

TENDER SPECIFICATION NO:

TS : BHE/PW/PUR/VIOCI-MECH/1075

RECEIPT/COLLECTION, UNLOADING, HANDLING, STACKING, VERIFICATION OF ENTIRE PROJECT MATERIALS INCLUDING ELECTRICAL, CONTROL & INSTRUMENTATION EQUIPMENTS / ITEMS AND OTHER MATERIALS IN BHEL/CUSTOMER'S STORES/STORAGE YARD AS RECEIVED BY ROAD FROM MANUFACTURING UNITS/ TRANSPORTERS GODOWN UNDER MATERIALS MANAGEMENT, RECEIPT / COLLECTION / LOADING / UNLOADING/ TRANSPORTATION OF MATERIALS FROM BHEL / CLIENT'S STORES / STORAGE YARDS TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, APPLICATION OF THERMAL INSULATION, FINAL PAINTING AND HANDING OVER OF 1X125 TPH HEAT RECOVERY STEAM GENERATOR WITH AUXILIARIES, STACK/ STEEL CHIMNEY WITH ASSOCIATED AUX, 1X30 MW(Fr6B) GAS TURBINE-GENERATOR SET WITH THEIR AUXILIARIES, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, INTEGRAL PIPING, FIELD / EXTERNAL / PIPING ETC. FOR 1X30 MW GTG + 1X125 TPH HRSG, BASED CO-GEN, IOCL (IRUP), GUJARAT REFINERY, IOCL VADODARA PROJECT (GT#6).

AT

**INDIAN OIL CORPORATION LIMITED
GUJARAT REFINERY, JAWAHAR NAGAR
VADODARA (GUJARAT)**

**TECHNICAL BID - VOLUME- I E (SAFETY MANUAL &
PAINTING SCHEME)**



Bharat Heavy Electricals Limited
(A Government of India Undertaking)
Power Sector - Western Region

TENDER SPECIFICATION ISSUED DETAILS

RECEIPT/COLLECTION, UNLOADING, HANDLING, STACKING, VERIFICATION OF ENTIRE PROJECT MATERIALS INCLUDING ELECTRICAL, CONTROL & INSTRUMENTATION EQUIPMENTS / ITEMS AND OTHER MATERIALS IN BHEL/CUSTOMER'S STORES/STORAGE YARD AS RECEIVED BY ROAD FROM MANUFACTURING UNITS/ TRANSPORTERS GODOWN UNDER MATERIALS MANAGEMENT, RECEIPT / COLLECTION / LOADING / UNLOADING/ TRANSPORTATION OF MATERIALS FROM BHEL / CLIENT'S STORES / STORAGE YARDS TO SITE OF WORK, ERECTION, TESTING, COMMISSIONING, APPLICATION OF THERMAL INSULATION, FINAL PAINTING AND HANDING OVER OF 1X125 TPH HEAT RECOVERY STEAM GENERATOR WITH AUXILIARIES, STACK/ STEEL CHIMNEY WITH ASSOCIATED AUX, 1X30 MW(Fr6B) GAS TURBINE-GENERATOR SET WITH THEIR AUXILIARIES, BALANCE OF PLANT EQUIPMENTS / SYSTEMS WITH RELATED AUXILIARIES, INTEGRAL PIPING, FIELD / EXTERNAL / PIPING ETC. FOR 1X30 MW GTG + 1X125 TPH HRSG, BASED CO-GEN, IOCL (IRUP), GUJARAT REFINERY, IOCL VADODARA PROJECT (GT#6).

AT
INDIAN OIL CORPORATION LIMITED
GUJARAT REFINERY, JAWAHAR NAGAR
VADODARA (GUJARAT)

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LAST DATE FOR Refer Notice Inviting Tender
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THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

DEPUTY GENERAL MANAGER (Purchase)

Place: Nagpur

Date :

**STANDARD CONSTRUCTION SPECIFICATION
FOR
PAINTING WORKS**

DOC.NO.O-301 A

PROJECT NAME: GAS TURBINE-6



**INDIAN OIL CORPORATION LIMITED
GUJARAT REFINERY**

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1.0 GENERAL

1.1 Scope

1.1.1 This Construction specification covers the requirements for painting of all equipments, piping, steel structures etc. GT/HRSG PACKAGE at IOCL, Gujarat Refinery, Vadodara, India.

It also explains the method of surface preparation, painting systems, procedure for painting and inspection requirements.

1.1.2 This Specification shall be applied to painting work for this Project. The Contractor shall complete the work in all respects with the best quality of materials and workmanship and in accordance with the best engineering practice and instructions from Owner .

1.1.3 This standard specification shall not apply to the following painting work.

- (a) Painting to be carried out based on manufacturer's specification.
- (b) Repainting.
- (c) Painting of temporary installation.
- (d) Painting using methods other than general methods such as brushing and spraying.
- (e) Coating and Lining.

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1.2 Specific Job Requirements

Where specific job requirements are in contradiction to this specification, specific job requirement shall govern.

1.3 Codes and standards

1.3.1 The applicable codes and standards reference in this specification shall be as follows :

- (1) (a) ASTM : American Standard Test Methods for Paints and coating.
- (b) ASA.A 13.1-1981 : Scheme for identification of piping system.
- (2) Steel structure painting council (SSPC-SP) – American Standard.
- (3) Swedish standards institution – SIS-05-5900-1967 for surface preparation.
- (4) Indian standards.
 - (a) IS-101 : Methods of test for ready mix paints and enamels.
 - (b) IS-2379:1990 Pipe line identification colour code.

1.3.2 If there is any conflict between the requirements of the above mentioned codes and standards and this specification, the requirements of this Specification shall prevail. All conflicts shall be referred to Owner for resolution before proceeding with the work.

1.4 Definition

For the purpose of this standard specification, the following definitions shall be applied.

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1.4.1 Plant facilities :

Facilities which comprise various types of plants related to energy, chemical industry and protection of environment etc. . These include equipment (e.g. towers, columns, vessels, including combustion equipment), machines, piping, storage tanks, steel frames, stacks, ducts, electrical equipment, instrumentation equipment etc.

1.4.2 Substrata surface :

Surfaces of items to be painted, which, however, have not yet been prepared for painting.

1.4.3 Painting surface :

Substrata surface prepared to receive paint or paint film-surface to receive subsequent or additional coating.

1.4.4 Painting system :

Combination of paint films, including surface preparation, from prime coating to finish coating, in order to satisfy the intended purpose and effectiveness of painting.

1.5 **Qualification**

Persons who are engaged in painting work shall be fully trained and shall have the qualification of the employer. Certificate, or qualification issued by Authorities are desirable.

2.0 **PAINTING SURFACES**

2.1 **Surfaces to be painted**

The exposed surfaces of the following equipments/ items shall be painted.

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2.1.1 Exposed surfaces of :

- (a) Structural steel for pipe racks, equipment supporting structure etc.
- (b) All Piping and Equipments such as columns, vessels, tanks, heat exchangers etc, . (Insulated & uninsulated, and C.S.& S.S).
- (c) Steel piping and pipe supports
- (d) Ladders, handrails, platforms, stairways etc.
- (e) Instrument and electrical panel boards
- (f) Valve, relief valves

2.1.2 Surfaces of rotating machinery and the like, except for rotating and sliding contact surfaces.

2.1.3 Part or entire surfaces of items, requiring rust and corrosion protection.

2.1.4 External surfaces of stainless steel equipment, storage tanks, piping etc. to be covered with hot insulation materials, of which operating temperature is upto 500⁰C.

2.2 Surface not to be painted

The surfaces of the following shall not be painted.

2.2.1 Internal surfaces of pipes, equipment, etc. and internal surfaces of closed steel structures which do not require chemical, acid and alkali resistance.

2.2.3 Surface of steel structures to be fire-proofed with concrete or mortar covering.

2.2.4 Surfaces of steel structures embedded or in contact with concrete or mortar.

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2.2.5 Interior wall surfaces of furnaces, boilers, etc. heating tubes and portions with heat resistant treatment.

2.2.6 Materials with high resistance to corrosion, such as stainless steel and anti weathering steel, except the stainless steel surface of equipment, storage tanks, piping etc. to be covered with hot insulation materials, of which operating temp. is upto 500°C.

2.2.7 Galvanised steel materials such as gratings, piping, handrails etc.

2.2.8 Friction surfaces to be connected with high tensile strength bolts.

2.2.9 All imported equipments shall be duly final painted before despatch to site, incase of any damage touch up will be carried out at site as per painting procedure. In case of indigenious, equipment shall be applied primer at shop and final paint at site as per painting specification enclosed.

2.2.10 High Pressure Steam Piping not to be painted.

3.0 PAINTING SCHEMES

3.1 Painting system for Equipment, Piping and Steel structures

3.1.1 Painting system for Equipment, Piping and Steel structure are listed in Annexure II.

3.1.2 In case painting system is not applicable due to special environment such as salt water immersion, chemical exposure, chemical immersion etc. Vendors specification or practice may be applicable subject to Owner's prior written approval.

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3.1.3 The final colour shall be as per Colour code given in Annexure III. Ground colour shall be applied through out the length of pipes., and on metal cladded insulated lines, minimum 2 M long portion should be painted. Colour bands shall be applied in the following points.

- (a) At battery limit points.
- (b) At start and terminating points.
- (c) At intersection points, change of direction points, junction joints of service, appliances ,Midway of Piping section, near valves,across culverts,etc.
- (d) For long stretch piping, at 50 metres interval.

3.1.4 Minimum width of the colour band shall be as follows :

- a) 3" NB and below -- 75 mm.
- b) Above 3" NB upto 6" NB -- NB X 25 mm.
- c) Above 6" NB upto 12" OD -- NB X 18 mm.
- d) Above 12" OD -- NB X 15 mm.

The relative width of the first colour band to the subsequent band shall be 4:1.

3.1.5 Flow direction shall be indicated by an arrow in the above locations as per para 3.1.3. Colours of arrow shall be black or white in contrast to the colour on which they are superimposed.

3.1.6 Product name shall be marked at pump inlet, outlet and battery limits. Line number shall be stencilled in black or white on all the pipe lines in more than one location. Size of the letter shall be 40 mm to 150 mm as per the size of pipe. Equipment number shall be stencilled in all equipments in black or white letters of 150 mm size.

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3.1.7 Wherever deemed required by Process Department or safety, pipes handling hazardous substances will be given hazard marking of 30 mm wide diagonal stripes of Black and Golden Yellow as per IS : 2379.

3.1.8 Identification Markings on Equipment / Piping.

Equipment tag Numbers shall be Stenciled / neatly painted using normal 'Arial' Lettering Style on all equipment and piping (Both insulated & uninsulated) after completion of all paint works. Lettering colour shall be either BLACK or WHITE, depending upon the background, so as to obtain good contrast.

Operations Group shall specify location.

Sizes shall be:

Columns, Vessels, Heaters:	150 mm
Pumps and other M/c	50 mm
Piping	OD / 2 with Maximum 100 MM.
Storage Tanks	(As per Drawings)

4.0 PAINTING PROCEDURE

4.1 Treatment prior to surface preparation

The following work shall be carried out prior to surface preparation.

4.1.1 Remove slag, flux and spatter adhered to weld and steel surfaces.

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4.1.2 Where substances such as grease and machine oil are found on the surface, remove them with cleaning solvent or other appropriate methods.

4.1.3 Remove excessive rust and dirt using appropriate methods.

4.2 Surface preparation

4.2.1 Surface preparation shall be carried out by appropriate methods that will ensure the required grade of finish. Procedure and degree of surface preparation are shown in Annexure 1 "Classification of Steel Surface Preparation".

One or more of the following methods of surface preparation shall be followed, depending on the condition of steel surface, to achieve maximum durability.

- a) Shot Blasting as per SA 2.5
- b) Mechanical or power tool cleaning (as specific requirement).
- c) High pressure water blast cleaning with or without abrasives.

4.2.2 Restrictions concerning surface preparation and protective measures :

- (a) In case of rain or bad weather, surface preparation shall not be carried out outdoors.
- (b) When the surface substrata is wet, preparation shall not be carried out.
- (c) When the relative humidity is 89 % or higher, surface preparation shall not, in principle, be carried out.
- (d) When surface preparation is carried out during the night or in dark locations (inside of tanks, etc.), proper lighting arrangements shall be made to check the extent of rust removal from the surface.

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- (e) When blast cleaning is to be carried out at the job site, appropriate protective measures shall be taken to ensure prevention of adverse effect of dust on adjacent work or environmental pollution in the surrounding area.
- (f) Iron grids used for blasting shall be approved by Owner before commencement of work.

4.2.3 Surface shall be air-blast cleaned by using A1203 particles, chilled cast iron or malleable iron, or by sand blasting where grit blasting is not possible.

4.2.4 Surface preparation is considered very important since the performance of any paint system is directly related to the level of surface preparation adopted prior to painting.

4.3 Treatment after surface preparation

After the completion of surface preparation, the surfaces are to be checked for the following prior to commencement of painting.

4.3.1 When rusting occurs after completion of surface preparation, surface preparation of the rusted area shall be carried out again, by using appropriate methods, prior to painting.

4.3.2 The painting surface shall be fully cleaned of mill scale, rust, and loose dust accumulated on the surface, due to the surface preparation work.

4.3.3 The painting surfaces (cleaning of which has already been completed) shall be kept clean in such a way as to prevent the adherence of grease, oil, dust and other detrimental materials until the painting work is started.

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4.4 Painting

4.4.1 Protection

Contractor shall fully protect all equipments, piping, walls, floors and other surfaces from damage and contamination, and shall provide the necessary protection required to fully protect all surfaces from dust, paint droppings, paint mist, other contaminants during the process of painting work. Care shall be taken to protect all stainless steel surfaces from Zinc Paint.

4.4.2 Mixing of paint

- (a) Paint shall be thoroughly stirred before use.
- (b) For multi-liquid type paint, the specified mixing ratio and pot life shall be observed.

4.4.3 Application

- (a) Painting shall be done either by brushing or by spraying.
- (b) Painting tools, suitable for the paint work shall be used according to manufacturers recommendation and as per work location, environment, shape of the items to be painted, and condition of surface to be painted.
- (c) Each coat shall be painted in the order specified in the painting system. During painting, the overcoat intervals and films thickness specified, shall be maintained as per manufacturer's recommendations and according to the properties and performance of the paint.

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- (d) Where each coat is applied successively, such continuous painting work shall be carried out after the lapse of specified drying time and drying of previous film has been confirmed.

4.4.4 Restrictions

Unless special measures are taken, painting shall not be carried out under the following conditions :

- (a) When the painting surfaces are moist or likely to become moist due to rain, snow, dew or frost.
- (b) When the temperature during painting is 4.4° C or lower and is not suitable for drying and hardening of paint.
- (c) When the relative humidity is 89 % or more.
- (d) When the temperature of painting surfaces is high and defects such as air bubbles may occur in the paint film.
- (e) When a strong wind is blowing and foreign materials such as sand may adhere to the paint film.

5.0 FIELD SAFETY AND HYGIENE

- 5.1 Industrial hygiene and safe working practice in connection with the painting work shall be strictly followed to avoid potential hazards to health and of fire. Special care shall be taken with regard to the following matters :

- 5.1.1 When surfaces are to be prepared by blast cleaning or with the use of power tools, protectors such as goggles, mask etc. shall be used.

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5.1.2 When painting work is to be carried out using organic solvent in an almost airtight environment, appropriate ventilating and lighting equipments shall be provided. Additionally, appropriate protectors such as gas masks etc. shall be worn.

5.1.3 Monitor for any fire around the work location and extinguish the fire prior to work, if observed.

6.0 FIELD STORAGE AND CONTROL OF PAINT

6.1 Storage

6.1.1 As a rule, paint shall be stored in a well-ventilated room, constructed to the appropriate standard of fire resistance.

6.1.2 All paint and thinner shall be stored in such a way that the manufacturer's labels can be readily identified.

6.1.3 Paint stocks shall be controlled so that they can be used within their effective period of use.

6.1.4 For storage areas, provide prescribed protective measure and signs. Paint exceeding the prescribed quantity shall not be stored.

6.1.5 Care shall be taken while storing and handling to avoid breakage or marked deformation of containers.

6.1.6 When paint is stored outdoors, it shall be protected by using plastic/tin sheets or other appropriate measures, in order to prevent damage to containers or changes in the quality of the paint.

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6.1.7 When paint is temporarily stored in the working area, the amount equivalent to one day's use or less shall be stored. Paint shall be protected from rain, snow etc, using plastic/tin sheets.

7.0 INSPECTION

7.1 Inspection of surface Preparation

The prepared surfaces shall be compared with the standard photographs of SIS, IS or SSPC. Where the prepared surfaces are found to be equivalent to those indicated in the above standard photographs, they shall be deemed acceptable.

7.1.1 Appearance of paint film

Paint film shall be visually checked with regard to the following :

- Unfinished surface, drips, wrinkles, blistering, peeling, cracking, crawling, discoloring, stains, pinholes and spraydust.
- Where there are no marked defects in appearance, the paint film shall be deemed acceptable.

7.1.2 Paint film thickness (DFT)

- (a) Film thickness shall be measured with appropriate measuring instruments, duly calibrated. Contractor shall provide measuring instruments of appropriate ranges for measuring the dry film thickness.
- (b) As a rule, film thickness shall be measured at the shop or field for the total dry film thickness (DFT).

7.1.3 Number of measurements and measured values :

- (a) The number and position of measurements shall be determined with due consideration given to the size and shape of items to be painted.

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- (b) Measurements shall be carried out three times at each measuring point. The average of three measurements shall be taken as the measured value for the item concerned.

7.2 Acceptance (DFT)

When the measured values satisfy the following requirements, they shall be deemed acceptable :

- (a) Average of measured film thickness is 90 % or more of prescribed film thickness.
- (b) Minimum of measured film thickness is 80% or more of the prescribed film thickness.

8.0 TRANSPORTATION

- (a) Painted product shall not be moved or transported until the required curing period has elapsed.
- (b) Painted products shall be handled, moved or transported in such a manner as not to damage the paint film. Appropriate protective measures shall be taken, to avoid damage to the paint film during transportation and storing.

9.0 RECORDS

- a) Contractor shall submit the batch test certificates of each batch of paints to Owner for review prior to commencement of painting.
- b) A report shall be maintained of all the stage wise inspection carried out, showing type of surface preparation, DFT. of primer, intermediate and final coats. The report, duly signed by the Contractor's inspector shall be submitted to Owner, on completion of final inspection.

ANNEXURE I

ANNEXURE – I

Table 1 Classification of Steel Surface Preparation

Method of Cleaning	Classification	Procedure and Degree of Steel Surface Finish	Reference Standard		
			SSPC	SIS	IS
Blast Cleaning	White Metal blast cleaning	Blast cleaning to pure white metal. Thorough removal of mill scale, rust and foreign matter. Total area to be cleaned and no residues in any form allowable.	SP 5	Sa 3	White metal (silver grey)
- do -	Near White Metal Blast Cleaning	Very thorough blast cleaning. Mill scale, rust and foreign matter shall be removed to the extent that the only traces are remaining as slight stains in the form of spots or strips. Finally, the surface is cleaned with a vacuum cleaner or clean dry compressed air or a clean brush.	SP 10	Sa 2.1/2	Near white metal (light grey)
- do -	Commercial Blast Cleaning	Thorough blast cleaning. Almost all mill scale, rust and foreign matter shall be removed. Finally, the surface is cleaned with a vacuum cleaner, clean dry compressed air or a clean brush. It shall then be greyish in color.	SP 6	Sa 2	Commercial
Power Tool Method	Power Tool Cleaning/ De-rusting	Very thorough scraping and wire-brushing, machine-brushing & grinding etc. Surface preparation shall be done as for St.2, but more effectively. After removal of rust, millscale etc. surface shall have a pronounced metallic sheen.	SP 3	St. 3	
Hand Tool cleaning	Mechanical Hand Tool Cleaning/ De-rusting.	Thorough scraping and wire – brushing, grinding etc. The treatment shall remove loose mill scale, rust and foreign matter. Finally, the surface is cleaned with compressed air or a clean brush . It shall then have a faint metallic sheen.	SP 2	St. 2	

SSPC : Steel Structures Painting Council "Steel Structures Council Manual" Vol. 2. Chapter 2 - 1982

SIS : Swedish Standard Institution "SIS 05 5900 1967".

IS : Indian Standard IS-1477-1971.

ANNEXURE II

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 1

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
EXTERNAL SURFACE OF VESSELS, COLUMNS, PUMPS ETC.	< 60°	SURFACE PREPARATION	Sa 2 1/2	--	--	--	--	190
		PRIME COAT	ALKYD BASED ZINC PHOSPHATE PRIMER HIGH BUILD	2	35 - 50	12 HRS.	70	
		INTERMEDIATE COAT	ALKYD HIGH BUILD M10 COATING	1	60 - 75	48 HRS.	60	
		FINAL COAT	OLEORESINOUS BASED ALUMINIUM PAINT (IS 2339)	3	20	12 HRS.	60	

PAINT SYSTEM TABLE - NO. 1A

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
TANKS EXTERNAL SURFACE INCLUDING FIXED ROOF DECK STRUCTURAL STEEL WORKS (PIPE, RACK & TECHNOLOGICAL STRUCTURE HAND RAILS, MIDDLE RAIL, LADDER CAGE, MONORAIL BEAM	< 60°	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	160
		PRIME COAT	POLYAMIDE CURED CATALYSED EPOXY RESIN / ZINC PHOSPHATE PRIMER (LOW BUILD EPOXY)	2	25 - 35	4 HRS.	60	
		FINAL COAT CAMOUFLAGE	POLYAMIDE CURED, CATALYSED EPOXY RESIN SUITABLY PIGMENTED (HIGH BUILD EPOXY)	2	50-60	10 HRS.	100	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 2

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
ROTARY AND OTHER BOUGHTOUT ITEMS								
<p align="center">MANUFACTURERS PAINTING SCHEME COMPATIBLE FOR THE TEMPERATURE RANGE OF THE EQUIPMENT SHADE AS PER THIS SPECIFICATION</p>								

PAINT SYSTEM TABLE - NO. 3

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
LADDERS, PLATFORM-STRUCTURALS,CHEQUERED PLATE,HANDRAIL,POST TOE GUARD,STAIR CASE STEPTREADS & WALKWAYS	< 60°	SURFACE PREPARATION	St-3	--	--	--	--	270
		PRIME COAT	ALKYD BASED ZINC PHOSPHATE PRIMER HIGH BUILD	2	35 - 50	12 HRS.	70	
		INTERMEDIATE COAT	--	--	--	--	--	
		FINAL COAT	HIGH BUILD BITUMINOUS BLACK COMPOSITION - PHENOLIC BITUMIN BASED	2	100-125	24 - 48 HRS.	200	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 4

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
TANK BOTTOM UNDER SIDE IN CONTACT WITH SOIL	< 60°	SURFACE PREPARATION	Sl-3	--	--	--	--	420
		FINAL COAT	COAL TAR MASTIC (SHALIMASTIC H.D.)	3	140-150	48 HRS	420	

PAINT SYSTEM TABLE - NO. 5 - DELETED

PAINT SYSTEM TABLE - NO. 6 (IN CONTACT WITH LIQUID & VAPOUR OF HYDROCARBON)

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
TANK (INTERIOR SURFACE OF ROOF, SHELL & BOTTOM	< 60°	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	235
		INTERMEDIATE COAT	CATALYZED EPOXY RESIN ZINC PHOSPHATE PRIMER, CURED WITH POLYIMIDE	1	25 - 35	12 HRS.	35	
		FINAL COAT	AMMINE ADUCT CURED HB EPOXY, CATELIZED EPOXY RESIN SUITABLE PIGMENTED	2	100-125	8 HRS.	200	

PAINT SYSTEM TABLE - NO. 7 (IN CONTACT WITH ACCUMULATED RAIN WATER & HYDROCARBONS)

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
TOP SURFACE OF FLOATING ROOF IN FR TANKS	< 60°	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	160
		PRIME COAT	POLYAMIED CURED CATALYSED EPOXY RESIN , ZINC PHOSPHATE PIGMENT (LOW BUILD EPOXY)	2	25 - 35	4 HRS.	60	
		FINAL COAT CAMOUFLAGE	CATALYSED EPOXY RESIN SUITABLY PIGMENTED (HIGH BUILD EPOXY)	2	50-60	10 HRS.	100	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 8

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
PIPING AND OTHER EQUIPMENTS NEAR COOLING TOWER (WATER WETTED SURFACE)	AMBIENT	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	155
		PRIME COAT	POLYAMIED CURED CATALYSED EPOXY RESIN / ZINC PHOSPHATE PRIMER (LOW BUILD EPOXY)	2	25 - 35	4 HRS.	70	
		INTERMEDIATE COAT	CATALYSED EPOXY RESIN SUITABLY PIGMENTED (HIGH BUILD EPOXY)	1	50-60	10 HRS.	50	
		FINAL COAT	POLYURETHENE COATING 2 PACK, ACRYLIC RESIN WITH POLYURETNE HARDNER, PIGMENTED	1	30-35	6 HRS.	35	

PAINT SYSTEM TABLE - NO. 9

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
EQUIPMENT IN ACID / CHEMICAL HANDLING AREA	<60°	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	140
		PRIME COAT	POLYAMIED CURED CATALYSED EPOXY RESIN / ZINC PHOSPHATE PRIMER (LOW BUILD EPOXY)	2	25 - 35	4 HRS.	60	
		INTERMEDIATE COAT	CATALYSED EPOXY RESIN SUITABLY PIGMENTED (HIGH BUILD EPOXY)	1	50-60	10 HRS.	50	
		FINAL COAT	ACRYLIC POLYURETHANE ENAMEL	1	30-35	6 HRS.	30	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 10

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
VESSELS, COLUMNS, TANKS HEAT EXCHANGERS ETC. (UNINSULATED & INSULATED)	60° - 160°	SURFACE PREPARATION	Sa - 2 1/2	--	--	--	--	60
		PRIME / FINAL COAT	HEAT RESISTANCE ALUMINIUM - OLEORESINOUS MEDIUM WITH LEAFING ALUMINIUM PAINT	4	15-20	8 HRS.	60	

PAINT SYSTEM TABLE - NO. 10A

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
PIPING (INSULATED & UNINSULATED)	60° - 160°	SURFACE PREPARATION	St-3	--	--	--	--	60
		PRIME / FINAL COAT	HEAT RESISTANCE ALUMINIUM - OLEORESINOUS MEDIUM WITH LEAFING ALUMINIUM PAINT	4	15-20	8 HRS.	60	

PAINT SYSTEM TABLE - NO. 11

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
VESSELS, COLUMNS, TANKS, HEAT EXCHANGERS (INSULATED & UNINSULATED).	160 - 250° C	SURFACE PREPARATION	St - 3	--	--	--	--	60
		PRIME COAT	HEAT RESISTANT ALUMINIUM PAINT UPTO 250 °C	1	15 - 20	12 HRS.	15	
		INTERMEDIATE COAT	HEAT RESISTANT ALUMINIUM PAINT UPTO 250 °C	1	15 - 20	12 HRS.	15	
		FINAL COAT	HEAT RESISTANT ALUMINIUM PAINT UPTO 250 °C	2	15 - 20	12 HRS.	30	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 11A

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
PIPING (UNINSULATED).	160 - 250° C	SURFACE PREPARATION	St - 3	--	--	--	--	60
		PRIME COAT	HEAT RESISTANT ALUMINIUM PAINT (UPTO 250° C)	1	15 - 20	12 HRS.	15	
		INTERMEDIATE COAT	HEAT RESISTANT ALUMINIUM PAINT (UPTO 250° C)	1	15 - 20	12 HRS.	15	
		FINAL COAT	HEAT RESISTANT ALUMINIUM PAINT (UPTO 250° C)	2	15 - 20	12 HRS.	30	

PAINT SYSTEM TABLE - NO. 12

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
VESSELS, COLUMNS, TANKS, HEAT EXCHANGERS (INSULATED & UNINSULATED).	250 - 400° C	SURFACE PREPARATION	St - 3	--	--	--	--	60
		PRIME COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	1	15 - 20	12 HRS.	15	
		INTERMEDIATE COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	1	15 - 20	12 HRS.	15	
		FINAL COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	2	15 - 20	12 HRS.	30	

NOTE : APPLICATION SHALL ONLY BE DONE BY AIRLESS /CONVENTIONAL SPRAY GUN

PAINT SYSTEM TABLE - NO. 12 A

DESCRIPTION	TEMP °C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
PIPING (UNINSULATED).	250 - 400° C	SURFACE PREPARATION	St - 3	--	--	--	--	60
		PRIME COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	1	15 - 20	12 HRS.	15	
		INTERMEDIATE COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	1	15 - 20	12 HRS.	15	
		FINAL COAT	HEAT RESISTANT ALUMINIUM PAINT (250 - 400° C)	2	15 - 20	12 HRS.	30	

NOTE : APPLICATION SHALL ONLY BE DONE BY AIRLESS /CONVENTIONAL SPRAY GUN

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 13

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
VESSELS, COLUMNS, TANKS, HEAT EXCHANGERS ETC. (BARE & INSULATED).	400 - 650° C	SURFACE PREPARATION	St-3	--	--	--	--	60
		PRIME COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	1	15 - 20	12 HRS	15	
		INTERMEDIATE COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	1	15 - 20	12 HRS	15	
		FINAL COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	2	15 - 20	12 HRS	30	

PAINT SYSTEM TABLE - NO. 13 A

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
PIPING (UNINSULATED)	400 - 650° C	SURFACE PREPARATION	St-3	--	--	--	--	60
		PRIME COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	1	15 - 20	12 HRS	15	
		INTERMEDIATE COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	1	15 - 20	12 HRS	15	
		FINAL COAT	SILICON RESIN HEAT RESISTANT ALUMINIUM PAINT(400 - 650° C)	2	15 - 20	12 HRS	30	

PAINT SYSTEM TABLE - NO. 14

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
FURNACE STACK / FLUE GAS DUCT	UPTO 250° C	SURFACE PREPARATION	St-3	--	--	--	--	30 FOR A & 40 FOR B
		PRIME COAT	A) HEAT RESISTANT BITUMINOUS STACK BLACK (OR) B) H.R. ALUMINIUM PAINT UPTO 250° C	1	30 - 40	24 HRS.	30	
		INTERMEDIATE COAT	--	--	--	--	40	
		FINAL COAT	A) HEAT RESISTANT BITUMINOUS STACK BLACK (OR) B) H.R. ALUMINIUM PAINT UPTO 250° C	1	30 - 40	24 HRS.	30	
				2	15 - 20	12 HRS.	40	

ANNEXURE - II

PAINT SYSTEM TABLE - NO. 15

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
EXTERNAL SURFACES OF PROCESS PIPING (INSULATED & UNINSULATED)	<60°	SURFACE PREPARATION	St-3	--	--	--	--	120
		PRIME COAT	HB ZN CHROMATE PRIMER 1 PACK.SYNTHETIC MEDIUM PIGMENTED WITHZINC CHROMATE	2	25-35	8 HRS.	60	
		FINAL COAT	RESINOUS ALUMINIUM PAINT:SYNTHETICRUBBER BASED AL:PAINT (UPTO 150 C)	2	20	12HRS	40	

PAINT SYSTEM TABLE - NO. 16

DESCRIPTION	TEMP ° C	ACTIVITY	SPECIFICATION OF PAINT MATERIAL	NO. OF COATS	DRY FILM THICKNESS COAT(μ)	DRYING TIME	DFT REQUIRED (μ)	TOTAL DFT MIN.(μ)
EXTERNAL SURFACES OF OTHER THAN PROCESS PIPING (INSULATED & UNINSULATED)	<60°	SURFACE PREPARATION	St-3	--	--	--	--	150
		PRIME COAT	HB ZINC PHOSPHATE PRIMER MODIFIED ALKYD MEDIUM PIGMENTED WITH ZINC PHOSPHATE	2	35 - 50	8 HRS.	80	
		FINAL COAT	MODIFIED ALKYD MEDIUM SUITABLY PIGMENTED CHEMICAL RESISTANT SYNTHETIC ENAMEL	2	30-35	8 HRS.	70	

ANNEXURE III

ANNEXURE – III

1. Identification markings on Equipment / Piping.

Equipment tag numbers shall be Stenciled / neatly painted using normal 'Arial' Lettering Style on all equipment and piping (Both Insulated & Uninsulated) after completion of all paint works. Lettering colour shall be either BLACK or WHITE, depending upon the background, so as to obtain good contrast.

Size shall be :

Coloums, Vessels, Heaters:	150mm
Pumps and other M/C	50mm
Piping	OD / 2 with Maximum 100MM.
Storage Tanks	(As per Existing Standard)

2. Colour Coding for Control Valve :

- a) Carbon Steel Body - Light grey
 Alloy Steel body - Canary yellow
 Stainless steel body- Natural

b) The actuator of the Control valve shall be painted as :

Direct action (open on air failure) Valves - Green

Reverse acting (close on air failure) valves - Red

3. Colour Codes for all Statutory and Rotary Equipments, Auxillary structures etc.

<u>SURFACE</u>	<u>COLOUR</u>
Heater Structure	Black
Heater Roof	H.R. Aluminium Paint.
Vessels, Columns etc.	Aluminium paint (Silver shine)
SO ₂ Vessels	Light Yellow
Heat Exchanger	H.R. Aluminium paint.
Fuel Oil tanks	Black
Naphtha tanks	Deep Cream.
Solvent tanks	Deep Cream.
All other tanks	Aluminium paint (Silver shine)
Outer surface of Boiler house	H.R. Aluminium paint.
Pumps	Navy Blue.

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Compressors, Blowers, Ventilators etc.	Dark Admiralty Grey.
Motor, Switchgear, Machines etc.	Blue Green.
Load lifting equipment, Monorails	Leaf Brown.
Main Steel Structure	Dark / Light Gray
Equipment Platforms	Dark / Light Gray
Gratings – equipment circular platforms	Galvanized
Chequered Plate (Both face)	Black
Hand Rails	Signal Red
Middle Rail	Signal Red
Handrail post	Black
Toe plate	Signal Red
Ladder Vertical Posts	Signal Red
Ladder Rungs & Railing vertical posts	Black
Stair case structure (Side Channels)	Dark / Light Gray
Stair case steptreads	Black
Overhead Monorail	Signal Red
Gantry Girder & Monorail	Dark Green
Monorail Stopper Plates	Signal Red
Coke Cutting System	Signal Red
EOT / HOT Cranes	Canary Yellow
Transformers & Battery room structurals	Dark Admiralty grey
Electrical Motors	Dark Blue

Special Camouflage Painting for Uninsulated Crude and Product Storage Tanks.

Paint specification shall be as per standards.

Camouflage painting scheme for Defense requirement in irregular patches will be applied with 3 colours

Dark Green : Light green : Medium Brown
5 : 3 : 2

The patches shall be irregular and asymmetrical and inclined at 30 to 60 Degrees.

Patches should be continuous at surface meeting lines / points.

Slits / holes shall be painted in dark green shade.

Width of patches shall be 1 to 2 meters.

4. Colour Codes for Piping.

	<u>Description</u>	<u>Ground Colour</u>	<u>First Colour Band</u>	<u>Second Colour Band</u>
A	WATER			
1.	Drinking water	Sea Green	French Blue	Signal Red
2.	D.M. Water	Sea Green	Orange	---
3.	Boiler feed water	Sea Green	Gulf Red	---
4.	Cooling water	Sea Green	French Blue	---
5.	Quench water	Sea Green	Dark Grey	---
6.	Wash water	Sea Green	Canary Yellow	---
7.	Process water	Sea Green	Oxide Red	---
8.	Condensate water	Sea Green	Light Brown	Signal Red.
9.	Sea-water	Sea Green	White	---
10.	Fire water	Fire Red	---	---
B	STEAM			
1.	Very high pressure Steam (VHP)	Aluminium IS-2339	Signal Red	---
2.	High pressure steam (SH)	Aluminium IS-2339	Signal Red	---
3.	Medium pressure steam (SM)	Aluminium IS-2339	French Blue	---
4.	Low pressure steam (SL)	Aluminium IS-2339	Canary Yellow	---
5.	Dilution steam/ Purge steam	Aluminium IS-2339	Grey	Canary Yellow
6.	Steam Condensate	Sea Green	Light Brown	---
C	GASES			
1.	Fuel gas and Sweetgas	Canary Yellow	Silver Grey	---
2.	Charge gas	Canary Yellow	Signal Red	French Blue
3.	Residue gas LPG	Canary Yellow	Oxide Red	White
4.	Flare Gas	Aluminium IS-2339	Signal Red	---
5.	Acetelene	Canary Yellow	Service Brown	---

	<u>Description</u>	<u>Ground Colour</u>	<u>First Colour</u> <u>Band</u>	<u>Second Colour</u> <u>Band</u>
6.	Sour gas	Canary Yellow	Grey	Violet
7.	Chlorine	Canary Yellow	Dark Violet	---
8.	Nitrogen	Canary Yellow	Black	---
D.	AIR			
1.	Compressed air	Sky Blue	Signal Red	---
2.	Plant air	Sky Blue	French Blue	---
3.	Instrument air	Sky Blue	Gulf Red	---
4.	Nitrogen	Canary Yellow	Black	---
5.	Oxygen	Canary Yellow	White	---
6.	CO ₂	Canary Yellow	Light Grey	----
7	Hydrogen	Canary Yellow	Signal Red	French Blue
E.	ACIDS AND CHEMICALS			
1.	Sulfuric Acid	Dark Violet	Brilliant Green	Light Orange
2.	Nitric Acid	Dark Violet	French Blue	Light Orange
3.	Hydrochloric Acid	Dark Violet	Signal Red	Light Orange
4.	Acetic Acid	Dark Violet	Silver Grey	Light Orange
5.	Caustic	White	Violet	---
6.	Other Chemicals	White	Violet	Signal Red
F.	HYDROCARBONS			
1	Naphtha	Aluminium	Dark Brown	---
2	Reformer naphtha	Aluminium	Dark Brown	French Blue
3	VGO	Aluminium	Golden Yellow	Signal Red
4.	Propylene	Dark Ad. Grey	Briliant Green	---
5.	Ethylene Glycol	Dark Ad. Grey	Briliant Green	Gulf Red
6.	Ethylene Dichloride	Dark Ad. Grey	Gulf Red	---
7.	Benzene	Dark Ad. Grey	Canary Yellow	---
8.	Butadiene	Dark Ad. Grey	Black	---
9.	Liquid Ethane	Dark Ad. Grey	Light Grey	French Blue
10.	Liquid Propylene	Dark Ad. Grey	Signal Red	Black
11	SKO	Aluminium	Golden Yellow	---

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	<u>Description</u>	<u>Ground Colour</u>	<u>First Colour</u> <u>Band</u>	<u>Second Colour</u> <u>Band</u>
12	ATF	Aluminium	Black	---
13	Phosphates	Violet	Orange	White
14	Amine	Admiral Grey	Signal Red	Lt. Brown
15	RCO	Aluminium	Black	Brown
16	Crude Oil	Aluminium	Black	French Blue
17	Liquid Ethylene	Dark Ad. Grey	Light Grey	Black
18	Fuel Oil	Aluminium	Golden Yellow	Black
19	Gas Oil	Aluminium	Green	Canary Yellow
20	Flushing Oil	Aluminium	Green	---
21	Slop	Aluminium	Lt. Brown	Lt. Brown
22	Hazard Marking	Yellow	Black	---
23	Vaccine Residue	Aluminium	Black	Red
24.	Tar	Dark Ad. Grey	Signal Red	Brilliant Green
25.	Aromatic Gasolene	Dark Ad. Grey	Brilliant Green	Canary Yellow
26.	Pyrolysis Gasolene	Dark Ad. Grey	Brilliant Green	Black
27.	Liquid Methanol	Dark Ad. Grey	White	Gulf Red
28.	Vapour LPG	Aluminium	Signal Red	Black
29.	Liquid LPG	Aluminium	Signal Red	Green
30.	Liquid Mixed C4	Dark Ad. Grey	Signal Red	Light Brown
31.	Kerosene	Light Brown	Brilliant Green	---
32.	HSD	Aluminium	French Blue	---

Colour Coding for Control Valve:

a) Carbon steel body - Light grey
 Alloy steel body - Canary yellow
 Stainless steel body- Natural

b) The actuator of the Control valve shall be painted as :
 Direct action (open on air failure) valves - Green
 Reverse acting (close on air failure) valves - Red

Notes :- 1) All LPG service PSVs shall be painted blue.
 2) All drains & Vents shall be painted in Main line colour.
 3) The colour code scheme is for identification of piping service group, It consists of a ground colour and 1 / 2 colour bands.

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ANNEXURE IV

ANNEXURE - IV

APPROVED BRAND NAMES

Sr. NO.	PAINT SYSTEM TABLE	GENERIC PAINT NAME	MANUFACTURER'S NAME			
			M/S. SHALIMAR	M/S. BERGER	M/S. ASIAN	M/S.SIGMA COATINGS
1	1,3,15,17	ALKYD ZINC PHOSPHATE PRIMER	TUFFKOTE HB ZINC PHOSPHATE PRIMER (9110-411) 30-50 µm PER COAT	BISON HB ZINC PHOSPHATE PRIMER 35-50 µm PER COAT	APCOMIN HB ZINC PHOSPHATE PRIMER 40µm PER COAT	7131 SIGMAFERRO PRIMER ZP
2	16	HB ZN CHROMATE PRIMER 1 PACK,SYNTHETIC MEDIUM PIGMENTED WITHZINC CHROMATE	EPIGARD 4 ZINC ZINC CHROMATE PRIMER RED (9110-07) 35-50 µm PER COAT	LUXOL ZN CHROMATE PRIMER	APCOMIN HB ZN CHROMATE PRIMER	
3	1A, 6,7,8,9	POLYAMIED CURED CATALYSED EPOXY RESIN , ZINC PHOSPHATE PIGMENT (LOW BUILD EPOXY)	EPIGARD 4 ZINC PHOSPHATE PRIMER RED (9110-06) 35-50 µm PER COAT	EPI LUX 610 PRIMER 25-35 µm PER COAT	APCODUR CP 689 30-35 µm PER COAT	A)7412 SIGMACOVER CM PRIMER b) 6281 SIGMA COVER EP PRIMER/ BUILDCOAT
4	1	ALKYD H.B. MIO PAINT	TUFFKOTE HB M10 COATING (9110-42) 35-50 µm PER COAT	BISON HB M10 COATING 60-75 µm PER COAT	APCOMIN HB M10 PAINT 40-50 µm PER COAT	7244 SIGMAFERRO MIO COAT
5	2,15,17	MODIFIED ALKYD MEDIUM SUITABLY PIGMENTED CHEMICAL RESISTANT SYNTHETIC ENAMALE	SYNTHETIC ENAMEL 25 µm PER COAT	BISON CR ENAMEL	APCOMIN CR SYNTHETIC ENAMEL	7240 SIGMARINE ENAMEL
6	3	BITUMINOUS PAINT	TUFFKOTE HIGH BUILD BITU BLACK 9110-45 75-100 µm PER COAT	BP HIGH BUILD BLACK 90-100 µm PER COAT	ASAIN SUPER SERVICE HIGH BUILD BLACK 100-125 µm PER COAT	7102 SIGMA EMALINE 3000
7	4	COAL TAR MASTIC	ONLY SHALIMASTIC HD OF M/S. STP LIMITED IS AVAILABLE. DFT 140-150 µm PER COAT TO A TOTAL MINM. DFT OF 420 µm			
8	1A,6,7,8,9	CATALYSED EPOXY RESIN SUITABLY PIGMENTED (HIGH BUILD EPOXY)	EPIGARD TL HB (9110-14) 75-100 µm PER COAT	EPI LUX 4 HIGH BUILD COATING 100-125 µm PER COAT	APCODUR CP 696 100-125 µm PER COAT	A) 7456 SIGMACOVER CM COATING B) 7433 SIGMAGUARD EHB
9	8,9	POLYURETHENE COATING 2 PACK,ACRYLIC RESIN WITH POLYURETNE HARDNER,PIGMENTED	SHALITHANE FINISH 9110-24	BERGERTHANE ENAMEL	APCOTHANE CF 676	6824 SIGMADUR188
10	1,10,10A,16	ALUMINIUM PAINT IS-2339	ALUMINIUM PAINT 20 µm PER COAT	ALUMINIUM PAINT 20 µm PER COAT	ALUMINIUM PAINT 20 µm PER COAT	7264 SIGMA ALUMINIUM
11	11, 11A,14	HEAT RESISTANT ALUMINIUM UPTO 250° C	HEAT RESL. AL. PAINT HR LUSTROL-9110 30-15µm PER COAT	FERROTOL HR ALUMINIUM PAINT 15-20µm PER COAT	HR READY MIXED ALUMINIUM PAINT 25µm PER COAT	7264 SIGMAFERRO ALUMINIUM
12	12,12A	HEAT RESISTANT ALUMINIUM UPTO 250-400° C	LU STROTHER HT 400 9110-31 12 µm PER COAT	LUMEROUS HR 47 15-20 µm PER COAT	APCOTHERM HR ALUMINIUM PAINT 15-20 µm PER COAT	7261 SIGMAINE ALUMINIUM HR 500
13	13,13A	HEAT RESISTANT ALUMINIUM UPTO 400-650° C	LU STROTHER HT 600 9110-32 15µm PER COAT	LUMEROUS HR 143 15-20 µm PER COAT	HEAT RESISTING SILICONE ALUMINIUM PAINT 25 µm PER COAT	7567 SIGMATHERM SUPERTHERMOVIT 600
14	14	HEAT RESISTANT BITUMINOUS UPTO 250° C	HT CHIMNEY BLACK 9110-33 30µm PER COAT	FERROTOL STACK BLOCK 30-40µm PER COAT		

The paints mentioned are for guidelines only, and does not limit the choice of paints in any manner.

ANNEXURE - IV

APPROVED BRAND NAMES

Sr. NO.	PAINT SYSTEM TABLE	GENERIC PAINT NAME	MANUFACTURER'S NAME			
			M/S. SHALIMAR	M/S. BERGER	M/S. ASIAN	M/S. SIGMA COATINGS
1	1,3,15,17	ALKYD ZINC PHOSPHATE PRIMER	TUFFKOTE HB ZINC PHOSPHATE PRIMER (9110-411) 30-50 µm PER COAT	BISON HB ZINC PHOSPHATE PRIMER 35-50 µm PER COAT	APCOMIN HB ZINC PHOSPHATE PRIMER 40µm PER COAT	7131 SIGMAFERRO PRIMER ZP
2	1	ALKYD H.B. MIO PAINT	TUFFKOTE HB M10 COATING (9110-42) 35-50 µm PER COAT	BISON HB M10 COATING 60-75 µm PER COAT	APCOMIN HB M10 PAINT 40-50 µm PER COAT	7244 SIGMAFERRO MIO COAT
4	2	MODIFIED ALKYD MEDIUM SUITABLY PIGMENTED CHEMICAL RESISTANT SYNTHETIC ENAMALE	SYNTHETIC ENAMEL 25 µm PER COAT	BISON CR ENAMEL	APCOMIN CR SYNTHETIC ENAMEL	
5	3	BITUMINOUS PAINT	TUFFKOTE HIGH BUILD BITU BLACK 9110-45 75-100 µm PER COAT	BP HIGH BUILD BLACK 90-100 µm PER COAT	ASAIN SUPER SERVICE HIGH BUILD BLACK 100-125 µm PER COAT	7102 SIGMA EMALINE 3000
6	4	COAL TAR MASTIC	ONLY SHALIMASTIC HD OF M/S. STP LIMITED IS AVAILABLE. DFT 140-150 µm PER COAT TO A TOTAL MINM. DFT OF 420 µm			
7	5, 10	SURFACE TOLERANT SELF PRIMING EPOXY	EPIPLUS 56 100 - 125 µm PER COAT	BERGER PROTECTIONASTIC 125-175 µm PER COAT	APCODUR CF 640 100-125 µm PER COAT	7428 SIGMACOVER ST
8	6	EPOXY BASED ZINC PHOSPHATE PRIMER	EPIGARD 4 ZINC PHOSPHATE PRIMER RED (9110-06) 35-50 µm PER COAT	EPI LUX 610 PRIMER 25-35 µm PER COAT	APCODUR CP 689 30-35 µm PER COAT	A)7412 SIGMACOVER CM PRIMER b) 6281 SIGMA COVER EP PRIMER/ BUILDCOAT
9	6	HIGH BUILD EPOXY ENAMEL	EPIGARD TL HB (9110-14) 75-100 µm PER COAT	EPI LUX 4 HIGH BUILD COATING 100-125 µm PER COAT	APCODUR CP 696 100-125 µm PER COAT	A) 7456 SIGMACOVER CM COATING B) 7433 SIGMAGUARD EHB
10	6,8,19	INORGNIC ZINC PRIMER	TUFFKOTE ZILICATE 9110-25 65-75µm PER COAT	ZN ANODE 304 65-75µm PER COAT	APCOSIL 601 65-75µm PER COAT	7558 SIGMA TORNUSIL MC 58
11	7	COAL TAR EPOXY MASTIC	ONLY SHALIMASTIC EHD OF M/S. STP LIMITED IS AVAILABLE. DFT 140-150 mm PER COAT TO A TOTAL MINM. DFT OF 420 mm			
12	8	COAL TAR EPOXY	BIPIGARD "S" (9110-18) 80 125 µm PER COAT	EPI LUX 5 100-125 µm PER COAT	APCODUR CP 651 90-100 µm PER COAT	7472 SIGMA TCN 300
13	9	CHLORINATED RUBBER BASED ZINC PHOSPHATE PRIMER	CHLOROKOTE ZP PRIMER (9110-27) 30-50 µm PER COAT	LINOSOL HB ZINC PHOSPHATE PRIMER 30-50 µm PER COAT	ASIOCHLOR HB ZINC PHOSPHATE PRIMER 50 µm PER COAT	7321 SIGMA NUCOL UNICOAT
14	9	CHLORINATED RUBBER PAINT	CHLOROKOTE FINISH (9110-29) 30-40 µm PER COAT	LINOSOL CHLORORUBBER HB COATING 50 µm PER COAT	ASIOCHLOR CF 625 HB CHLORORUBBER PAINT 40-45 µm PER COAT	7308 SIGMA NUCOL FINISH
15	5, 10	EPOXY ALUMINIUM	EPIGARD 4 ALUMINIUM (9110-13) 40 µm PER COAT	EPI LUX 4 ALUMINIUM 25-30µm PER COAT	EPIGARD 4 ALUMINIUM (9110-13) 40 µm PER COAT	7428 SIGMACOVER ST ALUMINIUM
2	1	ALUMINIUM PAINT IS-2339	ALUMINIUM PAINT 20 µm PER COAT	ALUMINIUM PAINT 20 µm PER COAT	ALUMINIUM PAINT 20 µm PER COAT	7264 SIGMA ALUMINIUM
16	11, 14	HEAT RESISTANT ALUMINIUM UPTO 250° C	HEAT RESI. AL. PAINT HR LUSTROL-9110 30-15µm PER COAT	FERROTOL HR ALUMINIUM PAINT 15-20µm PER COAT	HR READY MIXED ALUMINIUM PAINT 25µm PER COAT	7264 SIGMAFERRO ALUMINIUM
17	12	HEAT RESISTANT ALUMINIUM UPTO 250-400° C	LU STROTHER HT 400 9110-31 12 µm PER COAT	LUMEROUS HR 47 15-20 µm PER COAT	APCOTHERM HR ALUMINIUM PAINT 15-20 µm PER COAT	7261 SIGMAINE ALUMINIUM HR 500
18	13	HEAT RESISTANT ALUMINIUM UPTO 400-650° C	LU STROTHER HT 600 9110-32 15µm PER COAT	LUMEROUS HR 143 15-20 µm PER COAT	HEAT RESISTING SILICONE ALUMINIUM PAINT 25 µm PER COAT	7567 SIGMATHERM SUPER THERMOVIT 600
19	14	HEAT RESISTANT BITUMINOUS UPTO 250° C	HT CHIMNEY BLACK 9110-33 30µm PER COAT	FERROTOL STACK BLOCK 30-40µm PER COAT	--	--



Indian Oil

**INDIAN OIL CORPORATION LIMITED
(REFINERIES DIVISION)**

VOLUME – I (COMMERCIAL)

**SECTION - 2.2
SPECIAL CONDITIONS OF CONTRACT**

(BIDDING DOCUMENT NO. JC11ELT194)

APPENDIX- 7 TO SCC

SAFETY AND ENVIRONMENTAL
SYSTEM

APPENDIX -7 TO SCC

Safety Practices during Construction

Note :

LSTK Contractor shall be responsible for ensuring adherence of all safety requirements. In addition to price reduction and deductions as provided for in the contract the OWNER shall be entitled to deduct from any payment due to the LSTK Contractor, for violations of safety provisions by the LSTK Contractor and/or any of the other Contractors under his supervision, as per details given below:

- 1) Violation of applicable safety, health and environment related norms, a price reduction of Rs.5000/- per occasion.
- 2) Violation as above resulting in:
 - a) Any physical injury, a price reduction of 0.5% of the Lumpsum Price (maximum of Rs.2,00,000.00) per injury in addition to Rs.5,000.00.
 - b) Fatal accident, a price reduction of 1% of the contract value(maximum of Rs.10,00,000.00) per fatality in addition to Rs.5,000/-.

**SPECIAL CONDITIONS OF CONTRACT –
SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEM**

1. Safety, Fire & Security Regulations:

1.1. No smoking:

1.2. The Contractor shall instruct his personnel/ employees NOT TO SMOKE except at the prescribed smoking booths as provided by the Gujarat Refinery. The contractor shall be responsible for all defaults of his workers in this regard and Engineer-in-Charge / Project Engineer reserves the right to TERMINATE the work of the contractor and forfeit any or all the amounts which may be due to him.

1.2.1. Carrying of matchboxes, lighters or any other means of ignition is strictly prohibited.

1.2.2. Any contractor's employee who is found smoking or in the possession of match box or lighter or any other means of ignition in a prohibited area will be turned out from the premises of the refinery. Suitable action as decided by the management will also be taken.

1.3. Operational Area:

1.3.1. Refinery is an operational area, therefore, contractor and his employee shall observe all fire & safety regulations of the Refinery and shall so organise his work as not to interfere with the running of the Refinery in any manner whatsoever. The contractor shall ensure that their staff/ workmen carry with them valid passes/ work permits etc. for proper identification inside the battery area.

1.3.2. The contractor shall not commence the job without the valid permit for the area and for the job. The following are the types of permits / clearances to be obtained by the contractor as per the requirement of the job :

- Clearance from the Area-In-charge and Shift Engineer.
- Cold work / excavation permit
- Hot work permit
- Working at height / depth permit
- Working in confined area / Vessel entry permit
- Any other permits.

1.3.3. Before starting any work, contractor shall apply at least one day ahead for fire & safety permit for excavation, electrical, gas welding and cutting work to Engineer-in-Charge of work/ works who in turn will arrange for such permits. The contractor shall take all the precautions given in the permit before starting of the work to the full satisfaction of the Engineer-in-Charge of the sections. On account of operational problem it is possible that the clearance and permit may get delayed for which the contractor shall not ask for the idle charges. Equipments such as fire extinguishers, the hoses and nozzles required for such precautions can be had from the Gujarat Refinery's Fire Station free of cost and shall be returned after completion of the work/ works in working conditions, to the full satisfaction of the Fire & Safety Officer.

In case of any damage to the fire & safety equipments issued or used by the contractor, the contractor shall bear the cost of such damage in full and the same will be recovered from his bills.

- 1.3.4. The Engineer-in-Charge reserves the right to terminate the contract and forfeit any or all amounts due to him in case he finds that the precautions written on the permit are not strictly adhered to by the Contractor.
- 1.3.5. The complete job is to be carried out within the running unit of Gujarat Refinery. The Contractor shall take all necessary safety precautions and obtain required certificates/ fire permits / safety/ work permits etc. from the competent authority before carrying out any hot works during the execution of the entire works covered by this tender. Safety barricade wherever necessary are to be put up at his own cost.
- 1.4. Contractor's employees shall abide by the Fire & Safety rules and regulations of the Refinery since the job is to be done in the operational area. The contractor shall ensure smooth construction activities/ hot works may be suspended temporarily as per the instruction of the Engineer-in-Charge / Site Engineer. Any extra claim for whatsoever reasons for such suspension of the work will not be entertained.
- 1.5. The Contractor shall make his own arrangements of Gate Pass with photo for his employees as prescribed and instructed by the Security deptt. i.e. CISF, Gujarat Refinery at his own cost, each gate pass has to be endorsed by the Security Officer of the Refinery before the pass be used by any employee. In case of termination of the service of any of his employee during the contractual period, the contractor shall have to surrender the Gate Pass issued to the employees to the Security Deptt. At the end of the project all the gate passes endorsed by the Security Deptt. for use of the contractor's employees shall have to be returned.
- 1.6. For any damage done by the contractor's employees to the existing facilities of the Refinery, the contractor shall be solely responsible to make good as per the instruction of the Engineer-in-Charge or full satisfaction of the Gujarat belt for his workman at his own cost.
- 1.7. For any hazardous/ overhead work contractor has to arrange necessary full body harness for his workman at his own cost.

2. SPECIAL CONDITIONS OF CONTRACT ON SAFETY REGULATIONS

- 2.1. The following is a list of Rules and Regulations which must be observed by the contractor working in the Refinery.
- 2.2. **Safety :**
 - 2.2.1. The contractor shall ensure that all labourers/ supervisor engaged by him will carry identify Card/ Photo Pass displayed on their person during working hours at the work place in/ outside Refinery for their easy identification.
 - 2.2.2. The Contractors shall ensure that their supervisors must undergo Fire & Safety Training & subsequent Test at Fire Station before starting the job. All contractors

must disclose to CISF the name of supervisors and arrange safety training at GR Fire Station, before obtaining a gate pass. CISF will issue the gate pass meant for supervisor, only after getting the confirmation from Fire & Safety. It is the duty of supervisor to train his work force in Fire & Safety on regular basis. The violation of this will be viewed seriously.

- 2.2.3. The contractor shall ensure that their workmen/ supervisors shall not move to other places other than their work premises without proper permission/ authorisation.
- 2.2.4. The contractor shall ensure verification of antecedents of the labourers/ supervisors from Polices / Sarpanch/ other officials before they are engaged by him. No person having adverse antecedent shall be employed by the contractor. The contractor shall be held responsible for all the acts carried out by his workmen.
- 2.2.5. The contractor shall ensure that the workmen working with him are given Do's and Don'ts for strict adherence.
- 2.2.6. The contractor/ his workmen/ supervisor shall fully adhere to the security instructions issued by Management from time to time.
- 2.2.7. Persons below the age of 18 (Eighteen) will not be employed in any part of the Refinery.
- 2.2.8. The weekly safety report should be submitted in the prescribed format without fail.

2.3. **Work Permit :**

- 2.3.1. Any work carried out within the refinery must be covered by a work permit issued by the concerned department or area-in-charge. In addition, a clearance must be obtained from the concerned department's officer or supervisor prior to commencement of any job. A fire permit is required for all the hot jobs .
- 2.3.2. Any work involving open flames and spark such as welding, gas cutting, soldering, grinding ,concrete breaking, use of hurricane lamps and internal combustion driven vehicles/equipment.
- 2.3.3. Sand blasting, trucks, Jeeps, Cranes, Lifts, Cars or any kind of vehicle/equipment driven by an internal combustion engine or by batteries.
- 2.3.4. Use of gasoline, diesel or electrical power engines or tools.
- 2.3.5. Entry of vehicles inside battery limits of process area, within tank dykes and adjacent to pump houses / API separator and loading gantries.
- 2.3.6. Open fire such as burning of wood, coal etc. is strictly prohibited inside the Battery area.
- 2.3.7. While carrying out the hot job, the contractor and his workmen must ensure the following safety measures and job should not be carried out without these:
 - Valid hot job permit.
 - Availability of Tested and proper Fire Extinguisher at the work places.
 - Provision of running fire water hose at the work place.

2.3.8. All Flammable / combustible materials should either be removed from the work place or should be properly protected.

2.4. Safety Permits:

2.4.1. The contractor must obtain the safety permit from the area-in-charge of the concerned department, prior to the starting of the job as stated below.

2.4.2. Entry of personnel into any process area of storage facilities that has been in service etc. Entry into hazardous area like TEL blending, 012 dosing area or any other area where chemicals and hazardous materials are either in use or kept as store.

2.5. Vessels Entry Permit :

2.5.1. Contractor must obtain this permit prior to the start up of the job, column, vessels, tanks or any enclosed area where the chemicals and hazardous materials is either used or stores into it. It is the contractor's duty to ensure daily that the above permits are obtained from the area-in-charge till the completion of the job. All precautionary points stipulated in the permit and instruction of the Area-In-charge/ Engineer-In-charge must be strictly complied with.

2.5.2. Contractor shall ensure the following at the time of entry into the vessels:

- standby persons
- provision of exhaust fan
- use of breathing apparatus

2.6. Excavation :

2.6.1. All the areas where the existing grading is disturbed in the course of work by the contractor shall be made good by him to the full satisfaction of the Engineer-in-Charge.

2.6.2. This job must be executed only after obtaining a valid excavation permit for the particular area where the excavation is required to be done. The permit shall be considered valid only when it is signed by the authorized person of IOCL in addition to other signatories like F&S officer, Civil Engineer, the electrical section and supervising Engineer-in-Charge of the particular area where the excavation is to be carried out

2.6.3. The company reserves the right to cancel a permit without assigning any reasons. When called upon to stop the work by any personnel of the company, contractor shall immediately cease to continue the work. Before re-commencement, a fresh permit must be obtained.

2.6.4. If any excavation job is being done at the depth, then following precaution needs to be taken up.

- Contractor has to obtain the permit "Working at Depth" duly authorised by competent authorities.
- Proper barricading shall be provided at all sides of the opening.

- Excavation shall be done with adequate slop instead of vertical to avoid collapse of wall.
- Proper shoring / strutting shall be provided without fail.
- At least two no. of escape ladders shall be provided at two sides.
- Adequate illumination shall be provided as per site requirement.
- Minimum person shall be kept inside the pit. All idle workers should be removed from there.
- Heavy machinery like crane etc. should not be used near the pit.
- The excavated earth shall be dumped at a distance of 0.90 metre from the edge of the pit to avoid the earth collapse

2.7 Working at Heights :

2.7.1 While working at height, at more than 2 mtrs. from floor level, following safety precautions has to be followed :

- Contractor has to obtain the permit for working at height duly approved by competent authority
- Proper type of scaffolding / platform /ladder should be made to facilitate the job at height. Minimum 2 nos. of ladders should be provided at opposite sides.
- Use of bamboo scaffolding is strictly prohibited inside the Battery area. Only steel scaffolding shall be used for work inside the Refinery. The steel scaffolding material and it's erection shall be done as per relevant IS specification
- The contractor shall ensure the use of full body harness by the person who is working at heights. Full body harness to be used should be of good quality (IS marked) and shall be hooked up with firm support.
- Safety nets also to be used as per site conditions.
- Before starting the job, scaffolding shall be inspected by competent person and a record of the same shall be kept at site.

2.8 Working with Electrical system :

2.8.1 Contractor or his nominated subcontractor should have valid electrical contractor's license for working in Gujarat State. Contractor shall furnish a copy of the same to Engineer-in-Charge before commencement of any work pertaining to Electrical System. In any case, no work shall be permitted to be executed at site without a valid Electrical Contractors Licence, and the decision of the Engineer-in-charge in this regard shall be final and binding and no claim / compensation whatsoever shall be entertained on this account.

2.8.2 While working on electrical system, the contractor and his workmen shall ensure that the following safety measures are in place :

- Proper & valid Electrical line clearance is obtained for the equipment.
- The cables are properly insulated and are without any temporary joint.
- All Flammable / combustible materials should either be removed from the work place or should be properly protected.

- Suitable Earth leakage Circuit Breaker (ELCB) is provided for incoming and all outgoing feeders.
- Proper earthing is provided to distribution board and other electrical equipments like welding machines & grinding machines etc.
- Pipe sleeves are provided for road crossings of temporary cables laid by the contractor for his work.
- The power connection should not be overloaded and suitable overload protection should be provided.
- The tools used by the contractor personnel should be properly insulated and in good condition
- The grinding machine & other power tools should have proper guard.

2.9 **Electrical Apparatus :**

- 2.9.1 The contractor should ensure that the portable electrical equipment like grinding machine, drilling machine etc. is in healthy condition. The contractor should take all precautionary safety action, as providing of earth leakage circuit breakers for their portable electric machines. In lieu of the above, double insulated portable equipment may be used.
- 2.9.2 All portable electrical apparatus shall be regularly examined, tested and maintained to ensure the apparatus and leads are in good order.
- 2.9.3 Ensure that all portable appliances are provided with 3 pin plug and socket connections and that all the metallic parts of the apparatus are effectively earthed. All loose wiring such as flexible cables for portable lamps, tools and trailing cables and other portable and transportable apparatus shall be tested regularly at frequent intervals to ensure safety.
- 2.9.4 No dry battery or accumulator, type of electric hand lamp or torch which is not of flameproof safety type shall be taken inside the Refinery.

2.10 **Use of Company Facilities :**

- 2.10.1 Under no condition shall any contractor personnel temper with or use any property belonging to the refinery without obtaining prior sanction from the supervisor of area concerned.

2.11 **Radiography :**

- 2.11.1 The radiography agency employed by the contractor shall be duly approved by BARC.
- 2.11.2 Specific approval from the Engineer-in-charge for the radiography agency shall be obtained by the Contractor prior to any radiography work.
- 2.11.3 The contractor shall ensure the following safety precautions for the work to be done by the radiography agency.
- The radiography work shall be carried out under the supervision & guidelines of their site in-charge duly approved by BARC.

- As far as possible, field radiography should be done only during night time when there is little or no occupancy around.
- Field radiography during day time may be permitted with due permission of EIC when the occupancy around is minimum i.e. during lunch interval or on holidays.
- A suitable area around the radiography job should necessarily be cordoned off, so that the radiation level outside the area does not exceed the permissible radiation level. The radiation level along the cordon should be monitored by suitable & calibrated survey meter.
- Radiation warning symbol during day time & red warning light during the night to be prominently displayed while carrying the radiography work.
- The concerned radiographer shall remain physically present outside the cordoned area during exposure.

2.12 Temporary Structure / Fixtures:

- 2.12.1 Before erecting temporary shelters like sheds or tents anywhere within the refinery premises, written permission of the concerned authorities must be obtained.
- 2.12.2 Temporary fixtures like; sheds, tents, etc. shall be erected in conformity with normal safety standards. Thatched roof to such fixtures will not be permitted.
- 2.12.3 Temporary piping, hose connections and electrical wiring must be laid in such manner that they do not cause tripping or hitting hazard.
- 2.12.4 Temporary sheds can be constructed only for the storing of the material / site office. It should not be used for any other purpose.
- 2.12.5 However, for all jobs having value more than Rs. One crore, no temporary sheds shall be allowed for office / stores of the contractor and instead the contractor shall arrange for portal cabin for site office / stores.
- 2.12.6 Following information shall be clearly written on the shed.
- Name of the contractor
 - Work Order No.
 - Working under the Department
 - Name of the Engineer-in-charge.
 - Permit No. & it's validity period.
- 2.12.7 The shed shall be made of safe construction material and good aesthetic view. The shed shall be made strictly at the authorised location and size.
- 2.12.8 All windows shall be either of wire mesh or glass.
- 2.12.9 IOCL has the right to open or break the door at any time to inspect the shed.
- 2.12.10 After completion of the job, shed must be demolished within 10 days and area must be cleaned.

2.12.11 All precautions should be taken to ensure that any temporary electrical wiring used within the Refinery will not cause spark or shock.

2.13 Compressed Gas Cylinders :

2.13.1 Compressed gas cylinders should be used in upright position. They must be firmly located on the ground or to a sturdy stand and the cylinder should be chained to prevent accidental fall.

2.13.2 Rolling or throwing of cylinders is strictly prohibited. Cylinders shall be handled carefully and transported through hand trolleys.

2.13.3 Cylinders shall be stacked properly. Empty cylinders shall be stacked separately and filled cylinders separately. After completion of job, all cylinders must be removed.

2.14 Housekeeping :

2.14.1 Good House Keeping must be practiced by the contractor personnel at all times while within the plant. During and after completion of the work, they are to ensure that their work area is kept clean and tidy. Materials and equipment should be stored in a safe and orderly manner so that they will not block exits to roads, buildings, aisles, passage and approach to fire fighting equipment such as fire hydrants, fire hose and fire extinguishers or area where emergency safety showers, electrical switch panels and switch rooms are located.

2.14.2 The work / construction sites are to be cleaned daily and all debris / scrap generated is to be kept at the designated place only every day by the contractor as directed by the Engineer-In-charge. The scrap / debris so generated shall be disposed off to the designated places once a week as per the direction of Engineer-in-charge.

2.14.3 A job will not be considered completed until all surplus material, scrape and debris / rubbish are removed from the job site.

2.14.4 In case the Contractor does not clear the area within 5 days of completion of work, the same shall be got done by IOCL and recoveries shall be made from the bills of the Contractor at double the rate at which the IOCL has got it done.

2.14.5 Any failure by the contractor in maintaining good house-keeping / clearing the site as above shall be recorded in the performance report of the contractor.

2.14.6 At all work sites, contractor has to display a board containing following information:

- Name of the Contractor
- Name of the work
- Work Order No.
- Job site warning instruction
- Emergency Telephone Number
- Do's and don'ts on safety and security
- Working under the Department

- IOC site in-charge name
- Permit No. & Validity period.

2.14.7 The contractor has to maintain the following at job site :

- First Aid Box with required medicines
- Safety Register
- Injury record
- Records of Weekly Staff safety meeting.
- Record for Safety briefing / Training at site by contractor.

2.15 **Personal Protective Equipment:**

2.15.1 For the safe conduct of any job, contractor has to arrange personal protective equipments for his personnel as per requirement. The equipment's shall be approved type, good condition and adequate numbers. Use of PPE such as helmets, safety shoes, full body harness., hearing aids, hand gloves, aprons, safety goggles, etc, is a must. Gujarat Refinery shall not provide any personal protective equipment. However, in certain cases, personal protective equipment maintained by the Refinery will be made available for this purpose in which event such equipments shall be returned to the authorities in good condition.

2.15.2 Contractor shall arrange all Non-Respiratory Type of Personal Protective Equipment (PPE) (e.g. Safety Goggles, Welding Helmets, Full body harness etc.) at their own cost and shall ensure use of these PPE by their workmen/ personnel during execution of the job as per Fire & Safety Rules and Regulations of the Refinery and as directed by the Site Engineer-in-Charge. Fire & Safety Dept. may be contacted for any clarification on Safety Regulations.

2.15.3 Special precautions and personal protection shall be taken as per Refinery Safety Regulation during the following jobs:

- Handling of Hazardous Chemicals, gases and Materials etc. (e.g. TEL, Acids, Chlorine, Ammonia, Pyrophoric Iron etc.)
- Working in presence of Suspended Solids (e.g. Catalyst, Refractory, Sand, Dust etc.)
- Cleaning / Maintenance of equipments in Lead/ Sulphur/ Phenol rich Hydrocarbon service.
- Cleaning/ handling of oily sludge.
- Welding/ Grinding/ Gas cutting jobs.
- Radiography of Mechanical jobs.

2.16 **Clothing & Personal Protection :**

2.16.1 Contractor personnel shall not wear loose clothing while working around moving or rotating machinery and equipment, and must wear helmets and safety shoes while working in Refinery area.

2.17 **Unsafe Practices :**

2.17.1 Any unsafe practices in disregard of normal safe working practices by contractor personnel when pointed out by company personnel shall be immediately corrected.

2.18 Personal Conduct :

2.18.1 Working under influence of alcohol/ narcotics and entering Refinery premises while in the influence of alcohol/ narcotics is strictly forbidden. The contractor should ensure compliance of above by him and all his workmen.

2.18.2 Horseplay:

- Fooling on the job, mock fighting within the refinery premises will not be tolerated.
- Gambling within the refinery premises is strictly forbidden.
- Entering the refinery while in possession of weapons such as knives etc. is prohibited.
- Contractor personnel shall not pick up quarrel or get into arguments with Refinery personnel or act in any manner, which is in violation of plant discipline. In case of any misunderstanding, such problems should be referred to appropriate Refinery personnel.

2.19 Driving of Motor Vehicles :

2.19.1 Contractor shall ensure that all State traffic rules and regulations are complied with while motor vehicles are driven inside the refinery premises. In addition, the following points are also outlined for compliance :

- Speed Limit: Speed limit within the refinery is 25 KMPH except around the process area where the speed limit is 20 KMPH. In any case, vehicle drivers should take cognizance of road, weather and vehicle condition and adjust their driving accordingly. All vehicles must be mechanically sound and have an efficient exhaust with approved spark / flame arrestor, silencer, horn, breakers and fuel cap.
- Parking: Park vehicles only in approved area. Vehicles must be parked in such manner that they will not move while unattended. As a general rule, vehicles should not be parked at road bends; in front of fire equipment sheds and fire fighting equipment thereby blocking access to them.
- No vehicles should enter into any operating area without valid fire permit followed by a safety clearance from the area-in-charge (this includes process areas, tank farms and loading racks).
- Vehicles driven inside the refinery premises should have effective brakes horns, lights, mufflers, flame arrestors etc.
- Vehicles shall carry only the number of passengers or weight of load it is authorised to carry as per law. Loads carried in trucks shall be properly secured so that they will not accidentally fall off while vehicle is in motion.
- Tractors and trucks should not be used for transporting personnel.
- Vehicle drivers shall always check overhead and side clearance while driving vehicles.

- Any kind of repair work on Contractor's vehicle is not allowed inside the Battery area.
- The contractors shall prominently display the name of their company on all the vehicles including tractor trolleys, trucks, open jeeps, cranes which are allowed by the Engineer-in-charge to enter inside the Refinery for carrying out the job. The display board shall be put on front and rear side of each of the vehicle.
- Hand cart, tractor-trolley etc should also bear the name of the contractor clearly.
- Only open type of vehicles like jeep etc are allowed inside the Refinery having fitted with approved spark arrestor.

2.20 Use of heavy equipment:

2.20.1 If hoists, cranes, derrick, mixer machine, pumps etc. are used by the contractor, the following are to be ensured by the contractor and his workmen:

- Testing of crane for its capacity.
- Inspection & maintenance logs
- Crane operation logs
- Safety latch is provided on the hooks.
- The area is notified through display of Sign boards/ barricades
- Over head power cables is removed or kept at a safe distance.
- The exhaust of machines should have a proper flame arrester
- Carrying material by hydra inside refinery.
- No change of boom length beyond permissible limit.

2.21 Fire Protection Equipment:

2.21.1 The Refinery will provide fire protection equipment wherever it is required. Contractor personnel who are working on such jobs will be instructed by the concerned department about the operation of such standby fire protection equipment. In the event of an accidental fire, it is expected of such personnel to make efforts to extinguish the fire with the standby equipment made available and the contractor personnel should immediately get in touch with any the Refinery personnel available or inform (Phone 7333) or break the nearest fire alarm point glass. In all cases, accidental fires shall be reported to the supervisor of the area concerned.

2.21.2 A work permit must be obtained prior to contractor personnel drawing water from the refinery fire water loop.

2.21.3 All efforts should be made by contractor personnel to prevent occurrence of any unwanted fire, Gasoline driven engines, trucks, tractors etc. shall not be filled with fuel while the motor is still running.

2.21.4 Gasoline, naphtha, benzene or toluene must not be used as a cleaning agency or solvent.

2.22 Report on Accidents :

- 2.22.1 All accidents such as personal injuries sustained by contractor personnel and damages to vehicle and property, no matter how slight they are, shall be immediately reported to the engineer-in-charge / RSM & Fire & Safety in writing. It is the responsibility of the contractor to fulfill all legal formalities.
- 2.22.2 Medical treatment for injured contractor personnel will be entirely the responsibility of contractors. However, if required, emergency first aid treatment may be given by Refinery hospital.
- 2.22.3 Any questions or doubts on the safety regulations enumerated in this tender or the generally accepted safety working practices may be clarified with the concerned department of safety section.

2.23 The following actions shall be taken by the contractor and his employees/workmen about Bombs, Unattended baggage / Objects lying in secluded places in the Plant :

- 2.23.1 On noticing any bomb/ unattended baggage or object lying in the plant area, they should immediately inform the CISF control room on Telephone No.7971 & 7972 (Auto).
- 2.23.2 They should not touch the object or try to open the baggage or fiddle with the wires or battery if found attached to the object.
- 2.23.3 They should move away to a safety distance of approximate 100 mtrs. without creating any panic.
- 2.23.4 In case of unattended baggage, they should help CISF personnel in identifying the claimant.
- 2.23.5 They should not move to the area unless clearance is given by security personnel.

2.24 Do's and Don'ts- Safety

Do's and Don'ts in case of Bomb/ Unattended baggage lying secluded places in the Plant.

Do's
<ul style="list-style-type: none"> • On noticing any bomb or CISF unattended baggage, inform Control Room by quickest possible means or on Telephone no.7971 & 7972 (Auto) and P&T 272329 and IOC (GR) Fire Control Room on 7333 and 6333 • Move away from the bomb/ unattended baggage. • Help security personnel in identifying unattended baggage. • Move back to your place of work after clearance has been given.
Don'ts
<ul style="list-style-type: none"> • Do not touch the bomb/ unattended baggage. • Do not lift any attended baggage.

- Do not go very close to the object.
- Do not create panic.
- Do not fiddle with wires or battery if found attached with any object.
- Do not open any unattended baggage.
- Do not try to defuse any bomb of explosive material.

3.1 Penalties in case of non - compliance to safety rules and regulations

The contractor has to follow all Safety, Health and Environment rules & regulations of the Refinery. In case of non-compliance of any of these rules and regulations by contractor or his employees, the contractor shall be held responsible. **If any violation or non-fulfillment of these Safety, Health and Environment rules and regulation is observed by Refinery authorities during checking at any time, a penalty of Rs. 5000.00 (Rs. Five Thousand Only) shall be imposed on the contractor for each occasion of non-compliance to these rules and regulations by him or his employees.** The decision of Refinery authorities shall be final and binding on to the contractor in this regard . The amount of penalties so imposed shall be recovered from the next R.A. Bill of the work or any other dues payable to the contractor by Refinery.

In case any violation or non-compliance of the safety, health & environment norms, rules and regulations, is observed during checking / audit by DGMs, CM(F & S), CM(SA) and HODs at any time, following penalties shall be imposed on the contractor:

First violation : Rs.5000 for each type of violation / each occasion. **Second**

violation: Rs.10,000/- for each type of violation / each occasion **Third**

violation: Rs.50,000/- for each type of violation / each occasion **Fourth**

violation: The agency shall be put on holiday list for a period 1 year.

The decision of Refinery authorities shall be final and binding on the contractor in this regard. The said clause stands modified to that extent

S.No.	Clause Ref.	Actions for Compliance by Contractors
1.	2.14.6 & 2.14.7	<p>A. The contractor has to display the following information at the job site on a notice board :</p> <ol style="list-style-type: none"> 1) Name of the Contractor 2) Name of the Work & Contract No. 3) Job site warning instructions 4) Emergency telephone Number 5) Do's and Don't on Safety & Security <p>B. The contractor has to maintain the following at job site :</p> <ol style="list-style-type: none"> 1) First Aid Box with required medicines 2) Safety Register 3) Injury record 4) Records of Weekly Staff safety meeting. 5) Record for Safety briefing / Training at site by contractor.
2.	1.3.2	<p>The contractor shall not commence the job without the valid permit for the area and for the job. The following are the types of permits / clearances to be obtained by the contractor as per the requirement of the job:</p> <ol style="list-style-type: none"> 1) Clearance from the Area-In-charge and Shift Engineer. 2) Cold work / excavation permit 3) Hot work permit 4) Working at height / depth permit 5) Working in confined area / Vessel entry permit 6) Any other permits.
3.	2.15.1	<p>The contractor shall ensure that he and all his workmen shall use the following (minimum) personal protective equipment</p> <ol style="list-style-type: none"> 1) Helmet - while working in the Refinery or any other hard hit area. 2) Full body harness - Working above 2.50 m height 3) Eye shields / goggles & Face protecting equipment-while welding / grinding etc. 4) Hearing Aid - while working in noisy area 5) Hand gloves and aprons - as per job requirement 6) Any other as required:
4.	2.6.4	<p>While carrying out excavation or working at depth in pit, trench etc, the following safety measures are to be followed:</p> <ol style="list-style-type: none"> 1) Proper barricading for the floor opening / excavated area 2) Adequate side slope 3) Proper shoring / strutting 4) Provision of escape Ladder 5) Provision of Sufficient lighting arrangement

S.No.	Clause Ref.	Actions for Compliance by Contractors
5.	2.7	<p>While working at height, the contractor and his workmen shall ensure that the following safety measures are taken:</p> <ol style="list-style-type: none"> 1) Sufficient approach to work area and proper scaffolding. 2) The person working at height is wearing the full body harness which is firmly secured to a proper place. 3) The Scaffolding shall be made of steel as per norms. 4) The ladder / scaffolding shall be properly secured to prevent sliding / failing. 5) The clamps and tiring are properly secured. 6) The Safety net is provided. 7) Inspection of final scaffolding before use has been done by competent authority and the inspection report in this regard should be available with the contractor.
6.	2.5	<p>While working in a confined space the contractor and his workmen shall ensure the following :</p> <ol style="list-style-type: none"> 1) Provision of Exhaust fan on the confined place. 2) A standby man should always be available standing near the confined space entry / exit point when the other worker is carrying on job inside the confined space. 3) Use of breathing apparatus.
7.	2.3.7	<p>While carrying out the hot job, the contractor and his workmen must ensure the following safety measures and job should not be carried out without these:</p> <ol style="list-style-type: none"> 1) Valid hot job permit. 2) Availability of Tested and proper Fire Extinguisher at the work places. 3) Provision of running fire water hose at the work place. 4) All Flammable / combustible materials should either be removed from the work place or should be properly protected.
8.	2.19	<p>A. The contractor's vehicles like jeep, cars, trucks and tractors should maintain the prescribed speed limits and should not over speed. B. Obstacles for fire fighting and blockage of road etc.</p>

S.No.	Clause Ref.	Actions for Compliance by Contractors
9.	2.8.2	<p>While working on electrical system, the contractor and his workmen shall ensure that the following safety measures are in place:</p> <ol style="list-style-type: none"> 1) Proper & valid Electrical line clearance is obtained for the equipment. 2) The cables are properly insulated and are without any temporary joint. 3) All Flammable / combustible materials should either be removed from the work place or should be properly protected. 4) Suitable Earth leakage Circuit Breaker (ELCB) is provided for incoming and all outgoing feeders. 5) Proper earthing is provided to distribution board and other electrical equipments like welding machines & grinding machines etc. 6) Pipe sleeves are provided for road crossings of temporary cables laid by the contractor for his work. 7) The power connection should not be overloaded and suitable overload protection should be provided. 8) The tools used by the contractor personnel should be properly insulated and in good condition 9) The grinding machine & other power tools should have proper guard.
10.	2.20.1	<p>If hoists, cranes, derrick, mixer machine, pumps etc. are used by the contractor, the following are to be ensured by the contractor and his workmen:</p> <ol style="list-style-type: none"> 1) Testing of crane for its capacity. 2) Inspection & maintenance logs 3) Crane operation logs 4) Safety latch is provided on the hooks. 5) The area is notified through display of Sign boards/ barricades 6) Over head power cables is removed or kept at a safe distance. 7) The exhaust of machines should have a proper flame arrester 8) Carrying material by hydra inside refinery. 9) No change of boom length beyond permissible limit.
11.	2.14	<p>The contractor shall maintain good house keeping at his area of work and must ensure the following :</p> <ol style="list-style-type: none"> 1. Passage, walkway and working area should be free from any blockage are maintained neat and clean 2. Debris, scrap etc is removed daily and put to a proper

S.No.	Clause Ref.	Actions for Compliance by Contractors
		place. 3. The temporary structure are removed after completion of job.

3.2. In case the violation / non-compliance of above Safety , Health & Environment rules results in results in any Physical Injury or Fatal Accident, an additional penalty as given below shall also be imposed on to the Contractor :

3.2.1 For any physical injury: Additional penalty of 0.5 % of the contract value subject to a maximum of Rs.2,00,000 (Rs. Two Lakhs Only)per injury in addition to the penalty of Rs.5000 as per cl.No.3.1 above

3.2.2 For Fatal accident: Additional penalty of 1 % of the contract value subject to a maximum of Rs.10,00,000 (Rs. Ten Lakhs Only) per fatality in addition to the penalty of Rs.5000 as per cl.No.3.1 above

4. Compensation in case of accidents:

In case of any accidents/injury of a contractor's workmen, the contractor shall pay a suitable compensation (subjected to the minimum compensation as mentioned below) to the affected person / his family members in the presence of Engineer-in-charge and in consultation with Chief Medical Officer of the Refinery. The said compensation shall depend on the seriousness of injury, etc, and shall be in addition to the hospitalization / treatment charges and Group Insurance Amount payable to the effected person. The following are the minimum compensation shall be paid to the affected person / his family as stated above :

4.1 In case of fatal accidents: Rs.1.0 lacs (Rs. One Lakhs) within 5 days of accident.

4.2 In case of loss of both the limbs (hand / legs/eyes/ ears) : Rs.50,000/- (Rs. Fifty Thousand) within 1 week

4.3 In case of loss of one limb (hand / legs/eyes/ ears) : Rs.25,000/- (Rs. Twenty Five Thousand) within 1 week

4.4 In case of any injury not specified above, Rs.1000/- (Rs. One Thousand) to Rs.5000/- (Rs. Five Thousand)as directed by Engineer-in-charge within 1 week

5.0 EMERGENCY RESPONSE PLAN

5.1 Contractor has to adhere and respond to the on-site emergency plan and co-ordinate with the site main controller of Gujarat Refinery.

5.2 Contractor personnel shall stop their work and proceed to a safe area in the event an emergency arises in the area where they are working like, in case of fire, oil spillage, power failure etc. Before re-commencement of the job they should obtain clearance of supervisor of area involved.

- 5.3 In view of the hazards associated with Hydrocarbon processing, on site emergency plan has been prepared in the event of major accident occurring on site. The plan envisages handling emergency situation, which shall be communicated through siren, based on nature of emergency as mentioned below.
- 5.4 In case of major emergency, it is the responsibility of the contractor to head count his personnel and take them out with the help of concerned Gujarat Refinery Co-ordinator. Contractor must confirm the safe evacuation of his personnel to Gujarat Refinery Co-ordinator. In case of any missing person, it must be brought into the notice of Gujarat Refinery authorities immediately.

TYPES OF COMMUNICATION, IN CASE OF EMERGENCY:

TYPE OF EMERGENCY	SIREN
Air raid warning	Siren for two minutes on a wailing note or intermittent blasts each of four seconds duration followed by four seconds silence.
All clear or Raiders Passed warning	Continuous siren for two minutes at steady pitch.
Small fire	No siren
Major Fire	Wailing type siren: three times for 30 seconds with an interval of 15 seconds in between (Total duration: 2 minutes).
Disaster	Same type of siren as in the case of Major Fire except that it will be sounded three times at the interval of two minutes.
All clear	Straight siren for two minutes
Siren testing	Straight siren for two minutes (daily at 0815 hrs) First Monday of every month, all sirens will tested in all the modes

EVACUATION AND SHELTERING:

In case of emergency/major accident or disaster, following 8 Nos. of Muster points have been identified for assembling of people for head counting / transportation to a safe place. The contractor site-in-charge shall coordinate with Site Main Controller for sheltering and evacuation and advise his workmen to rush to the identified locations of muster points as given below

MUSTER POINTS

S. NO.	AFFECTED AREA	LOCATION
1.	For Administration Staff	At the garden outside the Technical building
2.	LPG, OM&S, TTL Area and nearby Tank farm area.	Outside the office of OM&S control room.
3.	For GR tank farm area, GRE & FCC Units	At Civil Office on Road No.6
4.	For KAPL, SMPL, ONGC Staff & people working GRE tank farm area.	At the crossing of Road No.7 & 8.
5.	Bitumen area & GRE tank farm.	At Bitumen Weigh Bridge on Road No.8
6.	For TPS/AU-1, 2, CRU, AU V & DHDS area.	Near Old Main Gate
7.	For PDF/Udex/FGH/ MTBE, Butene-I, CETP, SRU, Flare and connected tank farm.	At the junction of Road No.2 & 11
8.	For GHC, CGP & tank farm area.	At the crossing of Road No.23 & 26.

6.0 Special Conditions of Contract on Environmental Management System

- 6.1 Contractor shall inculcate environmental awareness among their workmen/ personnel and strive for enhancement of systems and skills for minimizing the environmental impact out of their activities/ services.
- 6.2 Contractor shall avoid wastage of water, compressed Air and Steam supplied to them from owner's source of supply for execution of the job and close the supply valves properly while not in a use.
- 6.3 Contractor shall ensure that while carrying out Modification/ Repair/ Replacement jobs of any equipment of pipeline, the spillage of Hydrocarbon Oily sludge etc. are cleaned and routed to nearby OWS, at regular interval as well as after completion of jobs. Contractor must ensure that the spillage of hydro-carbon oily sludge etc. are not drained in Storm water channel or open channel.
- 6.4 Before attending any blinding/ de-blinding jobs, all tools, tackles and spares shall be kept ready at site in order to minimise Hydrocarbon spillage.
- 6.5 Contractor shall clear and level the job-site and remove all metallic and non-metallic surplus materials, scrap and other waste materials generated out of his job, from time to time as well as after completion of job to a specific location as per Engineer-in-charge.
- 6.6 Contractor shall ensure to avoid idle running of all electrical equipments e.g.

welding machines etc. used for execution of the job.

- 6.7 Contractor's vehicles, trucks, tractor, cranes and other portable equipments e.g. Air Compressor, DG Set, Dewatering pumps etc. used inside Refinery premises (where Hydrocarbon is used as fuel) for execution of the job must be mechanically sound and have an approved spark arrester and have exhaust complying pollution norms. Idle running of those vehicles and equipments shall be avoided.