shall be written procedures for responding to any emergency or incident likely or suspected to be likely to cause material damage to the plant, it's employees (including contractors), the environment or the surrounding communities and industrial installations. These procedure shall be prepared and kept. While preparing the above procedures, the following points shall be taken into consideration:

- i. No worker on-site is authorized to give public statement by any means
- ii. Site shall be off-limits to non-authorized persons
- iii. Internal and external responders names and contact numbers with ID copies shall be obtained and approved by facility
- iv. Facility shall be able to clearly know, identify and define type of emergency
- v. Proper response measures for spills/gas releases and other emergencies shall be prepared

15. REDUCING ENVIRONMENTAL IMPACT

Facility shall establish procedures to minimize adverse impacts as a result of the emergency situation and to determine safe entry to emergency or incident area and procedures for clean-up, repair, containment measures, rehabilitation of contaminated land, containment and removal of spilled material.

16. CORRECTIVE ACTION PLAN

Corrective Action Plan shall be prepared by the EERP Team and implemented to avoid creating conditions that could potentially aggravate, repeat or augment the original incident. After preparing incident report the facility shall take corrective actions that may include:

- i. Compliance with RC requirements.
- ii. Control the source of pollution
- iii. Plan to avoid recurrence of similar incidents
- iv. Study the impacts of incident on surrounding environment.
- v. Procedures for cleanup or repair of the affected area affected by the hazards
- vi. Facility shall ensure that repair works do not create disruptions that may result in release of contaminants.
- vii. Assess the need for mitigation

17. MATERIAL HANDLED AND STORED AT SITE

All material stored, handled on-site as well as material transported to and from the site shall be declared by the facility and classified in accordance with RCER 2015 and the facility shall follow provisions stipulated in RCER-2015, specially to Section 4 for regulations concerning "Hazardous Material Management"..

18. EMERGENCY EQUIPMENT ON-SITE/OFF-SITE

A list of equipment to be used solely for the purpose of emergency response and shall be available at a designated location on-site for the purpose of making initial emergency response.

19. PPE FOR EMERGENCY PERSONNEL, FIRST AID, AND MEDICAL EXAMINATION

The facility shall ensure the availability of suitable PPE for the EERP team and all other personnel to be used in emergencies. First aid boxes shall be available in selected areas around the site for use by workers. The First Aid box shall be inspected regularly.

The facility shall have a proper medical facility to conduct periodic medical examination of employees.

20. EVACUATION ROUTES AND ENVIRONMENTAL EMERGENCY DRILLS

The facility shall prepare specific guidelines for determining the extent of the area that needs to be evacuated in an emergency, activating an evacuation, evacuation routes, evacuation sequence and communication guidelines during an evacuation.

The facility shall conduct potential environmental emergency drills periodically in relation to the hazardous materials.

Appendix E

GROUND WATER MONITORING GUIDELINES

Appendix E

GROUND WATER MONITORING GUIDELINES

Goal

To provide an effective system for monitoring the characteristics of groundwater within facilities and to rapidly detect any pollution of groundwater as a result of any leakages, accidental discharges etc.

1. Groundwater Network: Minimum design requirements

- The number of groundwater monitoring wells installed is determined by: (RC will determine required numbers of wells)
 - Facility type
 - Number/type of potential contamination sources
 - Site area
 - Previously determined groundwater contamination
 - Age of facility
- The location of groundwater monitoring wells is determined by (**RC shall approve locations before installation**)
 - location of potential contamination sources
 - Hydraulic gradient (direction of groundwater flow)
 - Number and placement of storage tanks
- Having determined the potential source for contamination as well as the hydraulic gradient, groundwater monitoring wells should be located 'down gradient' in a manner that is likely to establish whether any change in water quality detected is a result of any leakages, discharges etc. coming from that particular source. It is required however; to also locate a minimal number of groundwater monitoring wells 'up gradient' to provide verification that contamination is in fact from a particular source while also providing coverage due to potential fluctuations of the hydraulic gradient.
- It is recommended that each monitoring well is located in an area which is not likely to be affected by future developments, excavations, vehicular movements etc.

2. Groundwater Installation Guidelines

Borehole Drilling

- To avoid borehole cross contamination, the drilling contractor shall decontaminate all equipment that will be placed in the borehole onsite prior to use and again between boreholes. Decontamination methods include steam cleaning, high pressure hot water washing, detergent washing followed by rinsing with potable water.
- Boreholes, hollow-stem auger flights, permanent or temporary casing shall have a minimum inside working diameter of at least 100mm greater than the external diameter of the PVC well pipe,. i.e., if the well pipe is 100mm in diameter, then the borehole shall have a minimum diameter of 200mm.

- The bore hole drilling method shall be left to the discretion of the contractor.
- During drilling, a borehole log shall be completed clearly identifying the subsurface geology encountered as the borehole is advanced. Particular note should be made of potentially contaminated soils noted by discoloration, odors etc. The borehole log should identify the final borehole depth in meters, as well as the depth to groundwater when initially encountered.

Groundwater Monitoring Well Construction

- The RC recommends that groundwater wells should have a minimum internal diameter of 100 mm (4 inch), (however 50 mm (2 inch) is acceptable), and consist of Schedule 40 PVC (polyvinyl chloride), flush joint threaded; be new and visually clean. All PVC used shall conform to ASTM F-480 Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings. The use of solvents, glues or rubber sealants is prohibited.
- The groundwater monitoring well shall consist of a casing (blank section), and well screens. The well screen must be installed at an elevation to straddle the water table (to allow for the rise and fall of the water table) such that any floating contamination (fuel products and their derivatives) may be monitored. The screen slot size is recommended to be 0.25mm, however 0.50mm is acceptable.
- The final depth of the groundwater well should be no less than 3-4 meters below the water table (if using 100mm diameter casing) and 4-5m if using 50mm casing. If well construction is conducted during winter months, allow an additional 0.5 – 1.0 m to compensate for seasonal fluctuations of the water table. Otherwise, it may be that there is insufficient water inside the well during sampling.
- Upon completion of the borehole, the well casing and well screen shall be assembled above ground into manageable sections and inserted into the borehole.
- Once the PVC pipe including the screen and blank sections are installed, the silica sand filter is packed around the well screen to at least two (2) feet above the screen taking care that uniform packing is achieved. This acts as a sand filter to allow the ingress of groundwater into the monitoring well while restricting unwanted sediments etc. The silica sand (or similar material) shall have a consistent grain size with a uniformity coefficient of less than 2.5 or less. The grain size shall be selected to filter out fines present in the geological formation and will typically be within 0.7mm – 1.25mm.
- Bentonite chips follow, forming a clay (impervious) seal to prevent ingress of surface water which may contaminate the underlying ground water and monitoring samples. The Bentonite chips shall be untreated, pellet form, premium grade, sodium bentonite. The thickness of the bentonite seal shall be no less than 600mm.
- The remaining area around the blank PVC section (annular space) is packed with cement Bentonite grout annular seal. (Native materials may not be used to backfill the hole).

Note: There shall be no grease, oil film or other foreign substance on the outside or inside of the PVC pipe

It is recommended that a 1m solid steel or FRP plastic housing (with appropriate cap) is installed to protect the exposed section of PVC riser pipe. The monitoring wells must be adequately sealed near ground level with cement-based cap sloped away from the well to prevent ingress of surface water.

- To easily identify installed monitoring wells, a tag or plate is attached to the housing with identification markings. The installation of crash barriers is optional however is recommended in areas where there the potential for damage by vehicular movement etc.
- After completion of monitoring well construction, the well shall be 'developed' (removal of all water) by pumping. Alternatively, fresh clean water can be used to displace the dirty sediment laden water within the well. This process should continue until the well water is clean and free of silt, sand and clay.
- Well development water can be discharged to the ground surface unless it contains visible evidence of contamination.
- For installation of groundwater monitoring wells, refer the diagram in Annexure 1 (Groundwater Monitoring Well Standard Drawing - Minimum Construction Requirements).

Documentation

During installation of each monitoring well, the "Groundwater Monitoring Well Installation Record" (Annexure 2) shall be completed and submitted to RC along with attached borehole logs.

3. Groundwater Sampling/ Analysis Guidelines

Groundwater sampling information

During sampling, the "Groundwater Monitoring Sampling Record" (Annexure 3) shall be completed and submitted to RC.

Measuring Total Depth of Groundwater Well

Total groundwater well depth ~~can~~ shall be measured using an electronic measuring device (Solon or equivalent). Remember to subtract the height of the riser from the overall measurement. Record the result as total depth in meters below ground level (BGL) of the groundwater well on the groundwater well sampling sheet. Clean the tape before using it again.

Measuring Depth to Water Table

- Depth to water table (depth to groundwater) is the depth in meters from the ground surface to the water table. By monitoring water table levels we can identify whether and when groundwater levels are rising, falling or remaining static and provided valuable information if groundwater modeling or hydrology studies are conducted.

- **Suggested Methods and Equipment**

The water level measuring device (water level indicator), is otherwise known as an interface probe.

- **Procedure**

1. Lower the measuring device into the groundwater well until it hits the water and gives a beep.
2. Measure the depth from tape to the top of the well casing.
3. Subtract the height of the casing above the ground level from the measurement.
4. Lower the tape to the bottom of the well to get depth of the water column. Subtract #4 from # 3 to get height of the water column in the well (used to calculate purging) with reference to top of casing (TOC).
5. The probe will give a *different signal* if product on the water is detected-determine thickness of the product using the probe and log the thickness found.
6. Record the result as water level (in meters BGL) with the date of the measurement on the groundwater monitoring sampling record.
7. Use a plastic ground sheet to keep equipment clear of contact with the ground. Place a meter and half square of heavy duty polyethylene on the ground where the sampling equipment is kept to prevent contact with the soil. Replace for every well.
8. Wash the measuring device thoroughly according to the decontamination procedure before using it again to prevent contamination.

Groundwater Well Purging

- The purpose of groundwater sampling is to retrieve a water sample that represents the characteristics of water below the ground surface. To obtain a true representative sample, it is necessary to remove the stagnant water from the groundwater well casing before a sample is taken. This is called purging. At least three well volumes of water should be removed before sampling.
- **Purging using a Bailer**

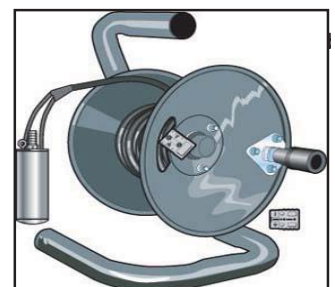
A groundwater well can be purged using a bailer, only when a reasonably small volume of water is to be removed, typically used when there is little or very slow recharge of the well during purging, or with a short water column in a two inch diameter well.

A bailer is a simple mechanical device that can used to draw water from the groundwater well (see Figure 1). It consists of some form of tubing with a one-way check valve at the bottom. When the bailer is lowered into the groundwater well casing below the water level, it fills with water. The check valve closes once the bailer containing the water sample is lifted to the surface. Bailers come in various types (polyethylene, Teflon, stainless steel, acrylic), lengths (from 30 cm to 180 cm), widths (19 mm to 90 mm) and with numerous features like weighted, unweighted, single check-valve, double check valve, controlled flow bottom, etc.



- **Purging using a Pump**

The most efficient purging of the well prior to sampling is accomplished using a pump. Small electric pumps in plastic housings that operate from a 12-volt battery are the most convenient pumps to use for groundwater purging and sampling (Figure 2). There are several types of submersible, battery operated, pumps available, which have slightly different options such as variable flow rate and ability to pump to a certain depth. The overall length of the pump should be around 25cm to allow for ease of cleaning. The pump should be able to push out water from a depth of around 7.6 meters or more. If the



well continually runs dry during purging, note the length of time needed to recharge. If more than two hours to recharge, see directions under Sampling.

Sampling

To draw water from a monitoring well, a bailer or a pump has to be used.

Note. The RC does not recommend purging by means of a bailer as the time required can be extensive, especially on a deep 4 inch diameter well. If the well takes more than two hours to recharge after purging, do not sample. Close up the well, return the following day and immediately sample the well.

• Equipment

- A. Extraction device like adjustable rate submersible pumps or bailer
- B. Tubing with 1/4 inch or 3/8 inch inner diameter, Tygon brand or equivalent, Pharmaceutical grade (Pharmed) tubing should be used for the section around the rotor head of a peristaltic pump, to minimize gaseous diffusion.
- C. Water level measuring device(interface probe), capable of measuring to 0.01 meter accuracy (electronic "tape", pressure transducer).
- D. Power source (generator, etc.). If a gasoline generator is used, it must be located downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate the samples.
- E. Indicator field parameter monitoring instruments - pH, dissolved oxygen (DO), turbidity, specific conductance, and temperature.
- F. Decontamination supplies (for example, non-phosphate detergent, distilled/de-ionized water, isopropyl alcohol, etc.).
- G. Logbook(s), and other forms (for example, well purging forms)
- H. Sample Bottles.
- I. Sample preservation supplies (as required by the analytical methods).
- J. Sample tags or labels.
- K. Disposable bailers.
- L. Large reusable bailer (3 inch)
- M. Plastic tubs to carry and store the equipment
- N. Well construction data, location map, field data from last sampling event.
- O. Well keys (if casing is locked).
- P. Site specific Sample and Analysis Plan/Quality Assurance Project Plan.

• Decontamination of Equipment Procedure.

1. CROSS CONTAMINATION. Purging the wells with the same section of tubing in each well is a source of cross contamination. This is prevented by using a new length of tubing for each monitoring well and is required.
2. EFFECTIVE CLEANING OF PROBE AND PUMP. The correct procedure is to retrieve the interface probe and its cable and deposit them into a bucket for immediate cleaning by first using detergent if oily, or if not oily, rinse with potable water followed by distilled water and follow with a solvent such as isopropanol. The solvent must not be an analyte that is part of the VOC analysis. For the pump, pump one gallon of distilled water through immediately after use. Wash or wipe the exterior surface of the pump power line with a detergent solution and rinse or wipe three times with distilled water. Thoroughly wash or wipe three times with solvent (typically isopropyl alcohol) and allow to air dry before reuse. Lines used to lower the bailer shall be replaced for each bailer used.
3. Cleaning supplies list: Water, solvents, wipes, brushes and buckets for the probe and pump, non-phosphate detergent, distilled/de-ionized water, etc. per item H in Equipment list above.
4. If wells with product in them are sampled, use large diameter reusable bailers with a drum or other means of storing the oily purge water. Do not discharge the oily water onto the ground.

- **Bailer Procedure**

1. Before taking a sample; purge the groundwater well by removing the calculated volume of water (3x well volume). It is a good idea to allow the well to settle for some time especially if there was potential sediment disturbance during purging.
2. To sample, lower the bailer slowly and gently into the water column of the groundwater well until it is submerged, do not allow the bailer to come into contact with the bottom of the well.
3. Carefully remove the water sample and empty it from the top of the bailer into a prepared sample container.

- **Pumping Procedure**

Using a pump is the efficient way of sampling a groundwater well as well as for groundwater well purging.

1. Assemble the pump system, keeping in mind how much water your particular pump can lift, and that any extension of the casing above ground level will reduce this capacity.
2. Purge the groundwater well by pumping out appropriate volume of water (see 'Purging using pump' for details).
3. If murky water persists, allow to settle before sampling, otherwise continue pumping water to obtain sample, with the pump in the same position as for purging.
4. If the position of screened section is not known, lower the pump almost to the bottom of the groundwater well (be careful not to hit the bottom) and lift up 2–3 m, pump from this position.

- **Sample Preservation**

Add preservative, as required by analytical methods, to samples immediately after they are collected if the sample containers are not pre-preserved. Check analytical methods (e.g. EPA SW-846, standard methods, etc.) for additional information on preservation.

Check pH for all samples requiring pH adjustment to assure proper pH value. All samples should be placed in a chilled ice box immediately for transport to the lab.

Note. It is preferable to measure physical parameters (pH, salinity etc) in the field using a portable analyzer

Field Quality Control (QA/QC)

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the ground water samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples shall be collected for each batch of samples (a batch may not exceed 20 samples).

- Blind duplicate
- Trip blank (VOCs)

Trip blanks are required for the VOC samples at a frequency of one per sample cooler. A VOC trip blank, determines whether there has been a loss of VOCs during the sampling, handling, transport or analysis process.

Blind duplicates (split samples) are collected to determine the precision of the analytical process. For this procedure, collect an exact duplicate for a random analyte (for best results, split a sample into 2). Label the blind duplicate 'BD1'. Make a note of from which sample the duplicate is taken. If there is a significant difference in the analytical result, it can be said that the analytical process is not precise.

Chain of Custody Form (COC)

The chain of custody form is used to insure that the samples are properly handed off to the lab with the appropriate signatures to prevent tampering or substitution. The form lists the client, lab, sample identification, state (soil, water, gas), type of tests to be run, and signature lines with date and time showing when they were transferred to the lab by the technician, and who in the lab received them, with date, time, and remarks about condition of the samples. A copy is given the firm who takes the samples. This document shall be included with the groundwater sampling report.

Analysis

After the analysis, the "Groundwater Standard Reporting Form" (Annexure 4) shall be completed and submitted to RC.

The following is a complete list of parameters regulated under the RC regulations:

- pH
- Salinity
- Conductivity or TDS
- Total Suspended Solids (TSS)
- Turbidity
- Total Organic Carbon (TOC)
- Phenols
- Cyanide
- Sulfide
- Ammonia
- Metals
 - Arsenic (As)
 - Cadmium (Cd)
 - Chromium (Cr)
 - Copper (Cu)
 - Lead (Pb)
 - Mercury (Hg)
 - Nickel (Ni)
 - Zinc (Zn)
 - Cobalt (Co)
 - Barium (Ba)
 - Iron (Fe)
- Monocyclic Aromatic Hydrocarbons (BTEX)
 - Benzene
 - Toluene
 - Ethylbenzene
 - Xylene
- Total petroleum Hydrocarbons (TPH)
- TPH fractions (C6 – C9) and (C10-C40)

- Volatile Organic Compounds (VOCs) –BTEX and other process VOCs. The RC reserves the right to request and amend the list of compounds required for analysis.
- Semi Volatile Organic Compounds (SVOCs) if required
 - Naphthalene,
 - Pyrene,
 - Benzo-a-pyrene
 - Benzo-a-anthracene
 - Phenanthrene.
 - Fluorene.

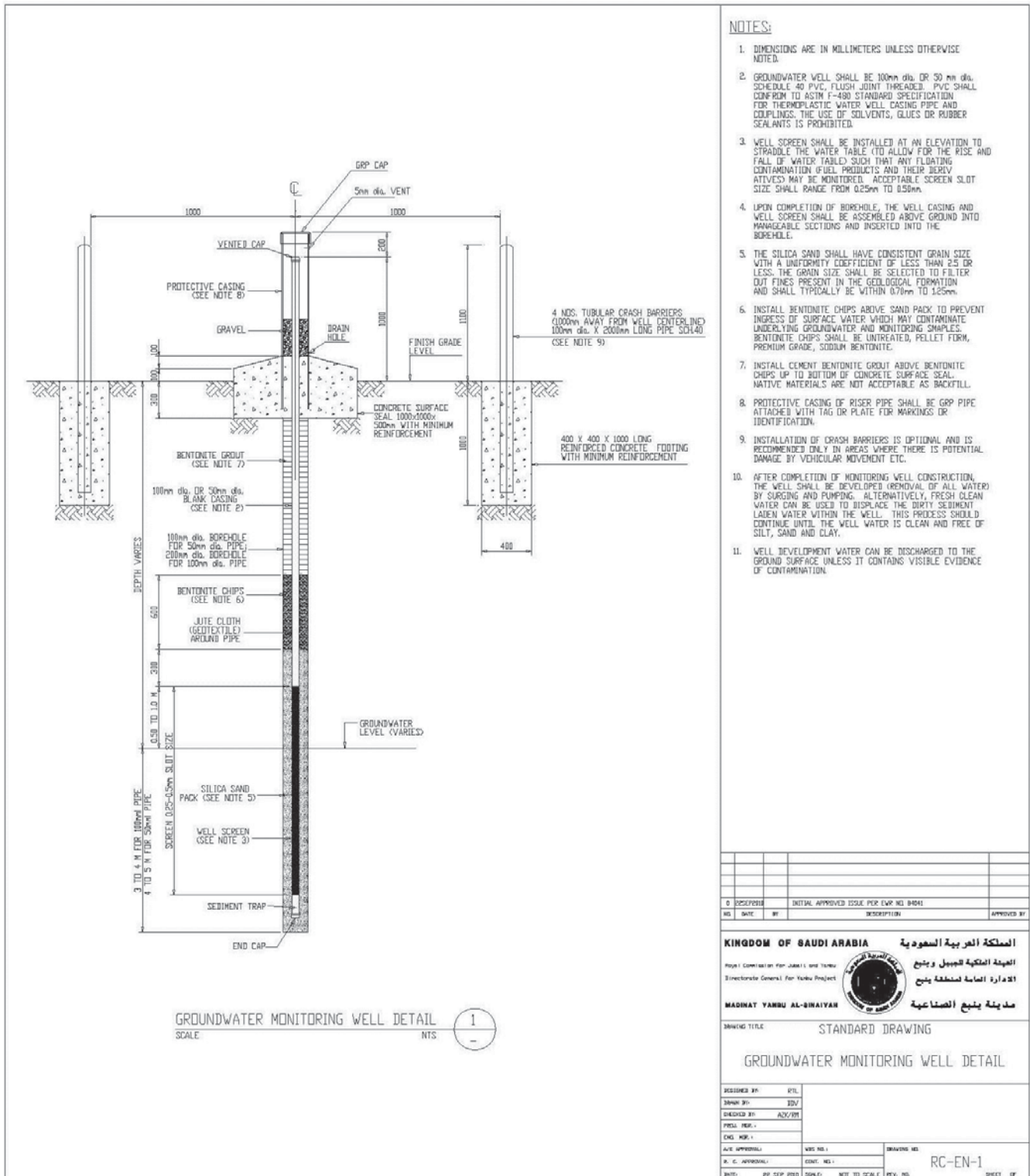
For each industry, the RC will designate the parameters which are required to be monitored for in accordance with the requirement of the Environmental Permit to Operate (EPO). The chosen parameters requiring monitoring will depend on the type of industry and the potential contaminants associated with the processes associated with that industry.

- The general parameters are **pH, Salinity, TSS, and TOC.**
- The important **heavy metals** e.g. arsenic, chromium, lead etc. Metals cause a range of serious health problems and are also known to 'bioaccumulate' meaning that concentrations within an organism will increase over time through continued exposure.
- **Benzene, Toluene, Ethylbenzene and Xylene (BTEX for short)** are common constituents in petroleum products and are toxic. Benzene is known to cause cancer in humans thus most groundwater programs will include these parameters.
- **Total petroleum Hydrocarbon (TPH)** which is the total concentration of all petroleum fractions (C6>C35). Petroleum hydrocarbons are broadly divided into paraffinic, naphthenic and aromatic types. TPH is a measure of all types from Naptha and Kerosene which are the lightest fractions, up to the heaviest fractions of crude oils (residuals, bitumen etc).
- In special cases, **VOCs** and **SVOC's** will be monitored especially if the industry type is associated with these types of compounds.

Annexure

1. Groundwater Monitoring Well Standard Drawing (Minimum Construction Requirements)
2. Groundwater Monitoring Well Installation Record.
3. Groundwater Monitoring and Sampling Record.
4. Groundwater Standard Reporting Form.

Annexure 1 Groundwater Monitoring Well Standard Drawing (Minimum Construction Requirements)



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. GROUNDWATER WELL SHALL BE 100mm dia. OR 50 mm dia. SCHEDULE 40 PVC, FLUSH JOINT THREADED. PVC SHALL CONFORM TO ASTM F-480 STANDARD SPECIFICATION FOR THERMOPLASTIC WATER WELL CASING PIPE AND COUPLINGS. THE USE OF SOLVENTS, GLUES OR RUBBER SEALANTS IS PROHIBITED.
3. WELL SCREEN SHALL BE INSTALLED AT AN ELEVATION TO STRADDLE THE WATER TABLE (TO ALLOW FOR THE RISE AND FALL OF WATER TABLE) SUCH THAT ANY FLOATING CONTAMINATION (FUEL PRODUCTS AND THEIR DERIVATIVES) MAY BE MONITORED. ACCEPTABLE SCREEN SLOT SIZE SHALL RANGE FROM 0.25mm TO 0.50mm.
4. UPON COMPLETION OF BOREHOLE, THE WELL CASING AND WELL SCREEN SHALL BE ASSEMBLED ABOVE GROUND INTO MANAGEABLE SECTIONS AND INSERTED INTO THE BOREHOLE.
5. THE SILICA SAND SHALL HAVE CONSISTENT GRAIN SIZE WITH A UNIFORMITY COEFFICIENT OF LESS THAN 2.5 OR LESS. THE GRAIN SIZE SHALL BE SELECTED TO FILTER OUT FINES PRESENT IN THE GEOLOGICAL FORMATION AND SHALL TYPICALLY BE WITHIN 0.70mm TO 1.25mm.
6. INSTALL BENTONITE CHIPS ABOVE SAND PACK TO PREVENT INGRESS OF SURFACE WATER WHICH MAY CONTAMINATE UNDERLYING GROUNDWATER AND MONITORING SAMPLES. BENTONITE CHIPS SHALL BE UNTREATED, PELLET FORM, PREMIUM GRADE, SODIUM BENTONITE.
7. INSTALL CEMENT BENTONITE GROUT ABOVE BENTONITE CHIPS UP TO BOTTOM OF CONCRETE SURFACE SEAL. NATIVE MATERIALS ARE NOT ACCEPTABLE AS BACKFILL.
8. PROTECTIVE CASING OF RISER PIPE SHALL BE GRP PIPE ATTACHED WITH TAG OR PLATE FOR MARKINGS OR IDENTIFICATION.
9. INSTALLATION OF CRASH BARRIERS IS OPTIONAL AND IS RECOMMENDED ONLY IN AREAS WHERE THERE IS POTENTIAL DAMAGE BY VEHICULAR MOVEMENT ETC.
10. AFTER COMPLETION OF MONITORING WELL CONSTRUCTION, THE WELL SHALL BE DEVELOPED (REMOVAL OF ALL WATER) BY SURGING AND PUMPING. ALTERNATIVELY, FRESH CLEAN WATER CAN BE USED TO DISPLACE THE DIRTY SEGMENTED WATER WITHIN THE WELL. THIS PROCESS SHOULD CONTINUE UNTIL THE WELL WATER IS CLEAN AND FREE OF SILT, SAND AND CLAY.
11. WELL DEVELOPMENT WATER CAN BE DISCHARGED TO THE GROUND SURFACE UNLESS IT CONTAINS VISIBLE EVIDENCE OF CONTAMINATION.

0	05/25/2018		INITIAL APPROVED ISSUE PER EAP NO. 04041						
NO.	DATE	BY	DESCRIPTION						APPROVED BY

KINGDOM OF SAUDI ARABIA المملكة العربية السعودية
 الهيئة العامة للغذاء والدواء
 الادارة العامة لمنطقة بنبع
MADINAT YAMBU AL-BINAIYAN مدينة بنبع الصناعية

DRAWING TITLE: **STANDARD DRAWING**
GROUNDWATER MONITORING WELL DETAIL

DESIGNED BY: STL	DATE: _____	DRAWING NO:
DRAWN BY: EDV		
CHECKED BY: ALY/STL		
PREP. PER: _____		
ENG. NO. 1: _____		
A/E APPROVAL: _____	VER. NO. 1: _____	DRAWING NO. _____
A. C. APPROVAL: _____	CONT. NO. 1: _____	
DATE: 02 SEP 2018	SCALE: NOT TO SCALE	REV. NO. _____

RC-EN-1
SHEET OF _____

Annexure 2 Groundwater Monitoring Well Installation Record

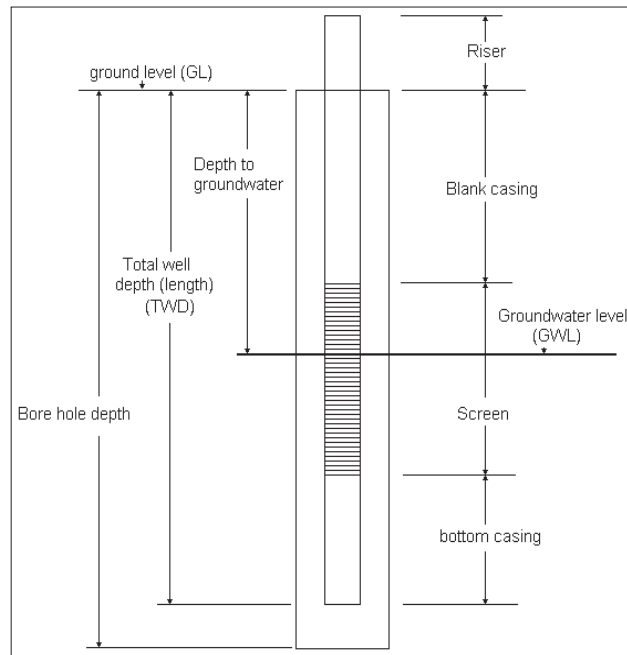
- Facility name _____ Date ____/____/____
- Contractor _____
- Well ID _____ Borehole (drilling) Depth _____ (m)
- Length bottom casing _____ (m) length of screen _____ (m)
- Length of blank casing _____ (m) Length of riser _____ (m)
- Total well depth (TWD) _____ (m) Screen slot size _____ (mm)
- Filter pack (type) _____ thickness _____ (m)
- Bentonite pack (type) _____ thickness _____ (m)
- Grouting material (type) _____ thickness _____ (m)
- Depth to groundwater (GWL) _____ (m)
- GPS coordinates (WGS 1984 UTM Zone 37N)
 _____ N _____ E
- GPS Coordinate system used (if not UTM 37N) _____
- Elevation (meters above sea level) _____ (m)

- Crash barrier installed Yes / No
- Signs of contamination Yes / No
- If yes describe _____

Name (Engineer) _____

Signed _____

Date ____/____/____



**Annexure 3
Groundwater Monitoring and Sampling Record**

Facility name _____ Date ____ / ____ / ____

Sampler name _____

Well ID _____ Well Diameter _____ (mm)

Total well depth (from ground level) _____ (m)

Total depth to groundwater _____ (m)

Approximate Volume of water in well _____ (litre)

General Condition of well _____

GPS coordinates (WGS 1984 UTM Zone 37N)
 _____ N _____ E

GPS Coordinate system used (if not UTM 37N) _____

Elevation (meters above sea level) _____ (m)

Sampling method (Pump or Bailer) _____

Weather Conditions _____

Signs of contamination (Yes / No). If yes describe _____

Time (min)	Water Level	Volume Pumped	Pumping Rate	Temperature	pH	Cond

Quality control samples taken (tick)

Blind duplicate p blank (VOCs)

Sample Delivered to _____

By _____

Signed (Sampler) _____ **Date** _____

Annexure 4: Groundwater Standard Reporting Form

Company Name:-----Periodic Groundwater Monitoring Results
 (EXAMPLE ONLY)

GW W#	pH	Salinity (ppt)	TSS (mg/L)	TOC (mg/L)	Phenols (mg/L)	Amonia Nitrogen (mg/L)	Metals (µg/L)								Monocyclic Aromatic Hydrocarbons (BTEX) (mg/L)				(TPH) (mg/L)	TPH fractions (mg/L)		VOCs (Total)	
							As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Benzene	Toluene	Ethylbenzene	Xylene		C6 – C9	C10-C40		
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Abbreviations

TPH = Total petroleum Hydrocarbon
 TSS = Total Suspended Solids
 TOC = Total Organic Carbon

**APPENDIX F.
GUIDELINES FOR STACK TESTING AND FUGITIVE EMISSIONS**

Stack Testing

A stack is a type of chimney, a vertical pipe, channel or similar structure through which gaseous or particulate emissions including combustion gases (called flue gases) are exhausted to the atmosphere. Flue gases are produced when fuel oil, natural gas, coal or any other fuel is combusted in an industrial furnace or a power plant's steam-generating boiler or any other large combustion device such as incinerator. Stack emissions are typically comprised of gaseous emissions such as carbon dioxide (CO₂) and water vapors as well as, nitrogen, oxygen. It also contains air pollutants such as carbon monoxide (CO), nitrogen oxides (NO_x) and sulfur oxides (SO_x), unburnt hydrocarbons, particulate matters (PM), etc.

A compliance stack test measures the amount of a specific pollutant or pollutants being emitted through source stacks at a facility against regulatory or permit limit to demonstrate compliance with an emission limit.

A performance stack test measures the amount of a specific pollutant or pollutants being emitted through source test to demonstrate performance guarantee for a emission control equipment according to its technical specifications guaranteed by the equipment vendor.

The facility which is required to conduct stack test/performance test shall submit a "Test Plan" for RC approval at least one month before testing date. The test plan shall be developed by a RC accepted third party for each source to be tested under RC regulation and EPO condition. The test plan shall include the testing methodology (from US EPA federal regulations or other international regulatory body).

1. General Description:

A range of methods for conducting stack tests were developed in response to the requirements as provided in US Environmental Protection Agency Clean Air Act Title-I "Air Pollution Prevention and Control".

Title-I Part A (Air Quality and Emission Limitations) Section 103 with U.S. Code 7403 further contains information on research, investigation, training and other activities.

The need to monitor and report as required in Title 1, has led to the EPA's research and development group crafting the tools and techniques to accurately measure pollutant discharges. US EPA Code of Federal Regulations (CFR) Title 40 (Protection of Environment) sub-Parts 60, 63, etc. contain information on standards of performance for new and existing stationary sources. A list of US EPA approved stack test methods is provided at the end of stack testing guidelines. In this list, the reference methods are linked with each other, particularly reference methods 1, 2 and 4 for flow, velocity, probe placement, and moisture content.

This guideline will mainly address some important points on the following reference methods as an example. However, the applicant is required to refer the test methods listed at the end of this Appendix-F, for detailed information as per their requirement. For example:

US EPA Method 6C: Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

US EPA Method 7E: Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

US EPA Method 10: Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

For example, probe placement and velocity measurements are some of the important factors to ensure that the gas stream is being measured at the correct location in the gas stream. Further, some of the equations needed for stack test calculations are found in 40 CFR Part 60 Appendix A –Reference Method 19 (Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates), and Appendix D (Required Emission Inventory Information), in addition to those as provided in Reference Methods 7E of Appendix A.

The various calibration and analyzer checks which are provided in this Appendix are required as mandatory. If these checks are not performed by the applicant, it will not be accepted by the Royal Commission.

Electronic analyzers for HCL and HF are preferable for analysis. Reference Method 26 (Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method) is only approved on a case by case basis.

In the electronic analyzer sampling methods, an electronic analyzer is used to measure stack gases extracted through a sampling system that has been checked for influencing the test results, (system bias), zero baseline, and span (range of analysis). Three runs are typically done, with sample periods of one hour each during a run. Calibration checks are done between runs to check for accuracy and drift.

Adjustments to boilers, incinerators, or pollution control devices are not permitted during a sampling run. If the boiler or incinerator is operating outside of permissible permit limits during a sampling run, stop the run, correct the operational error, and start a new sample run.

Facilities equipped with continuous emissions monitoring system (CEMS) shall be operating in specified limits and cannot be adjusted during the stack test. The CEMS will be verified for accuracy at the same time the stack test is run. This is referred to as the RATA- Relative Accuracy Test Audit in US EPA.

2. Equipment.

Analyzers with EPA approved measuring principle shall be used to measure stack exhaust gases. Calibration gasses must be within the manufacturer's approved time frame for use.

The sample line, which connects the stack to the gas analyzers, must be properly equipped to accept the calibration gas at the stack intake port via a valve arrangement, or by moving the cylinder to the intake port. This is done in order to conduct the system bias test.

The valve array in the sample trailer shall also be tested for leaks before any sampling is done.

3. Discussion of Procedures

3a. Calibration.

Interference check:

The interference check is done to ensure that the analyzers are not affected by other gases in the sample stream. For NO_x, single calibration gases of SO₂, CO, NH₃, and any other gases the analyzer is expected to be exposed to are passed through the analyzer. There should be no response from the analyzer. The next step is to add SO₂ to the feed and look for changes in the NO_x reading.

This is done by using a calibration gas consisting of only NO_x and SO₂ to check for SO₂ interference of the NO_x reading. The analyzer reading should not vary more than that allowed by the manufacturer. The same is done for NO_x and CO, and similarly for NO_x and NH₃. This is done only once in the lab. It does

not have to be repeated unless the detector in the analyzer is repaired or replaced. Repeat for SO₂, CO, NH₃ and any other gases measured.

3b. System Bias.

The purpose of the system bias test is to see if the sample train has an influence on the readings. Start by introducing the calibration gas directly entered into the analyzers and note the response. Next, the same gas is entered into the sample line at the stack, with the stack flow cut off. Given enough time for the calibration gas to purge the line before having the gas enter the analyzer. Any difference between the two is the system bias, and the equation for the calculation is to be found in the specific method. This is done before and after each run. The error must be no more than 5% of the calibration gas value for lower and upper span values.

3c. Drift.

Drift is the difference between the pre and post run system bias, or system calibration error check for a specific calibration gas concentration level at the low, mid or high level gas concentration. It is done after each run.

3d. Calculations.

Emissions are reported in units of ng/j. F factors for this calculation is found in Reference Method 19 (Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates) and in 40 CFR Part 60 Appendix D. Appendix D is for fossil fuel fired steam generators. Use these formulas for calculating ng/j of NO_x and SO₂ emissions.

3e. RATA (Relative Accuracy Test Audit)

Operations that have CEMS as a permit requirement shall run their analyzers during the stack test and include in the report to fulfill the relative accuracy test audit (RATA) for CEMS.

4. Procedural Checklist

This Appendix has adopted the Summary Table of QA/QC in Section 9 of Reference Method 7E (Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure) as a checklist for what is to be done before and during the stack test. Appropriate QA/QC procedures shall be followed for all the tests as described in the EPA test methods. The following table summarizes the QA/QC requirement.

Summary Table of QA/QC

Status	Process or element	QA/QC specification	Acceptance criteria	Checking frequency
S	Identify Data User		Regulatory Agency or other primary end user of data	Before designing test.
S	Analyzer Design	Analyzer resolution or sensitivity	<2.0% of full- scale range	Manufacturer design.
M		Interference gas check	Sum of responses $\leq 2.5\%$ of calibration span. Alternatively, sum of responses: ≤ 0.5 ppmv for calibration spans of 5 to 10 ppmv. ≤ 0.2 ppmv for calibration spans < 5 ppmv. See Table 7E-3.	
M	System Performance	NO ₂ -NO conversion efficiency	$\geq 90\%$ of certified test gas concentration	Before or after each test
M	Calibration on Gases	Traceability protocol (G1, G2)	Valid certificate required. Uncertainty $\leq 2.0\%$ of tag value	
M		High-level gas	Equal to the calibration span	Each test.
M		Mid-level gas	40 to 60% of calibration span	Each test.
M		Low-level gas	<20% of calibration span	Each test.
S	Data Recorder Design	Data resolution	$\leq 0.5\%$ of full- scale range	Manufacturer design.
S	Sample Extraction	Probe material	SS or quartz if stack >500 °F	Each test.
M	Sample Extraction	Probe, filter and sample line temperature	For dry-basis analyzers, keep sample above the dew point by heating, prior to sample conditioning For wet-basis analyzers, keep	Each run.

			sample above dew point at all times, by heating or dilution.	
S	Sample Extraction	Calibration valve material	SS	Each test.
S	Sample Extraction	Sample pump material	Inert to sample constituents	Each test.
S	Sample Extraction	Manifolding material	Inert to sample constituents	Each test.
S	Moisture Removal	Equipment efficiency	<5% target compound removal	Verified through system bias check.
S	Particulate Removal	Filter inertness	Pass system bias check	Each bias check.
M	Analyzer & Calibration Gas Performance	Analyzer calibration error (or 3-point system calibration error for dilution systems)	Within $\pm 2.0\%$ of the calibration span of the analyzer for the low-, mid-, and high-level calibration gases. Alternative specification: 0.5 ppmv absolute difference.	Before initial run and after a failed system bias test or dilution drift test.
M	System Performance	System bias (or pre- and post-run 2-point system calibration error for dilution systems)	Within $\pm 5.0\%$ of the analyzer calibration span for low-scale and upscale calibration gases. Alternative specification: 0.5 ppmv absolute difference.	Before and after each run.
M	System Performance	System response time	Determines minimum sampling time per point	During initial sampling system bias test.
M	System Performance	Drift	3.0% of calibration span for low-level and mid- or high-level gases. Alternative specification: 0.5 ppmv absolute difference.	After each test run.
M	System Performance	NO ₂ -NO conversion efficiency	$\geq 90\%$ of certified test gas concentration	Before or after each test.

M	System Performance	Purge time	≥2times system response time	Before starting the first run and when probe is removed from and re- inserted into the stack.
M	System Performance	Minimum sample time at each point	Two times the system response time	Each sample point.
M	System Performance	Stable sample flow rate (surrogate for maintaining system response time)	Within 10% of flow rate established during system response time check	Each run.
M	Sample Point Selection	Stratification test	All points within: ±5% of mean for 1- point sampling. ±10% of mean for 3-point. Alternatively, all points within: ±0.5 ppm of mean for 1-point sampling. ±1.0 ppm of mean for 3-point sampling.	Prior to first run.
A	Multiple sample points simultaneously	No. of openings in probe	Multi-hole probe with verifiable constant flow through all holes within 10% of mean flow rate (requires Administrative approval for Part 75)	Each run.
M	Data Recording	Frequency	1 minute average	During run.
S	Data Parameters	Sample concentration range	All 1-minute averages within calibration span	Each run.
M	Data Parameters	Average concentration for the run	Run average ≤calibrationspan	Each run.

S=Suggested, M=Mandatory, A=Alternative

5. Reporting Requirements

5a. Reporting Schedule

RCER-2015 regulations require the following under Section 2.5:

The operator of facility shall, within **60** days of conducting any required emission test, submit a written report to the Royal Commission. The report shall contain all applicable information which shall include as minimum:

- a) Analytical data – pollutants, moisture content, oxygen content,
- b) Physical data – flow rate, stack emission velocity, temperature, pressures, stack dimensions, isokinetic flow conditions,
- c) Process operating conditions at time of testing,
- d) One example calculation for each method,
- e) Emission results with raw data-(electronic or hard copy) mission data in same unit as the relevant emission standard in Table 2B, mass emission data and concentration emission data,
- f) Calibration.

NOTE: Temperature readouts must be available in the vehicle to provide RC staff the ability to see the stack temperature real time.

RC requires both electronic and hard copies to be submitted. Penalties for late submittals will be enforced.

5b. Reporting Format

The following format is the only acceptable format to be used in submitting reports. If this format will not be followed, Royal Commission will reject the submitted report.

The report shall be organized in the sections shown below:

- 1) Introduction/project description: To include at a minimum:
 - (a) Description of the facility and details about the process that generates the emissions being monitored by the stack test.
 - (b) Date of last stack test and stack test approval letter from the RC
 - (c) Location of the stacks, both by site plan and latitude-longitude.
 - (d) Test methods employed.
 - (i) Name and model number of analyzers used
 - (ii) Interference gas test results
 - (iii) Reference methods used
 - (iv) definitions
 - (v) Log of technician- hours on site, name and title of the technicians for the consultant.
- (2) Process flow and or process instrumentation diagrams.
 - (a) Include legible 11inch by 14inch or 14 by 18 drawings for PI&Ds.

(3) Summary.

The summary section shall include the following:

- b) NO_x and or SO₂ emission numbers for each emission source identified
- c) Heat rates as BTU/kw-hr (for all combustion sources)
- d) Fuel consumption per run and percent of maximum load of the equipment being tested.
- e) Failed runs due to analyzer or unit operating equipment problems with dialog describing the problem and corrective measures.
- f) The permit limit for the particular emission source.
- g) The summary is to be located at the front of the report after Section 2 - Process flow and or process instrumentation diagrams

(4) Calculations.

- (a) Stratification test results
- (b) Analyzer Calibrations- before each run –low, mid, and high level gas concentrations
- (c) System bias - before and after each run
- (d) Drift
- (e) NO_x, CO, and or SO₂ emission numbers
- (f) Heat rates as BTU/kw-hr(NO_x, SO₂, CO)
- (g) Fuel consumption per run
- (h) Per cent load the unit being tested is operating at during the test.

5) Data.

Calibration results used for run checks, bias, and drift shall be reported in Section 4 for calculations. The data is needed to show calibration calculations and results. Analyzer data: A sixty minute run shall have 60 samples in it. Runs are typically sixty minutes in length. Calibration gas certifications and fuel analysis:

- a) Include a copy of calibration gas certificates for all calibration gases used on site.
- b) Gas/oil BTU and sulfur content(for power generating operations)
- c) Feed rate and identification of other gases/liquids going into an incinerator being tested.

6) Formatting and Binding

- a) Multiple locations or operating units
 - i) Calculations and results for all units shall be put into the Calculation section only.
 - ii) Analyzer data for all units shall be put into the Data section only.
 - iii) Description of the various unit operating units shall be put into Section 1a in the Introduction/project description section only.
 - iv) Results for all emissions monitoring runs to be put into the **Summary** section to summarize the results of the runs and whether or not they meet RC emissions limits (see 6e).
- b) Spreadsheets and tables shall have only one entry per cell.

- c) The calculated result shall be colored coded blue. Red ink is to be used if the reported value is in exceedance of the RC emission limit.
- d) Include the appropriate RC permit limit in the tables or spreadsheets.
- e) Each run result shall be calculated in the Calculation Section with the result printed there, and the results shown in the Summary Section as well.
- f) Additional sections or divisions may be added to the required format as subsections if needed.
- g) Fonts shall be no smaller than 12 point unless the text is reduced to fit tables.
- h) The name of the company and consultant shall be visible on the cover.
- i) Contact information for the company and consultant shall be found in the front of the report.
- j) Bindings must be able to be laid flat.
- k) Electronic copies are to be submitted via compact disc with the appropriate storage pouch integral to the document.

REFERENCE METHOD 21 FUGITIVE EMISSIONS

1. General Description of Method

INTRODUCTION.

With the passing of the Clean Air Act, the EPA began to quantify emissions from petrochemical, pharmaceutical, pulp and paper, and other facilities that emit hydrocarbons from valves and fittings in the plants. The Leak Detection and Repair (LDAR) program was promulgated in the 1980's with the Synthetic Organic Chemicals Manufacturing Industry regulations. The method to quantify and identify the leaks is found in 40 CFR Part 60, Appendix A, and is known as Reference Method 21.

The various calibration and analyzer checks which are provided in this Appendix are required as mandatory. If these checks are not performed by the applicant, it will not be accepted by the Royal Commission.

REFERENCE METHOD 21

Reference Method 21 is the standard for fugitive emissions. In this method, an electronic analyzer with a PID or FID detector is used to measure fugitive emissions. Calibration checks are done daily to check for accuracy.

2. Equipment

Analyzers with EPA approved measuring principle shall be used to measure stack exhaust gases. Calibration gases must be within the manufacturer's approved time frame for use.

3. Discussion of Procedures.

3a. Calibration

Zero gas, also called zero air is used to both purge the instrument between calibration gases, and check base line reading for the instrument. After the introduction of the zero air, the analyzer

should return to a zero reading within fifteen minutes. A longer period is indicative of a problem with the analyzer, which should be serviced at that point.

Standard gases typically have a one or two year shelf life. Three different concentrations are needed for low, mid, and high range of the analyzer span. See Appendix H for details on analyzer tests using standard gases. Concentration are reported in units of parts per million (ppm).

4. Procedural Checklist

This Appendix has adopted the Summary Table of QA/QC, which is given on next page:

Summary Table of QA/QC Procedures

STATUS	PROCESS/ELEMENT	QA/QC SPECIFICATION	ACCEPTANCE CRITERIA	CHECKING FREQUENCY
M	analyzer design		PID or FID	
M		intrinsically safe	Class 1 Div.1 or Class 2 Div. 1	checked before purchasing or after modifications
M	system performance	flow rate	0.1 to 3.0 L/min	daily
		response factor	record variation between meter reading and reference compound	daily
M	calibration gases	response time	less than 30 seconds	continuous observations during testing
		zero gas	valid certificate	before mobilization
			less than 10 ppmv VOC	daily
		reference compound	cal gas for each compound to be detected	daily
	A cal gas is made up with each chemical being sampled for, or as alternate-follow 7.4 in RM21 and calculate conversion factor	RCER Limit of 500 ppm HAP - 10,000 ppm VOC for each chemical	check certificate on reception of the calibration gas	
M	analyzer calibration	zero reading between samples or background reading level	zero or manufacturers' allowable variation	continuous observations during testing
M		precision tests	manufacturer's specification	quarterly

Status: M means mandatory requirement.

5. Reporting Requirements

5a. Reporting Schedule

RCER-2015 regulations require the following under Section 2.5.8:

The operator of facility shall, within **60** days of conduction any required emission testing, submit a written report to the Royal Commission. The report shall contain all applicable information which shall include as minimum:

- g) Analytical data- types of chemicals that pass through the valves and fittings being tested.
- h) Emission results with raw data
- i) Calibration.

RC requires both electronic and hard copies to be submitted. Penalties for late submittals will be enforced.

5b. Reporting Format

The following format is the only acceptable format to be used in submitting reports. If this format will not be followed, Royal Commission will reject the submitted report.

The report shall be organized in the sections shown below:

- i. Introduction/project description.
 - To include at a minimum:
 - a) Description of the facility and details about the process that generates the emissions being monitored by the fugitive emissions test.
 - b) Date of last test and test approval letter from the RC
 - c) Location of the equipment being surveyed, by site plan
 - d) Test methods employed.
 - i) Name and model number of analyzers used
 - ii) Log of technician- hours on site, name and title of the technicians for the consultant.
- ii. Process flow diagrams.
 - a) Include legible 11inch by 14inch or 14 by 18 drawings for PFDs.
- iii. Summary.
 - The summary section shall include the following:
 - a) Emission numbers for each emission source identified
 - b) The permit limit for the particular emission source.
 - c) The summary is to be located at the front of the report after Section 2 - Process flow and or process instrumentation diagrams
- iv. Calculations.
 - Response factor (RM 21-8.1.1) must be determined and conversion factor calculation- if needed.
 - Include Form PA6 for fugitive emissions.
- v. Data.
 - a) Calibration results. The data is needed to show calibration calculations and results.
 - b) Analyzer data.
- vi. Formatting and binding.
 - a) Multiple locations or operating units
 - i) Calculations and results for all units shall be put into the **Calculation** section only.
 - ii) Analyzer data for all units shall be put into the Data section only. Results for all emissions monitoring runs to be

put into the Summary section to summarize the results of the runs and whether or not they meet RC emissions limits.

- b) Spreadsheets and tables shall have only one entry per cell.
 - c) The calculated result shall be colored coded black. Red ink is to be used if the reported value is in exceedance of the RC emission limit.
 - d) Include the appropriate RC permit limit in the tables or spreadsheets.
 - e) Each run result will be calculated in the Calculation Section with the result printed there, and the results show in the Summary Section as well.
 - f) Additional sections or divisions may be added to the required format as subsections if needed.
 - g) Fonts shall be no small than 12 point unless the text is reduced to fit tables.
 - h) The name of the company and consultant shall be visible on the cover.
 - i) Contact information for the company and consultant shall be found in the front of the report.
 - j) Bindings must be able to be laid flat.
 - k) Electronic copies are to be submitted via compact disc with the appropriate storage pouch integral to the document.
-

US EPA Approved Stack Test Methods - 40 CFR Part 60, Appendix A

Link: <http://www.epa.gov/ttnemc01/promgate.html>

USA EPA Method 1 - Sample And Velocity Traverses For Stationary Sources
USA EPA Method 1A - Sample And Velocity Traverses For Stationary sources With Small Stacks Or Ducts
USA EPA Method 2 - Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
USA EPA Method 2A - Direct Measurement Of Gas Volume Through Pipes And Small Ducts
USA EPA Method 2B - Exhaust Gas Volume Flow Rate From Gasoline Vapor Incinerators
USA EPA Method 2C - Gas Velocity And Volumetric Flow Rate In Small Stacks Or Ducts (Standard Pitot Tube)
USA EPA Method 2D - Gas Velocity And Volumetric Flow Rate In Small Stacks Or Ducts
USA EPA Method 2E - Landfill Gas Production Flow Rate
USA EPA Method 2F - Flow Rate Measurement with 3-D Probe
USA EPA Method 2G - Flow Rate Measurement with 2-D Probe
USA EPA Method 2H - Flow Rate Measurement with Velocity Decay Near Stack Walls
USA EPA Method 3 - Gas Analysis for the Dry Molecular Weight
USA EPA Method 3A - O2 and CO2 Concentrations in Emissions From Stationary Sources (Instrumental Procedure)
USA EPA Method 3B - Gas Analysis for the Emission Rate Correction Factor or Excess Air
USA EPA Method 3C - Carbon Dioxide, Methane, Nitrogen, and Oxygen From Stationary Sources
USA EPA Method 4 - Moisture Content In Stack Gases
USA EPA Method 5 - Particulate (PM)
USA EPA Method 5A - PM Asphalt Roofing (Particulate)
USA EPA Method 5B - PM Nonsulfuric Acid (Particulate)
USA EPA Method 5D - PM Baghouses (Particulate)
USA EPA Method 5E - PM Fiberglass Plants (Particulate)
USA EPA Method 5F - PM Fluid Catalytic Cracking Unit
USA EPA Method 5G - PM Wood Heaters from a Dilution Tunnel
USA EPA Method 5H - PM Wood Heaters from a Stack
USA EPA Method 5I - Low Level Particulate Emissions
USA EPA Method 6 - Sulfur Dioxide Emissions From Stationary Sources(SO2)
USA EPA Method 6A - SO2, CO2
USA EPA Method 6B - SO2, CO2 - Long Term Integrated
USA EPA Method 6C - SO2 - Instrumental
USA EPA Method 7 - Nitrogen Oxide (NOx)
USA EPA Method 7A - NOx - Ion Chromatographic Method
USA EPA Method 7B - NOx - Ultraviolet Spectrophotometry
USA EPA Method 7C - NOx - Colorimetric Method
USA EPA Method 7D - NOx - Ion Chromatographic
USA EPA Method 7E - NOx - Instrumental
USA EPA Method 8 - Sulfuric Acid Mist
USA EPA Method 9 - Visual Opacity

USA EPA Method 10 - Carbon Monoxide-NDIR
USA EPA Method 10A - CO for Certifying CEMS
USA EPA Method 10B - CO from Stationary Sources
USA EPA Method 11 - H2S Content of Fuel
USA EPA Method 12 - Inorganic Lead
USA EPA Method 13A - Total Fluoride (SPADNS Zirconium Lake)
USA EPA Method 13B - Total Fluoride (Specific Ion Electrode)
USA EPA Method 14 - Fluoride for Primary Aluminum Plants
USA EPA Method 15 - Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide
USA EPA Method 15A - Total Reduced Sulfur Emissions From Sulfur Recovery Plants in Petroleum Refineries
USA EPA Method 16 - Sulfur (Semicontinuous Determination)
USA EPA Method 16A - Total Reduced Sulfur (Impinger)
USA EPA Method 16B - Total Reduced Sulfur (GC Analysis)
USA EPA Method 17 - In-Stack Particulate (PM)
USA EPA Method 18 - VOC by GC
USA EPA Method 19 - SO2 Removal & PM, SO2, NOx Rates from Electric Utility Steam Generators
USA EPA Method 20 - NOx from Stationary Gas Turbines
USA EPA Method 21 - VOC Leaks
USA EPA Method 22 - Fugitive Opacity
USA EPA Method 23 - Dioxin and Furan (02/91 FR Copy)
USA EPA Method 24 - Surface Coatings
USA EPA Method 24A - Publication Rotogravure Inks and Related Publication Rotogravure Coatings
USA EPA Method 25 - Gaseous Nonmethane Organic Emissions
USA EPA Method 25A - Gaseous Organic Concentration (Flame Ionization)
USA EPA Method 25B - Gaseous Organic Concentration (Infrared Analyzer)
USA EPA Method 25C - Nonmethane Organic Compounds (Nmoc) In Landfill Gases
USA EPA Method 25D - VOC of Waste Samples
USA EPA Method 25E - Vapor Phase Organic Concentration in Waste Samples
USA EPA Method 26 - Hydrogen Chloride, Halides, Halogens
USA EPA Method 26A - Hydrogen Halide & Halogen-Isokinetic
USA EPA Method 27 - Vapor Tightness of Gasoline Tank-Pressure Vacuum
USA EPA Method 28 - Certification and Auditing - Wood Heaters
USA EPA Method 28A - Air to Fuel Ratio, Burn Rate - Wood-fired Appliances
USA EPA Method 29 - Metals Emissions from Stationary Sources
USA EPA Method 30A - Total Vapor Phase Mercury Emissions From Stationary Sources (Instrumental Procedure)
USA EPA Method 30B - Total Vapor Phase Mercury Emissions From Coal-Fired Combustion Sources (Sorbent Trap)
USA EPA Method 101 - Mercury from Chlor-Alkali Plants (Air)
USA EPA Method 101A - Mercury from Sewage Sludge Incinerators
USA EPA Method 102 - Mercury from Chlor-Alkali Plants (Hydrogen Streams)
USA EPA Method 103 - Beryllium Screening Method
USA EPA Method 104 - Beryllium Emissions Determination
USA EPA Method 105 - Mercury in Wastewater Treatment Plant Sewage Sludge
USA EPA Method 106 - Vinyl Chloride
USA EPA Method 107 - Vinyl Chloride Content of Inprocess Wastewater Samples
USA EPA Method 107A - Vinyl Chloride Content of Solvents
USA EPA Method 108 - Particulate & Gaseous Arsenic Emissions
USA EPA Method 108A - Arsenic Content in Ore Samples from Nonferrous Smelters
USA EPA Method 108B - Arsenic
USA EPA Method 108C - Arsenic
USA EPA Method 111 - Polonium-210 Emissions
USA EPA Method 114 - Radionuclide Emissions
USA EPA Method 115 - Radon-222 Emissions
USA EPA Method 201 - PM10 (In-stack, CRS)
USA EPA Method 201A - PM10 (In-stack, CRS) (revised with figures)
USA EPA Method 202 - Condensable Particulate
USA EPA Method 203 - Opacity Of Emissions From Stationary Sources By Continuous Opacity Monitoring
USA EPA Method 203A - Visual Opacity - Stationary Sources - Time-Averaged Regulations
USA EPA Method 204 - Permanent or Temporary Total Enclosure (TTE) for Determining Capture Efficiency
USA EPA Method 204A - VOCs in Liquid Input Stream
USA EPA Method 204B - VOCs in Captured Stream
USA EPA Method 204C - VOCs in Captured Stream (Dilution Technique)
USA EPA Method 204D - Fugitive VOCs from Temporary Total Enclosure
USA EPA Method 204E - Fugitive VOCs from Building Enclosure
USA EPA Method 204F - VOCs in Liquid Input Stream (Distillation)
USA EPA Method 205 - Gas Dilution Calibration
USA EPA Method 301 - Validation Protocol
USA EPA Method 303 - By-product Coke Oven Batteries
USA EPA Method 303A - Nonrecovery Coke Oven Batteries
USA EPA Method 304A - Biodegradation Rates-Vent Option
USA EPA Method 304B - Biodegradation Rates- Scrubber Option

USA EPA Method 305 - Potential VOC in Waste
USA EPA Method 306 - Chromium Emissions Electroplating/Anodizing
USA EPA Method 306A - Chromium Emissions Electroplating/Anodizing (Mason Jar Method)
USA EPA Method 306B - Surface Tension for Tanks Electroplating/Anodizing
USA EPA Method 307 - Emissions from Solvent Vapor Cleaners (Dec. 2, 1994)
USA EPA Method 308 - Methanol Emissions (Appeared in Federal Register 11/14/97)
USA EPA Method 310A - Residual Hexane
USA EPA Method 310B - Residual Solvent
USA EPA Method 310C - Residual N-Hexane in EDPM Rubber
USA EPA Method 311 - HAPS in Paints & Coatings
USA EPA Method 312A - Styrene in SBR Latex (GC)
USA EPA Method 312B - Styrene in SBR Latex by Capillary GC
USA EPA Method 312C - Styrene in SBR Latex Produced by Emulsion Polymerization
USA EPA Method 313A - Residual Hydrocarbon in Rubber Crumb
USA EPA Method 313B - Residual HC in Rubber Crumb by Capillary GC
USA EPA Method 315 - PM and MCEM from Aluminum Production Facilities
USA EPA Method 316 - Sample & Analysis for Formaldehyde Emissions in the Mineral Wool & Wool Fiberglass Industries
USA EPA Method 318 - Extractive FTIR Method for Measurement of Emissions from the Mineral Wool and Wool Fiberglass Industries
USA EPA Method 320 - Vapor Phase Organic & Inorganic Emissions by Extractive FTIR
USA EPA Method 321 - Gaseous HCl Emissions at Portland Cement Kilns by FTIR

**APPENDIX G.
GUIDELINES FOR COTINUOUS EMISSION MONITORING SYSTEM (CEMS)
CALIBRATION METHODOLOGIES**

TABLE OF CONTENTS

1. General Description of Method
2. Equipment.
3. Discussion of Procedures, Calibration and Procedural Checklist
4. Reporting Requirements

1. General Description of Method

INTRODUCTION

The reference methods were developed in response to the requirements of the US Clean Air Act. This is found in Title 1, Part A, Section 103, which is Research, Training, Investigations, and other activities. This is officially identified as 42 USC § 7403.

The need to monitor and report as required in Title 1, has led to the EPA's research and development group crafting the tools and techniques to accurately measure pollutant discharges.

The various calibration and analyzer checks listed in this Appendix are required. They are not optional. Not carrying out the requirements in this Appendix invalidates the test. It will not be accepted by the Royal Commission.

Reports received by the Royal Commission have shown the following:

- Insufficient knowledge of the correct quality assurance protocols required in EPA 40CFR Part 75,
- Omissions observed include incomplete calibration checks,
- Poor report formatting.

The requirements for preparing an acceptable report are given in detail in this document. This includes a standard for bindings and the requirements for electronic copies and submissions.

2. Equipment

Manufacturer recognized analyzers made by Thermo, Siemens, and other manufacturers, preferably EPA approved, or ISO equivalent shall be used to stack emissions. Calibration gases must be within the manufacturer's approved time frame for use.

3. Discussion of Procedures, Calibration and Procedural Checklist

Calibration.
Zero gas.
Standard gas

Emissions are reported in units of parts per million (ppm).

Tests shall be in accordance with US EPA Methods in order to prove the compliance with RC emission standards. The Monthly Self-Monitoring Report must report the data on an hourly basis for all parameters. Both data tables and graphical summaries showing each parameter (NO_x, CO, etc.) shall be submitted. The following four calibration tests shall be included in the monthly report:

- a) Linearity test

- b) Interference test
- c) calibration (drift)
- d) certification- Seven day calibration test

Annual Stack tests shall include the CEMS readouts as well. The CEMS shall be run simultaneously and the readout submitted to the RC to insure CEMS accuracy.

QA/QC Plan

Scheduled maintenance,
spare parts kept on hand,
maintenance record
calibration and linearity procedure in the plan
Submit initially, then biannually for review
Sample line check (system bias check)

CALIBRATION TEST PROCEDURES

The following tests are being added to bring monitoring and equipment calibration checks in line with current EPA procedures and anticipated regulatory changes for 2015. These procedures will be described and given a schedule for checking the calibration accuracy. In addition, a quality assurance manual shall be written to give inspectors current knowledge of the condition of the CEMS. One requirement in particular is to have sufficient spare parts on hand to prevent extended periods of equipment being offline and in violation of operating requirements.

TEST DESCRIPTIONS.

1. Linearity check.

As the name implies, this test is done to insure that the response of the analyzers are linear over the range of calibration gases used and not responding on a curve that would skew the readings.

2. Interference check.

This test insures that other gases in the stream do not interfere with the one being measured. As an example, verifying that the SO₂ in the gas stream is not interfering with the NO_x analyzer and vice versa. This needs to be done for NO_x, CO, and SO₂ analyzers.

3. Calibration drift test.

As the name implies, this test is done to insure that the calibration is stable over time and does not drift.

4. Certification- Seven day calibration test

If the analyzer fails the drift test, the analyzer shall be repaired and a seven day calibration check done. The analyzer is tested with calibration gases daily for one week. This is the same procedure as certifying a new analyzer or one that has been repaired. If the analyzer passes the seven day certification test while recording data in the interim, the interim data is accepted, otherwise it must not be used in the

hourly calculations.

5. Cycle time.

The cycle time for pollutant concentration monitors and any other monitoring component a continuous emission monitoring system shall not exceed 15 minutes to stabilize This is the EPA standard.

TEST METHODS.

1. LINEARITY CHECK

For SO₂, CO, and NO_x pollutant concentration monitors, the error in linearity for each calibration gas concentration (low-, mid-, and high-levels) shall not exceed or deviate from the reference value by more than 5.0 percent (as calculated using equation 1).

Linearity check results are also acceptable if the absolute value of the difference between the average of the monitor response values and the average of the reference values, | R-A | in equation A-1 of this appendix, is less than or equal to 5 ppm

Gases are not to be run consecutively- vary the order (low, mid, high) of sampling for each run.

1. Plant and Audit Information

Facility Name:		ORIS Code:	
Location:		Plant ID:	
Plant Contact:		Phone Number:	
Inspector Name:		Audit Date:	

2. System Information

Parameter Monitored:	
System/Component ID:	
Span Value:	

3. Observations

Certified calibration gases?					
Are the cal gas concentrations appropriate for each range?	Low 20% - 30%		Mid 50%- 60%		High 80 - 100%
Were gases injected non consecutively?					
Concentration stable before recording? (not to exceed 15 minutes)?					

4. Test Results

Gas Range	Low	Mid	High
Cal Gas Value (R)			
Gas Cylinder ID No.			
Run #			
1			
2			
3			
Mean of the Response (A)			
R - A			
Linearity Result (LE)			

Equation #1: $LE = \frac{|R - A|}{R} \times 100$

where LE = Percent Linearity Error
 R = Reference value of calibration gas
 A = Average of monitoring system response

2. INTERFERENCE TEST

This is done periodically to insure that the analyzer is not experiencing interference from other gases in the exhaust gas stream. This test is for NOx, CO, and SO₂ analyzers. The following special calibration gases are needed: NOx + SO₂, NOx + CO, SO₂ + CO, and zero air. The gases shall not be mixed at the same concentrations. For example, if NOx is rated at 10ppm, the SO₂ should be around 15 ppm or vice versa. The concentrations should be different enough for dual use (NOx/ SO₂ for example), but not so different that one gas could mask the other due to a much higher concentration. A 25% to 50% difference in the concentrations is the recommended mixture parameter.

Use zero air gas to purge the analyzers between each test gas mixture. Record the results in the QA/QC manual. Analyzers that show interference from other gases shall be repaired according to manufacturer's recommendations or replaced.

3. CALIBRATION DRIFT TEST.

As the name implies, this test is done to insure that the calibration is stable over time and does not drift more than permitted in this procedure.

The procedure is to record calibration gas readings, for low, mid, and high range of the span. Repeat the test six weeks later. The percent drift shall be less than 3% absolute value by equation #2 for each gas.

Equation #2:

$$\left(\frac{\text{calibration gas reading at time 1} - \text{calibration gas reading at time 2}}{\text{calibration gas value}} \right) < 0.03$$

4. CERTIFICATION- SEVEN DAY CALIBRATION TEST

For each reference value, calculate the percentage calibration error based upon instrument span for daily calibration error tests using the following equation:

$$CE = \frac{|R-A|}{S} \times 100$$

where,

CE = Calibration error as a percentage of the span of the instrument.

R = Reference value of zero or upscale (high-level or mid-level, as applicable) calibration gas introduced into the monitoring system.

A = Actual monitoring system response to the calibration gas.

S = Span of the instrument, as specified in section 2 of this appendix.

5. Cycle Time

The cycle time for pollutant concentration monitors and any other monitoring component of a continuous emission monitoring system shall not exceed 15 minutes.

Use:

High level gas concentration for the analyzer span setting

Zero level gas

Upscale: Stable starting monitor value: ___ ppm

Stable ending monitor reading: ___ ppm

Elapsed time: ___ seconds for the analyzer to

Downscale:

Stable starting monitor value: ___ ppm, Stable ending monitor value: ___ ppm, Elapsed time: ___ seconds, Component cycle time= ___ seconds, System cycle time= ___ seconds

Figure 6a. Upscale Cycle Time Test

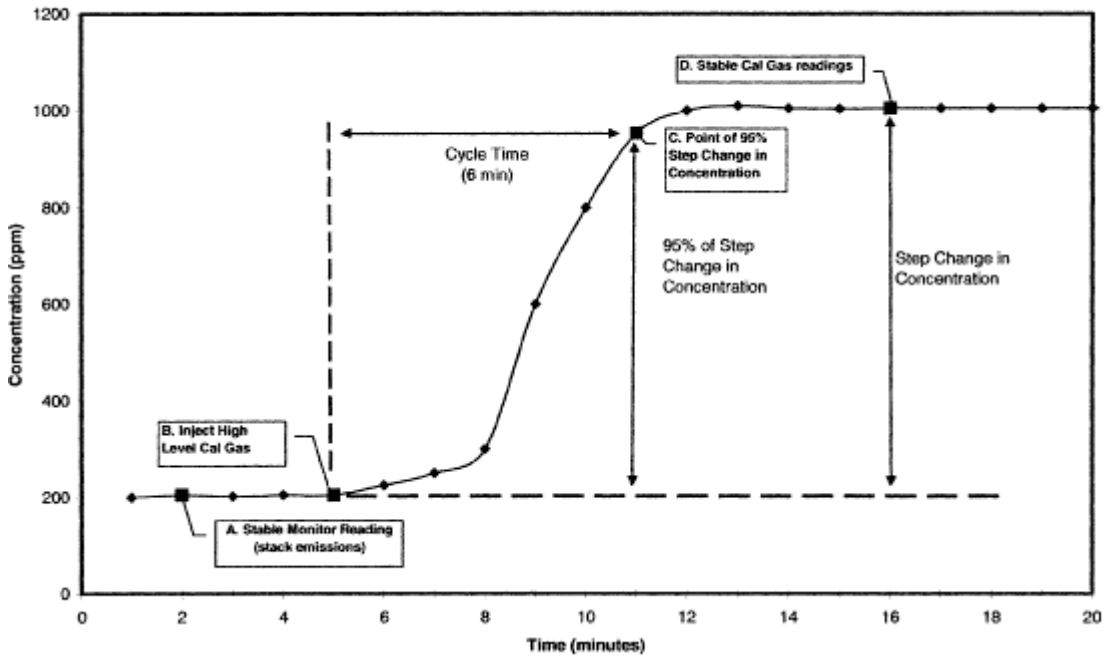
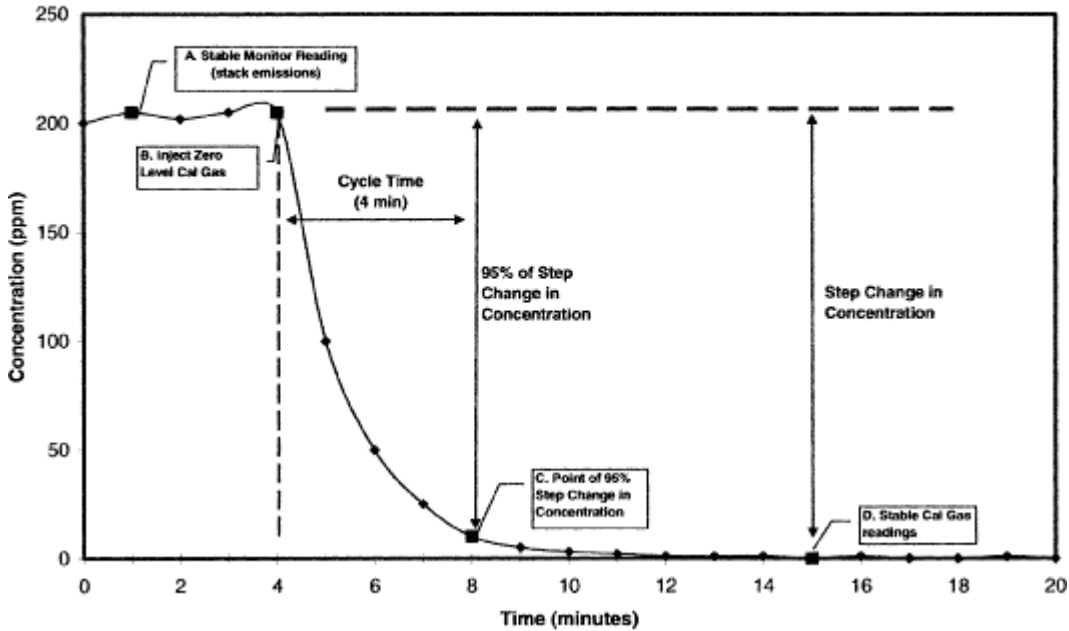


Figure 6b. Downscale Cycle Time Test



- A. To determine the upscale cycle time (Figure 6a), measure the flue gas emissions until the response stabilizes. Record the stabilized value (see section 6.4 of this appendix for the stability criteria).
- B. Inject a high-level calibration gas into the port leading to the calibration cell or thimble (Point B). Allow the analyzer to stabilize. Record the stabilized value.
- C. Determine the step change. The step change is equal to the difference between the final stable calibration gas value (Point D) and the stabilized stack emissions value (Point A).
- D. Take 95% of the step change value and add the result to the stabilized stack emissions value

- (Point A). Determine the time at which 95% of the step change occurred (Point C).
- E. Calculate the upscale cycle time by subtracting the time at which the calibration gas was injected (Point B) from the time at which 95% of the step change occurred (Point C). In this example, upscale cycle time = (11-5) = 6 minutes.
- F. To determine the downscale cycle time (Figure 6b) repeat the procedures above, except that a zero gas is injected when the flue gas emissions have stabilized, and 95% of the step change in concentration is subtracted from the stabilized stack emissions value.
- G. Compare the upscale and downscale cycle time values. The longer of these two times is the cycle time for the analyzer.

4. Reporting Requirements

RCER-2015 regulations require the following under Section 2 for calibration.

The operator of facility shall, within **60** days of conducting any required calibration test submit a hard copy report and an electronic report to the Royal Commission. The report shall contain all applicable information which shall include:

1. Last interference test, or current one if requested.
2. Calibration test,
3. Linearity test
4. Drift test,
5. Seven day calibration test- if required

Compliance Schedule

TYPE OF QA TEST	TYPE OF MONITOR	FREQUENCY
calibration error test	CEMS	Bi-weekly
linearity check	CEMS	quarterly
leak check	differential pressure flow monitors	quarterly
Relative Accuracy Test Audit	CEMS	annually, compare CEMS readings to stack testers' analyzers
flowmeter accuracy test	fuel flowmeters	annual

Reporting Format

Reporting Format

The following format is the only acceptable format to be used in submitting reports. If this format will not be followed, Royal Commission will reject the submitted report.

The report shall be organized in the sections shown below:

- 1) Introduction/project description: To include at a minimum:
 - a) Description of the facility and details about the process that generates the emissions being monitored by the CEMS.
 - b) Date of last test and test submittal-include any correspondence from the RC.
 - c) Location of the equipment being surveyed, by site plan
 - d) Test methods employed.
 - i) Name and model number of analyzers being calibrated
- 2) Summary: The summary section shall include the following:
 - a) Calibration results for each CEMS.
- 3) Calculations: Calculations for the above tests using the forms in this appendix.
- 4) Data.
 - a) Calibration results. The data is needed to show calibration calculations and results.
 - b) Analyzer data.
- 5) Formatting and binding.
 - a) Multiple locations or operating units
 - i) Calculations and results for all units shall be put into the Calculation section only.
 - ii) Analyzer data for all units shall be put into the Data section only.
 - iii) Description of the various unit operating units shall be put into Section 1a in the Introduction/project description section only.
 - iv) Results for all calibration runs to be put into the Summary section to summarize the results of the runs and whether or not they meet the specification in this appendix.
 - b) Spreadsheets and tables shall have only one entry per cell.
 - c) The calculated result shall be colored coded black. Red ink is to be used if the reported value is in exceedance of the RC emission limit.
 - d) Fonts shall be no small than 12 point unless the text is reduced to fit tables.
 - e) The name of the company and consultant shall be visible on the cover if a consultant is used
 - f) Contact information for the company and consultant shall be found in the front of the report.
 - g) Bindings must be able to be laid flat.
 - h) Electronic copies are to be submitted via compact disc with the appropriate storage pouch integral to the document.

Continuous Opacity Monitoring Systems (COMS)

As per Clause 2.6.6 of RCER-2015 Volume-I, the additional requirements for COMS are given below:

- A. The COMS shall meet the design and performance specifications, pass the field tests, and meet the installation requirements and data analysis and reporting requirements specified in US EPA Performance Specification No. 1, 40 CFR Part 60, Appendix B.
- B. The COMS must allow for the measurement of zero and span calibration drifts at least once every 24 hours by using a method for producing a simulated zero opacity condition and an upscale (span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of the light beam. The optical surfaces exposed to the effluent gases shall be cleaned prior to performing any zero and span drift adjustments, except that for systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds 4 percent opacity.
- C. Except for system breakdowns, repairs, calibration checks, and zero and span adjustments required by this special condition, the COMS shall complete a minimum of one cycle of sampling and analysing for each successive ten-second period and one cycle of data recording for each successive six-minute period. The six-minute averages shall be based on a minimum of 36 data points equally spaced over each six-minute period.

**APPENDIX H.
GUIDELINES FOR INSTALLING AUTO SAMPLING SYSTEM INSIDE FACILITY
FENCE**

Guideline for Installing Auto Sampling System Inside Facility Fence

1. Goal

- 1.1. To provide an effective system for RC to monitor compliance of a facility with RCER wastewater standards.
- 1.2. To counter check efficiency of facility's auto sampler and ensure that results consistently represent wastewater quality.

2. Auto Sampler Cabin

- 2.1. The auto sampler cabin shall be installed by the facility.
- 2.2. The auto sampler cabin shall be installed at the following location
 - a. Nearest location inside the facility to have easy access by regulatory authority to collect samples
 - b. Near the wastewater discharge pipe
 - c. Located where wastewater from the facility is well mixed.
- 2.3. The auto sampler cabin shall be constructed as per specification in figures 1 & 2.
- 2.4. The wastewater from the facility shall be routed through the auto sampler cabin inside the facility . No open channel is allowed in between the auto sampler cabin inside the facility and Marafiq discharge line to prevent contamination.
- 2.5. The wastewater pressure along the wastewater discharge pipe where sample will be taken shall be maintained at zero to facilitate auto sampling.
- 2.6. The cabin shall be provided with power connections with ready power outlets.
- 2.7. In cases where a facility has two or more wastewater discharge pipe leading to IWTP, two (2) cabins shall be constructed.

3. Auto sampler

- 3.1. Auto sampler shall be equipped with refrigeration system to preserve sample.
- 3.2. The auto sampler must be able to collect at least 1 liter sample for all parameters to be analyzed.
- 3.3. If auto sampler uses a peristaltic pump, the auto sampler must be capable of taking individual sample aliquot of at least 100 ml.

- 3.4. The auto sampler shall be capable of pumping samples from the wastewater discharge pipe through a head (vertical height) of at least 20 feet and sample volume can be adjustable since the volume is a function of a pumping head.
- 3.5. The pumping velocity shall be at least 2 ft/sec to prevent the settling of solid component of sample during pumping thus ensuring a reliable TSS sample.
- 3.6. The minimum inside diameter of the auto sampler intake line should be half of an inch (1/2 inch).

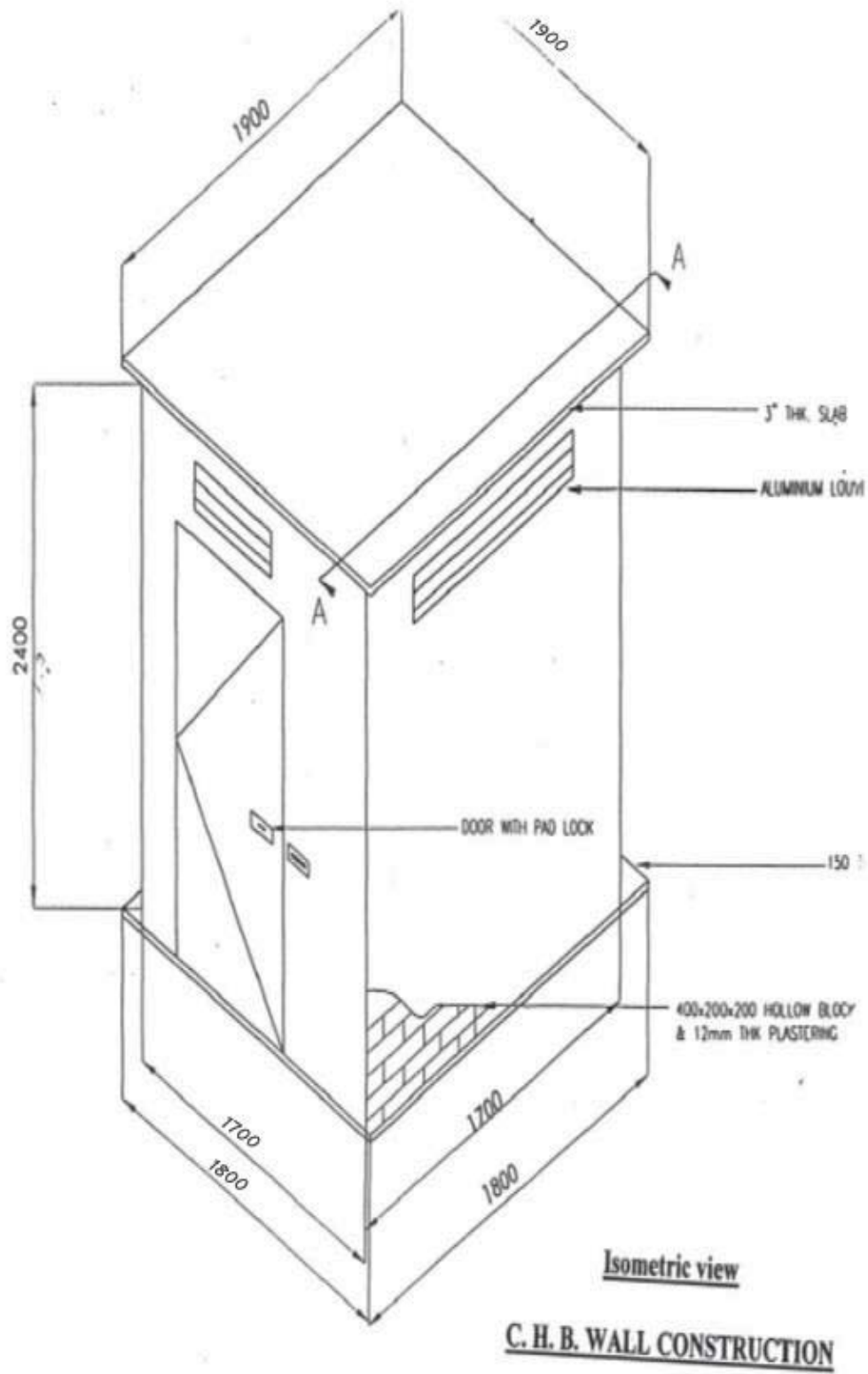
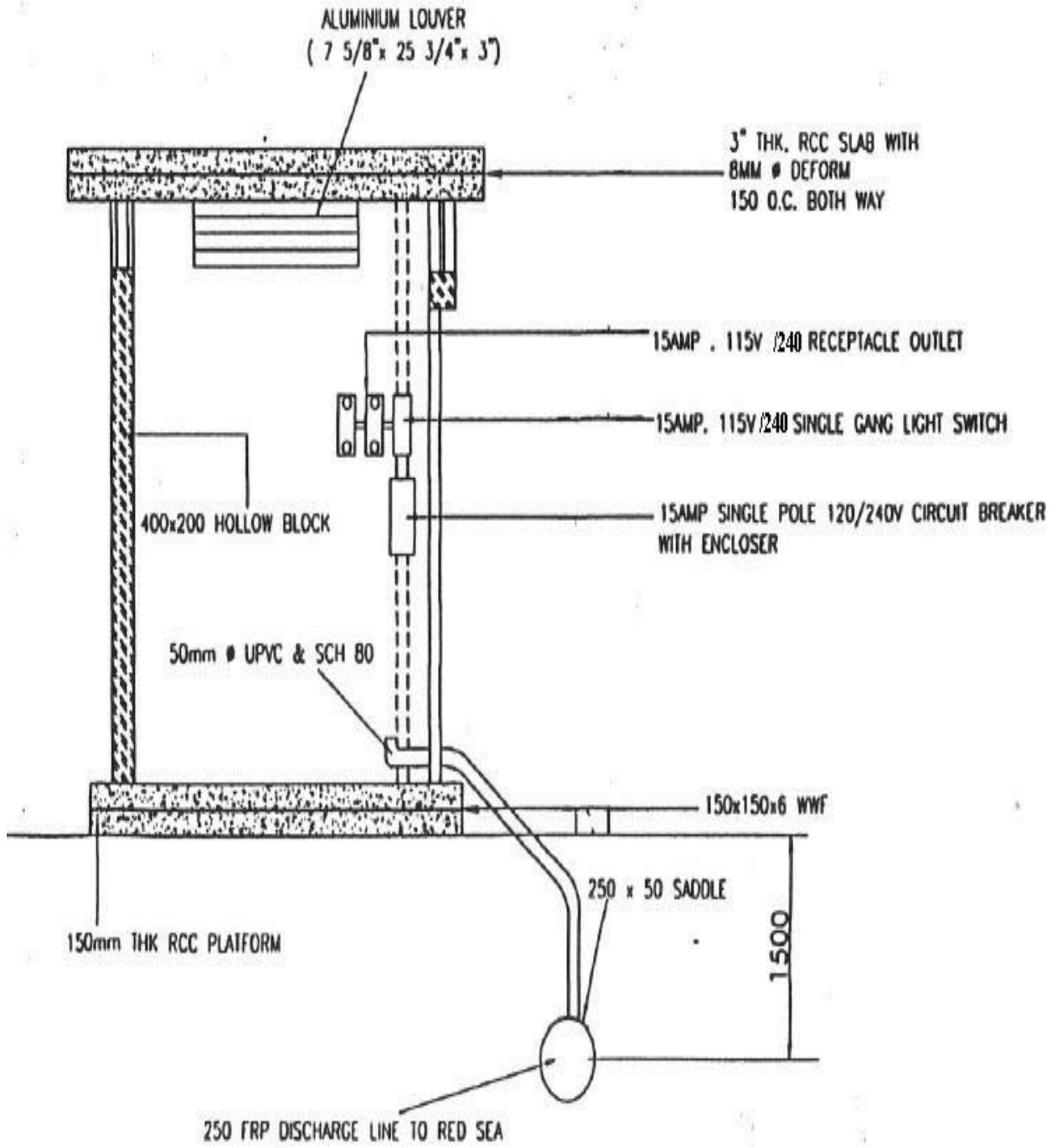


Figure 1



SECTION A - A

Figure 2

APPENDIX I
GUIDELINES FOR ASBESTOS DISMANTLING, REMOVAL, TRANSPORT AND
DISPOSAL

Table of Contents

1. Introduction
2. Legal Framework
3. Definitions
4. General Contractor Requirements
5. Procedures
6. Asbestos Demolition and Removal
7. Handling and Transporting
8. Receiving Asbestos Waste at Disposal Facility
9. Disposal Site
10. Landfilling
11. Asbestos Waste Deposition and Cover
12. Final Closure of the Landfill
13. Recordkeeping
14. References

1. INTRODUCTION

Asbestos is a special type of waste which is extremely hazardous and it is a naturally occurring magnesium silicate minerals in fibrous form composed of bundles of fibers. Worldwide, asbestos is known for killing more people than any other single work related illness.

Asbestos products have proven to be superior over other materials as long as it remained intact. However, if asbestos becomes air-borne and an individual inhaled it, severe health problems could result. Since the 1970's, there have been stricter rules regulating the removal and disposal of asbestos materials.

Exposure to asbestos fibers causes serious incurable diseases such as asbestosis, fibrosis and other carcinogenic and fatal diseases. Inhalation of asbestos fibers can lead to asbestos related lung diseases that can take 15 - 60 years to develop.

Dealing with Asbestos requires a specialized degree of professionalism and is subject to high operational standards in order to protect both ambient and working environments, maintain the safety of workers, and ensure that all workers have undergone extensive training in accordance with the referenced occupational safety requirements (OSHA). In depth knowledge of PPE requirements, safety rules, containment methods, and site cleanup techniques is necessary to avoid environmental impacts due to the dispersion of asbestos fibers.

The objectives of this document are to insure all asbestos is removed before any major work begins, *and* control and regulate the removal/demolition, containment, transport, and disposal of asbestos in accordance with the referenced standards in this document to protect public health, safety, and the environment.

2. LEGAL FRAMEWORK

In Saudi Arabia , since 2001 there has been an all-out ban on all asbestos material in the Kingdom by a Royal Decree. The Royal Commission has declared asbestos as a hazardous air pollutant and is banned as per RCER 2015 Serial No. 1, Table 2B, and with a general ban on its usage as per RCER 2015 Clause 2.3.5. PME has classified asbestos as hazardous in accordance with General Environmental Regulations And Rules for Implementation 2001 Appendix III , b,Y35.

Both US EPA and Occupational Safety and Health Administration (OSHA) strictly regulate the removal and final disposal of asbestos waste. The US EPA has declared asbestos unsafe, and listed it as a hazardous air pollutant. The Occupational Safety and Health Administration, OSHA, has regulations in effect to protect employees working with or around asbestos. In 1995, OSHA issued revised regulations for asbestos with stricter requirements.

3. DEFINITIONS

- ACM. Any material that contains greater than 1% asbestos fibers (*Asbestos Containing Material.*)
- EPA. The United States Environmental Protection Agency

FIBER.	The particulate form of asbestos. A fiber is at least 5 microns with a length to width ratio of at least 3:1.
FRIABLE.	Asbestos containing materials that can easily generate airborne fibers
HEPA.	Filter that can trap and retain greater than 99.7% of 0.3 micron diameter particles (<i>High Efficiency Particulate Air</i>).
NESHAP	United States regulation for limiting hazardous air pollutant emissions, including asbestos (<i>National Emission Standards for Hazardous Air Pollutants</i>).
NONFRIABLE.	Asbestos containing materials that do not generate fibers unless damaged.
OHSA.	Covers ACM removal and classification of removal activities. (<i>U.S. Occupational and Health Safety Administration</i>).
PME.	Presidency of Meteorology and Environment

4. GENERAL CONTRACTOR REQUIREMENTS

Prior to works commencement, contractor shall submit his credentials for review and assessment by the Royal Commission and profile with a track record of successfully executed projects and shall include documentation on the following:

- a) Contractor shall be licensed by the PME for this type of activity.
- b) Procedure (method) to detect the presence of asbestos in materials to be removed
- c) Description of work practices and engineering controls to measure and control the dispersion of asbestos fibers.

Including, but not limited to preventing excess exposure to workers in the containment area and prevent emission of fibers outside the containment area.

- d) Methodology of packing and wrapping of asbestos sheets and other nonfriable ACM for disposal to avoid rendering it friable.
- e) Name of RC approved transporter and license to transport such type of material.
- f) Specifications of protective clothing should be approved by RC.
- g) Warning signs and labels at the working site and in surrounding areas.
- h) Procedure and methodology for safe disposal.
- i) CV of supervisors and other engineers working on this project.
- j) Training certificates of workers for safe handling and removal of asbestos from an independent asbestos training provider. State that only trained workers with current training shall do asbestos removal work.
- k) Time schedule for all project tasks with completion dates for each job and details on how the removal plan will be communicated to workers.

- l) Emergency Response Plan (ERP) for all phases of removal and disposal of asbestos. The ERP shall contain procedures to be followed in the event that unexpected ACM is found during demolition or removal.
- m) Scope of work for safe dismantling, disposal, and landfilling shall be submitted to the RC for prior approval
- n) Waste generator should supervise all phases of asbestos removal and disposal and make sure that all work has been done according to the referenced standards.
- o) Contractor's classification of asbestos work activities according to OSHA standard.

5. PROCEDURES

Royal Commission Environmental Regulations (RCER-2015) section 5, requires waste generator to obtain prior RC EPCD approval (*by giving full details about the wastes and planned disposal methodologies*) for disposal of their waste materials.

The contractor should provide a detailed procedure prior to work start up in accordance with RCER-2015 provision, with reference to USEPA appendix D to Subpart E of Part 763 - Transport and Disposal of Asbestos Waste

The goal of this document is to insure that all asbestos is removed before any major work begins. This statement shall be included in the contractor's submission.

Asbestos waste requires implementation of special procedures prior to removal mainly as follows:

- 1) Surveying
 - a) Identification of the type of asbestos.
 - b) Quantity of asbestos.
- 2) Material Risk Assessment
 - a) Determination of friability.
 - b) Percentage of asbestos fibers in the building material.
- 3) Quality Assurance and Quality Control.
 - a) Use of a third party coordinator to monitor compliance with methods in this procedure.
 - b) The third party coordinator conducts all air monitoring and is empowered to shut down the work or modify procedures.
 - c) The third party coordinator reports directly to the RC.
- 4) Decontamination facilities for workers and tools.
 - a) Don and doff areas, showers, equipment room.
 - b) Areas for rest and food consumption shall be isolated from don and doff areas.
- 5) Personal and Respiratory Protective Equipment.
 - a) The use of PAPR- pressurized air purifying respirator is mandatory for jobs larger than glove bag work.
 - b) Fit testing of respirators with records of fit testing all employees doing removal work.
 - c) Details of the medical surveillance policy for workers exposed to asbestos including frequency of examinations.
- 6) Protect / enclose.

- a) Use of plastic to cover floors, windows, and doorways.
- b) Use of negative air blowers with HEPA filters.
- c) Air monitoring both inside and outside containment area.
- 7) Seal / encapsulate area.
 - a) Containerizing or wrapping of asbestos materials and designated storage area.
- 8) Repair and maintenance if required.
 - a) Conduct a negative exposure assessment before suspending respirator use for repair and maintenance of ACM insulation or other materials.
- 9) Handling of asbestos.
- 10) Removal works.
 - a) Air in work area to have less than 0.1 fiber per cc of air sampled TWA 8 hours or less. 1.0 fiber per cc in a 30 minute interval is the maximum excursion—not to exceed 3 excursions in a week (ACGIH guideline). Work will be stopped if either limit is exceeded.
 - b) Clearance air sampling is done before removing containment structure.
- 11) Loading/unloading.
- 12) Transport to disposal site.
- 13) Final disposal.

6. ASBESTOS DEMOLITION AND REMOVAL

- a) Asbestos shall be removed wet with special chemicals to prevent fibers release into atmosphere; double wrapped in polyethylene sheet, minimum 1000 gage. (any broken parts should be double bagged with a yellow colored interior bag. Do not use red, it is strictly for biohazard) and safely disposed in lined landfill and properly covered. Containerize loose materials and HEPA vacuum exterior of asbestos containers before transport.
- b) Isolate the area where removal work is to be conducted from all other areas by means of constructed walls and or fencing. Install plastic sheeting on floors and walls to prevent contamination of non-asbestos surfaces.
- c) Install barrier tape and warning signs in proximity to the work area. Post signs around the removal area to restrict access. Post enough signs to warn of the hazard.
- d) Removal methods shall include: HEPA vacuum, water spraying, no dry sweeping, mechanical chipping to be done in negative pressure enclosure areas only, intact removal if possible, especially for roofing materials.

7. HANDLING AND TRANSPORTING

- a) Transport is defined as all activities from receipt of the containerized asbestos waste at the generation site until it has been unloaded safely at the disposal site.
- b) Before accepting the wastes, the transporter should ensure that the asbestos waste is properly contained in leak-tight containers with appropriate labels, and that the outside surfaces of the containers are not contaminated with asbestos debris.
- c) The transporter shall insure that the waste is properly containerized and marked as per RCER Regulations, Section 5.3.

- d) The contractor shall insure that the transporter is trained to handle ACM waste and is included and trained in the Emergency Response Plan in Section 4.L.
- e) If condition of asbestos waste may cause fiber release, the transporter shall not accept the waste.
- f) Improper containerization of wastes is a violation to RC environmental standards.
- g) Once the transporter is satisfied with the condition of the asbestos waste and agrees to handle it, the containers shall be loaded into the transport vehicle in a careful manner to prevent breaking of the containers.
- h) At the disposal site, the asbestos waste containers should be transferred carefully to avoid fiber release.
- i) Vehicles used for transport of containerized asbestos waste shall have an enclosed carrying compartment covering sufficiently all parts to contain the transported waste, prevent damage to containers, prevent fiber release, and can be locked.
- j) Transport of large quantities of asbestos waste is commonly conducted in a 20m³ "roll off" box, which shall also be covered.
- k) Vehicles that use compactors to reduce waste volume shall not be used in order to avoid damage to the containers holding the asbestos.
- l) Disposal involves the full isolation of asbestos waste material in order to prevent fiber release to air or water.

8. RECEIVING ASBESTOS WASTE AT DISPOSAL FACILITY

- a) Both the landfill approved for receipt of asbestos waste and the approved trucking company should be notified that waste load contains asbestos.
- b) Landfill operator should inspect the loads to verify that asbestos waste is properly contained in leak-tight containers and labeled appropriately.
- c) RC should be notified if landfill operator believes that the asbestos waste is in a condition that may cause significant fiber release during disposal.
- d) In situations when the wastes are not properly containerized, the disposal facility operator shall contact the contractor.
- e) In case of breakage during transport, the contractor shall immediately send out a crew with proper PPE to thoroughly soak the asbestos with a water spray prior to unloading, rinse out the truck, HEPA vacuum the truck, and immediately cover the wastes with non-asbestos material prior to compacting the waste in the landfill.

9. DISPOSAL SITE

- a) Prior to sending to landfill, demolition waste containing asbestos may be accepted without testing according to the following conditions:
- b) Asbestos wastes approved for landfilling shall not contain additional hazardous wastes other than asbestos fibers or asbestos fibers packed in plastic.
- c) All asbestos wastes (demolition wastes-asbestos pipes-household asbestos-and any other asbestos wastes) shall only be accepted in designated and enclosed landfill.
- d) All asbestos materials placed in the landfill shall be containerized or covered in plastic to prevent dispersion of fibers.
- e) Fill material shall be of particles with standard size and composition that is stable and fireproof.
- f) Prohibition of any type of work in the area that may disrupt landfill or cell and cause dispersion of asbestos fibers.
- g) Maintain a site plan at all times indicating the actual location of asbestos fibers throughout operation period till time of closure.

10. LANDFILLING

- a) Landfilling is an environmentally sound containment method for asbestos waste material because asbestos fibers are virtually immobile in soil.
- b) There must be no visible emissions to the outside air during waste transport.
- c) However, recognizing the potential hazards and subsequent liabilities associated with exposure, the following additional precautions are recommended:
- d) Other disposal techniques such as incineration or chemical treatment are not feasible due to the unique physical/chemical properties of asbestos.
- e) Asbestos shall be safely disposed in lined landfill and properly covered.
- f) Disposed area must not be disturbed later on in the future.
- g) Workers handling asbestos shall wear all necessary PPE including breathing apparatus to protect workers and to avoid any inhalation of asbestos fibers.
- h) Disposal involves the full isolation of asbestos waste material in order to prevent fiber release to air, water, or soil.

- i) Royal Commission has provisions to dispose asbestos waste in a single lined landfill which meets EPA asbestos disposal requirements for active and inactive disposal sites under NESHAPs (40 CFR Part 61, subpart M).
- j) Record the following information:
 - 1. Capacity of the asbestos landfill
 - 2. Quantity received from date of operation till last asbestos load
 - 3. No. of cells that have been filled
 - 4. Asbestos containing cells are located on a site map
 - 5. Dates of receipt of asbestos
 - 6. Expected lifetime of landfill
 - 7. Closure date
 - 8. Post-closure Plan
 - 9. Details of PPE assigned to workers
 - 10. Worker training programs
 - 11. Details of groundwater monitoring wells (landfill site)

11. ASBESTOS WASTE DEPOSITION AND COVERING

The following procedure must be followed:

- a) Designate a separate area for asbestos waste disposal.
- b) Provide a record for future planning purposes, indicating that asbestos waste has been buried there and that it would be hazardous to attempt to excavate that area. (Future regulations may require certain property procedures to identify the location of any asbestos wastes and warn against excavation.)
- c) Prepare a separate trench to receive asbestos wastes. The size of the trench will depend upon the quantity and frequency of asbestos waste delivered to the disposal site. The trenching technique allows application of soil cover without disturbing the asbestos waste containers.
- d) The trench should be ramped to allow the transport vehicle to back into it, and the trench should be as narrow as possible to reduce the amount of cover required. If possible, the trench should be aligned perpendicular to prevailing winds.
- e) Place asbestos waste containers into the trench carefully to avoid breaking them. Particular care is needed with plastic wrapped asbestos panels. If broken under pressure, asbestos fibers can be emitted.
- f) Completely cover the containerized waste within 24 hours with a minimum of
- g) 1 meter (39 inches) of non-asbestos material.
- h) Improperly containerized waste is considered as an environmental violation.

- i) If improperly containerized waste is received at the disposal site, it shall be covered immediately after unloading. The asbestos contractor shall be called to be onsite and correct the situation.
- j) Only after properly containerized wastes are completely covered, can the wastes be compacted or other heavy equipment run over it.
- k) During compacting, avoid exposing wastes to the air or tracking asbestos material away from the trench.

12. FINAL CLOSURE OF AN AREA CONTAINING ASBESTOS WASTE

Final cover, including vegetation and grading, will be in accordance with RCER 2015 Regulations, Section 5.4.

13. RECORD KEEPING

For protection from liability, and considering possible future planning and investment requirements, the landfill operator shall maintain documentation of specific locations and quantities of the buried asbestos wastes. In addition, the estimated depth of the waste below the surface should be recorded whenever a landfill section is closed.

As mentioned previously, such information should be recorded regularly along with a notice warning against excavation of the area.

The transporter shall require a chain-of-custody form signed by the generator. A chain-of-custody form may include the name and address of the generator, the name and address of the pickup site, the estimated quantity of asbestos waste, types of containers used, and the destination of the waste.

The chain-of-custody form should then be signed over to a disposal site operator to transfer responsibility for the asbestos waste. A copy of the form signed by the disposal site operator should be maintained by the transporter as evidence of receipt at the disposal site.

14. REFERENCES

1. American Conference of Governmental Industrial Hygienists (ACGIH)
2. Asbestos NESHAP Adequately Wet Guidance EPA340/1-90-019.
3. EPA has established asbestos disposal requirements for active and inactive disposal sites under NESHAPs (40 CFR Part 61, subpart M) EPA asbestos disposal requirements for active and inactive disposal sites under NESHAPs (40 CFR Part 61, subpart M).
4. USEPA appendix D to Subpart E of Part 763 -- Transport and Disposal of Asbestos Waste

5. EPA: 40 CFR 763.121 (Regulatory Requirements)
6. EPA asbestos disposal requirements for active and inactive disposal sites under NESHAPs (40 CFR Part 61, subpart M)
7. General requirements for solid waste disposal under RCRA (40 CFR Part 257).
8. 52 FR 41897, Oct. 30, 1987, as amended at 62 FR 1834, Jan. 14, 1997]
9. OSHA 29 CFR 1910.1001(j)(4)(ii) or 1926.1101(k)(8)(iii).
10. OSHA: 29 CFR 1910.1200 (Hazard Communication)
11. Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.1001(j)(4)(ii) or 1926.1101(k)(8)(iii); or WAC 296-62-07721(6)(c)
12. Medical surveillance guidelines for asbestos, non-mandatory – OSHA 29 CFR Par 1926.1101 App I
13. OSHA 3114 Hazardous Waste Operations and Emergency Response -Asbestos Hazard Emergency Response Act of 1986 (AHERA) EPA- Public Law 99-519, Oct 22,1986 ,15 USC Section 2651 TITLE II - ASBESTOS HAZARD EMERGENCY RESPONSE
14. PME General Environmental Regulations And Rules for Implementation 2001 Appendix III , b,Y35.
15. RCER 2015
16. Technical Guidance Manual for the Safe Removal, Transport, and Disposal of Asbestos (DRAFT). RC-EPCD Aug. 22, 2013