

TD-201 Rev No. 00	Form No.	 	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD	ANNEXURE-14 to PY55223
				Rev No. 00
				Page 1 of 17

COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED,
It must not be used directly or indirectly in any way detrimental to the interest of the company.

PROJECT

40MW CDQ WASTE HEAT RECOVERY
CO-GENERATION POWER PLANT

CUSTOMER

M/S TATA STEEL LIMITED,
JAMSHEDPUR

CONSULTANT

TATA CONSULTING ENGINEERS,
KOLKATA

SPECIFICATION.NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION:
TCE.7742B-C-540-001	1 X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR AND AUXILIARIES	CONTENTS

Appendix -6

GENERAL PAINTING SPECIFICATION

ISSUE R1

APPENDIX-6

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION
TCE.7742B-C-540-001	IX 40 MW CAPTIVE POWER PLANT FOR CDC 1984 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	DRG NO. 1001

19.0 PAINTING SCHEME FOR POWER PLANT

1.0 SCOPE

The purpose of this contract is to describe the surface preparation, methods, application procedures and type of protective coatings required. This specification covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted. The painting system should ensure optimal protection of the installation with minimum need for maintenance. Environmentally friendly & easy to apply.

2.0 CODES AND STANDARDS

Painting of equipment will be carried out as per the contract indicated below and will conform to the relevant IS standard for the material and workmanship.

The following Standards may be referred to for carrying out the painting:

IS: 5	Colours for ready mixed paints and primers
IS: 101	All Parts and Sections for paint testing
IS: 1303	Glossary of terms relating to paints
IS: 2379	Colour code for identification of pipes
IS: 1477	Code of practice for painting of ferrous structures and buildings (Parts I & II)
IS: 2524	Code of practice for painting of non-ferrous structures and buildings (Parts I & II)
IS: 6278	Code of practice for white washing of masonry
IS: 13183	Aluminium Paint, heat Resistant Coatings, inorganic
IS: 158	Ready mixed paint, brushing, chromic acid, black Lead free, acid, alkali, water and heat resistant
IS: 2074	Ready mixed paint, air drying, red Chromic acid, zinc chromate priming
IS: 104	Ready mixed paint, brushing, Zinc Chromate priming
IS: 2932	Enamel, synthetic, exterior (a) undercoating (b) finishing
IS: 2629	Recommended Practice for Hot Dip Galvanising
BS EN ISO 14713	Code of practice for protection of iron & steel structure against corrosion

FILE NAME:

Proprietary rights of the information contained herein belong to Tata Consulting Engineers Limited (TCE). This information is intended to be used for the mentioned purpose/project only. In case of misuse of information and any claim arising thereof, cost and consequence will be on the party misusing the information.

FILE NAME: F329R6.DOC

FORM NO. 1001

SPECIFICATION NO:	TATA CONSULTING ENGINEERS LIMITED	SECTION C 19
TCE.77426-C-54C-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 2 OF 15

ISO 8501	Preparation of steel substrates before application of paint & related Products
ISO 8502	Assessment of dust on steel surface prepared for painting (Pressure sensitive tape method)
ISO 12944	Paints and Varnishes-Corrosion protection of steel structures by protective paint systems
SSPC	US Contract documents of Steel Structures Painting Council SSPC Volumes I and II
SSPC-SP-08	Surface preparation by Pickling
NORSOK M-501	Surface preparation & Protective coating
ISO 20340	Pre-Qualification test
ASTM	American standard test method for paints and coatings
AWWA	American Water Works Association

Statutory and Local regulations will be strictly followed in selection and application of paint

3.0 GENERAL

This contract document covers the surface preparation, method of application and material to be used for oil coating of equipment, steel structures and piping. Steel material subjected to surface preparation on shop/site will have minimum requirements in accordance with Rust Grade B (SSPC/SSPM Volume-2)

Coating materials according to SSPC, EN ISO, ASTM, BIS or DIN standards, will be used. The paint will comply with applicable laws, regulations, ordinances etc., of the local authority state or the nation pertains to the work. The materials will be matched with each other so that they are compatible. Coatings deviating this contract document will be subject to approval. Standards of surface preparation and painting will give a time to first maintenance of 10 years.

3.1 Approved Paint Manufacturers

- | | |
|--|-----------------------------------|
| i) Asian Paints (I) Ltd. | vi) Shalimar Paints Ltd. |
| ii) Berger Paints India Ltd | vii) Addison Paints Ltd. |
| iii) Goodclass Neoplac | viii) Grand Polycoat |
| iv) Jenson & Nicholson (I) Ltd | ix) Bombay Paints |
| v) CDC carboline (I) Ltd. | x) Sigma Coatings |
| xi) Premier Products | xii) Coromandel Paints & Chemical |
| xii) Anupam enterprises | xiii) VCM Polyurethane Paints |
| xiv) International Protective Coatings | xv) Ameron, USA |

SEAL
RT

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 3 OF 15

xvi) Jotun
xviii) M S Corrocoat

xvii) Cipy Polyurethane

3.2 Coating materials

The selected coating materials will be suitable for the intended use and will be selected after an evaluation of all relevant aspects such as

- Corrosion protective properties
- Requirements to health, safety and environment
- Properties related to application conditions, equipment and personnel
- Experience with the coating materials and coating system.

Performance standard as listed below will be established by paint manufacturer, the records will be submitted for review.

- Adhesion test (pull off test)
- Flexibility test
- Salt spray test (min 1000 Hrs)
- Water absorption test
- UV resistance test (external coating)
- Cathodic disbonding test (internal coating)
- Abrasion test (internal coating)
- Impact resistance test
- Sea water immersion test (structures in tidal, splash zone and conveying sea water)

Each product will have a batch number showing year and month of manufacture and giving full traceability of production. Shelf life will be included in the technical data sheet. All coating materials and solvents will be stored in the original container bearing the manufacturer's label and instructions.

The paint manufacturers will provide coating system data sheet for each coating system to be used containing the following information

1. Surface preparations
2. Film thickness(min and max)
3. Min and max recoating intervals at relevant temperatures
4. Mixing ratio, thinner details and coating repair systems

The composition of the paint will be at the discretion of the manufacturer, provided that the finished product meets the requirements of, State or Local regulatory bodies for the products. All vehicle components for use in the manufacture of paints and enamels will meet the ASTM/ ISO Contract document except as otherwise stated. Coating systems

ISSUE
R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 4 OF 15

will be selected as per corrosivity category. Coating systems are tabulated in ANNEXURE and will be pre-qualified in accordance with Contract document. Coating systems/ alternative coating systems may be re-subjected to pre-qualification, at the discretion of OWNER/ ENGINEER. The specified coating systems, the number of coats and the coating film thicknesses given in Annexure are minimum requirements. Top coat colors should be in accordance with Annexure.

The paint to be applied will be approved by Customer / Engineer.

4.0 Painting System Procedure

All paints & paint material used will be procured from approved manufacturers. Paint will be supplied in manufacturers original containers with the description of content, Contract document No., colour, ref no, date of manufacture, shelf life expiry date & pot life.

All coating materials and solvents will be protected from ignition sources and will remain within storage temperatures and storage conditions recommended by the coating manufacturer. All coating materials and solvents will be stored in the original container bearing the manufacturer's label and instructions.

The sample for testing the paint being used may be taken by the customer at any time. In general Shop manufactured equipment / component will be delivered to the site coated with a shop applied system or the manufacturer's standard finish in accordance with the requirements of this Contract document. The CONTRACTOR will state the extent of shop coating and field coating for the equipments supplied.

For equipment that has received shop prime coat, touch-up prime coat and additional coats will be applied in accordance with the coating schedule. It is responsibility of the CONTRACTOR to ensure compatibility between shop and field applied paint systems.

Necessary Protection will be provided to the surfaces of all the other equipment, structures, during surface preparation and painting. Damage to other surfaces or equipment will be repaired by the CONTRACTOR.

The CONTRACTOR will submit the following for review and approval by the Customer:

1. Manufacturer's recommended paint scheme for the project
2. Latest published product & instructions for application data,
3. Procedures for surface preparation and application of recommended painting scheme.
4. Pre qualification for equipments and blasting materials, product, procedure and personnel qualifications for the paint and painting systems.
5. Painting repair procedures

The supply of all necessary equipments, weather protection, and scaffolding for painting to ensure work is carried out in accordance with the Contract document and agreed programme.

HS

me

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 5 OF 15

Maintenance of the paint work until completion of the contract, this will include repair of any damaged areas caused by third party.

Disposal of painting waste resulting from painting, will comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work and coating materials.

It is a mandatory requirement that all operatives working to this procedure take full cognizance and implement necessary safety precautions.

5.0 PREPARATION OF SURFACES

All surfaces to be painted will be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust, weld spatters, sharp edges and any other foreign matter. Removal of grease and oil contamination will be in accordance with SSPC-SP1 prior to cleaning process described below.

Mechanical cleaning by power tool and scrapping with steel wire brushes will be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out, hand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents will be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents will be adopted only after written approval of the Engineer.

The blast cleaned surface will be checked for signs of salt contamination as per ISO 8502-6 & 9. The maximum allowable level of contamination will be 20 mg/m². Surfaces that do not meet these criteria will be reprocessed.

Mechanical Cleaning:

Manual/power tool cleaning will be done as per grade St-2 or St-3, of ISO 8504-3. This method to be used for repair painting or on already painted surface and in case of usage on new construction painting prior approval may be obtained from purchaser/engineer.

	Condition of surface	ISO 8504-3	SIS 055900	SSPC
Hand tool cleaning	Rusted	C St2	C St2	SP2
	Rusted and pitted	D St2	D St2	SP2
Power tool cleaning	Rusted	C St3	C St3	SP3
	Rusted and pitted	D St3	D St3	SP3

i) Grade St-2: Thorough scraping and wire brushing, machine brushing, grinding etc. This grade of preparation will remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or

Camp

HS

Sne

Red

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 6 OF 15

with clean brush. After preparation, the surface should have a faint metallic sheen. The appearance will correspond to the prints designated St-2.

ii) Grade St-3: very thorough scraping and wire brushing, machine brushing, grinding etc. After preparing the surface, it should have a pronounced metallic sheen and correspond to the prints designated St-3.

Blast cleaning:

Compressors: Compressed air supply for blast cleaning will be free of water and oil. Air compressors will not be allowed to deliver air at 110deg C. The blasting activity will be performed at ambient temperatures above 5°C and relative humidity less than 85%. Steel temperature will be 3°C above dew point. Necessary safety precautions for equipment and operator will be adhered to.

Abrasives: Abrasives used for blast cleaning carbon steel and alloy steel will be as per ISO 8504-2 and SSPC painting manual. Suggested abrasives may be chilled iron grit or shot steel and malleable iron grit and shots non metallic abrasive (aluminium oxide, copper slag, garnet etc.).

Removal of mill scale and rust using abrasives such as grit or shot under high pressure. The grade of blasting performed in line with the approved painting scheme.

Surfaces to be coated will be free of all grease, oil, loose rust, and loose mill scale. Rust, mill scale, weld spatter, flux, will be removed by the methods indicated in the Coating Schedule. Oil and grease will be removed by solvent cleaning method as outlined in SSPC - SP - 1 prior to blasting.

The quality and grain size of abrasives and the parameter of their use are to be chosen to obtain the surface profile depth and cleanliness. Abrasives will comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertaining to the work.

Profile measurements for abrasive blast cleaned surface will be made with a Profile comparator and permanent record will be maintained with Testex Press-O-Film.

Surfaces prepared for coating will be coated the same day and before any visible rusting occurs (the time elapsed between blast cleaning and commencement of painting will under no circumstances exceed 4 hours, but in any case must commence before signs of degradation occur).

After blasting cleaning, depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer of minimum dry film thickness 25 µm may be used.

fs

Sne

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 7 OF 15

The grades of surface finish:

	ISO 8501-1	SIS 055900	SSPC	NACE
White metal	Sa3	Sa3	SP5	1
Near White metal	Sa 2½	Sa 2½	SP10	2
Commercial blast	Sa2	Sa2	SP6	3
Brush off blast	Sa1	Sa1	SP7	4

PAINT APPLICATION

GENERAL:

Paints and other coating materials will be applied in accordance with the paint manufacturer's instructions. The surface preparation and painting system will be as described in ANNEXURE with the following exceptions:

Nameplates, code stampings and push buttons

Concrete brickwork, tile, and glass unless specified by the Purchaser / Engineer

Non-ferrous materials

Austenitic stainless steel

Plastic and / or plastic coated materials

Insulated surface of equipment and pipes except colour coating wherever required

Any surface specified by the Purchaser / Engineer not to be painted.

Painting records will contain:

- Equipment/components/location painted
- Date of painting
- Paint details such as Contract document No, colour, date of manufacture, shelf life, expiry date
- Application equipments
- Ambient conditions at the time of painting
- Surface temperature
- Drying time between coating, DFT and number of coatings
- Appropriate work plan for painting.

PAINT APPLICATION REQUIREMENTS

The paint will be applied in accordance with the paint manufacturer's product data sheet, which will include the mix ratio, the method of application, and the use of thinners and over coating times.

Handwritten signature

Handwritten signature

Handwritten signature

Handwritten signature

ISSUE
R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 8 OF 15

Paint application will be by brush, roller or spray gun. Local regulations regarding spray and roller coating will be observed. A smooth uniform film will be applied to the surfaces to be coated.

Painting will be performed when the temperature of the surface is greater than 3°C above the dew point of the surrounding air and relative humidity of the air is less than 85% unless local conditions dictate otherwise and the Customer is in agreement. Guidance on the estimation of the probability of condensation can be found in ISO 8502-4. The measurement of these conditions is the responsibility of the CONTRACTOR.

In addition, paints will not be applied under the following conditions:

- When the surface temperature is greater than 60 °C (unless a higher temperature is agreed by the paint manufacturer)
- When the air temperature is less than approximately 5°C, (depending on local conditions)
- When there is the likelihood of an unfavourable change in weather conditions within two hours after painting
- When there is a deposition of moisture in the form of rain, condensation, frost, etc., on the surface.
- When the available light is less than 500 lux.

Paints will not be applied within 50 mm of edges which will later have to be welded. Such weld areas will be taped/one coat of weldable primer for distance of 50 mm either side of the weld line.

When zinc rich primers are used, care will be taken to mask to avoid any possibility of over spraying onto duplex, austenitic stainless steels; nickel alloys or 9% nickel steel components.

Two pack coatings like Air drying epoxy, Polyurethane coatings etc will be mixed in the ratio recommended by manufacturer to ensure proper and complete curing of the coatings. The base and hardener are to be separately mixed first to obtain a homogenous mixture. The hardener is to be added to the base slowly, with continuous mixing / agitation and not the reverse. Power agitation is preferred over hand mixing.

Any addition of thinner to achieve the application viscosity should be made only after the components are thoroughly mixed. Excess thinner is not recommended, as increase in volume, leads to lower DFT, sagging, longer curing time, etc.

Coating containing heavy or metallic pigments that have a tendency to settle will be kept in suspension by continuous use of a mechanical agitator whilst being applied, to ensure uniformity over the surface area (e.g., zinc MIO's pigmented materials).

JS

One

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 9 OF 15

Transport and erection of painted structures will be carried out only after the drying time specified by the paint manufacturer has elapsed. Handling & packing of painted material will be appropriate to avoid damage to painting, such as the use of non-metallic slings, etc for handling and by minimising handling after painting.

All steel equipment will be provided with priming or coating system to protect the steel surface during transport, storage, installation and construction.

Spray application:

Airless or pneumatic spray applications are preferred methods of application. Spraying will be carried out keeping the spray gun at the minimum suitable distance from the work piece and consistently at 90° to the surface being painted.

Approval of Purchaser / Engineer will be obtained during spray painting which may cause interference to other works. If spray painting is to be carried out, the following will be taken into account:

The correct spray tips, air pressures, etc, as recommended by the equipment supplier, will be used.

Conventional air spray equipment is used, the correct combination of air volume, air pressure and fluid flow to give good atomisation to be ensured to get a defect free painted surface. The major disadvantage of conventional air spray is that high build coatings can generally not be applied by this method as most paints have to be thinned to a suitable viscosity for satisfactory atomisation, and so lose their high build properties. CONTRACTOR will follow manufacture's instruction.

Air spray (pressure pot) is recommended in cases where large quantities of paint are to be applied as paint in the tank can be prevented from settling, reduces application time and also enables the gun to be turned to any angle to coat objects effectively without spilling paint.

Airless spray is recommended as high build coatings can be applied without thinning, very rapid application is possible, giving an economic advantage, compared to conventional spray, overspray and bounce-back are reduced, leading to reduced losses of material and less dust and fume hazards.

Each coat will be applied uniformly and completely over the entire surface. All runs and sags will be brushed out immediately or the paint will be removed and the surface re-sprayed.

Very complex structures should be painted by brush instead of spray gun to avoid overspray, dry spray and unacceptable paint losses.

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 10 OF 15

Brush application:

Brush application may be used under the following circumstances:

- When areas cannot be properly coated by spraying for reasons such as material or environmental considerations
- For the initial coat of paint to corners, edges, crevices, holes, welds or irregular surface prior to spray application
- For "touch up" or repairs to localize damaged paint or areas of incorrectly applied paint
- Where the paint manufacturer considers the coating material suitable for brush application.

Brushes will be of a style and quality that will permit the proper application of paint. Brush applications should be done in two passes that are perpendicular to each other 'wet on wet' so that a smooth coat, as near uniform in thickness as possible, is obtained there by avoiding running and droplets. There should be no deep or detrimental brush marks. Paint will be worked into all crevices and corners. Runs and sags will be brushed out.

During the application of each coat, all areas such as corners, edges, welds, small brackets, bolts, nuts and interstices will receive additional paint to ensure that these areas have at least the minimum specified dry film thickness and to ensure continuity of coating.

Roller application:

Roller application will only be used on relatively large surface areas and only if spraying is not an option. Roller application will only be used if the first or priming coat of paint has been applied by brush. Roller application will be in accordance with the paint Manufacturer's instructions.

Galvanising:

Gratings and step threads

i) Surface preparation

Gratings and step threads will be cleaned by acid pickling as per SSPC-SP-08.

ii) Hot dip galvanising

The hot dip galvanising will be done as per IS 2629. The average mass of coating will be 610 gms/m².

iii) Post galvanising treatment

JS

Sme

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 11 OF 15

Immediately after galvanising, post treatment such as chromating will be applied to retard white rust attack.

iv) Touch up mechanical damages

The repair of damages coatings will be done as per the recommended practice ASTM A 780.

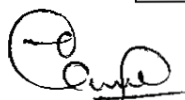
CORROSIVITY OF ENVIRONMENTS

Corrosivity category	
C2	Low
C3	Medium
C4	High
C5	Very High Industrial & marine
IM 1	Immersion in Fresh Water
IM 2	Immersion in Sea or brackish water
IM 3	Buried in Soil

Tests required for evaluation of acceptance of coating materials:

TABLE -1
PERFORMANCE TEST OF PAINT

SL. No.	TEST	ASTM TEST METHOD
	Abrasion Resistance: (topcoat only)	ASTM D4060
	Adhesion:	ASTM D4541
	Dry Heat Resistance:	ASTM D2485
	Flexibility: (topcoat only)	ASTM D522, 180° bend
	Pencil Hardness: (topcoat only)	ASTM D3363
	Salt Fog Resistance:	ASTM B117, 1000 hours
	Weather Resistance:	ASTMG23 Type D
	Test	ASTM Test Method
	Density	D 1475
	Dipping properties	D 823
	Drying time	D 1640
	Flexibility	D 1737/D 522
	Hardness	D 3363
	Adhesion (pull off test)	D 4541



H



ISSUE
R1

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 12 OF 15

	Abrasion resistance	D 968/D 4060
	DFT/Coat	As per SSPC Guidelines
	Storage Stability	D 1849
	Resistance to	
	i) Humidity for 2000 hrs.	D 2247
	ii) Salt Spray for 2000 hrs.	B 117
	iii) Accelerated Weathering	D 822

INSPECTION:

Inspection will be performed by an inspector authorised by Purchaser / Engineer if applicable in MQP & FQP. Paint materials including primers and thinners brought to site by CONTRACTOR for application will be procured directly from manufactures as per Contract document and will be accompanied by manufacturer's test certificates.

The painting work will be subjected to inspection by purchaser / engineer at all times. The CONTRACTOR will offer following stage of inspection:

- Surface preparation
- Primer application
- Subsequent coats
- Paint qualification test

CONTRACTOR will provide the expert technical services of the paint manufactures as and when required by purchaser / engineer to ensure both the surface preparation and applications are carried out as per their recommendations. This service will be provided without any obligation to purchaser.

The following coating inspection & test will be carried out:

1. Ambient and steel temperature, relative humidity and dew point min twice in a shift.
2. Surface finish & profile check each component or once per 10 m² after surface preparation.
3. Salt contamination test - Free from salt contamination.
4. Dry Film Thickness as per ISO 2808 No.6.
5. Holiday Test as per ASTM D 5162/ NACE RP 0188.
6. Adhesion Test as per ISO 2409 for cross-cut test, or a pull-off test as per ISO 4624/ ASTM D 4541.

Handwritten signature

Handwritten signature

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 13 OF 15

6.0 SUGGESTED COLOUR CODES FOR PAINTING:

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
1.0	Structures, platforms, ladders and handrails	Dark Admiralty Grey	632	-	-
2.0	Boiler casing, ESP and ducting	Nut Brown	413	-	-
3.0	Fans, pumps, motors,	Light Grey	631	-	-
4.0	Tanks (without insulation and cladding)				
4.1	Outdoor	Aluminium	-	-	-
4.2	Indoor	Light grey	631	-	-
5.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631	-	-
6.0	Switchgear	Light grey	631	-	-
7.0	Control & relay panels	Light grey	631/70 78 of IS 1650	-	-
8.0	Turbine	Golden Yellow	356	-	-
9.0	Generator & exciter	Light grey	631	--	-
10.0	Transformers	Aluminium	-	-	-
11.0	Machinery guards	Signal red	537	-	-
12.0	Piping (without insulation and cladding)				
12.1	Water System				
	Boiler feed	Sea green	217	-	-
	Condensate	Sea green	217	Light brown	410
	Bearing cooling water	Sea green	217	French blue	166

Notes:

1. This colour code basically refers to IS: 2379 for piping with necessary modifications.
2. Where band colour is specified, same will be provided at 30 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

Note: CONTRACTOR will follow their painting standard for steam turbine & generator and will provide fibre epoxy painting for condenser.

ISSUE
R1

SPECIFICATION. NO.	TATA CONSULTING ENGINEERS LIMITED	SECTION : C 19
TCE.7742B-C-540-001	1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11 TATA STEEL LIMITED, JAMSHEDPUR STEAM TURBINE GENERATOR & AUXILIARIES PAINTING	SHEET 14 OF 15

ANNEXURE

A. Painting scheme for C2 and C3 environment

Sl no	Description	Surface Preparation	Primer		Intermediate paint			Finish coat			Total DFT	
			paint	no of coats	DFT	paint	no of coats	DFT	paint	no of coats	DFT	Min
1	Boiler Structure, uninsulated ducts, suspensions, hangers temperature < 120 °C	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120µ	poly urethane	2	60µ	260µ
2	Indoor Structure	Sa 2 ½	HB Zn Phosphate	2	80 µ	HB MIO epoxy	1	120µ	-	-	-	200µ
3	Insulated parts exposed to temp > 120 °C	Sa 2 ½	In organic Zn silicate	2	60 µ							60 µ
4	Work Shop	Sa 2 ½	HB Zn Phosphate	2	80 µ	HB MIO epoxy	1	120µ	-	-	-	200µ
5	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	80µ	HB MIO epoxy	2	200µ	Aliphatic poly urethane	2	80µ	360µ
6	Coal Handling Plant	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120µ	poly urethane	2	60µ	260µ
7	Fuel pipings	Sa 2	Ethyl Zn silicate	1	40µ				HR aluminium paint	2	40µ	80 µ
8	Un insulated silencer steel stacks > 120 °C	Sa 2 ½	Ethyl Zn silicate	1	40µ				HR silicone aluminium paint	2	40µ	80 µ
9	Above Ground piping	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120µ	poly urethane	2	60µ	260µ
10	Buried Piping (External)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre									4.0 mm
11	Buried Piping (Internal)	Sa 2 ½				solid rigid poly urethane 500µ						500µ
12	storage Tanks External	Sa 2 ½	In organic Zn silicate	2	80 µ	HB MIO epoxy	1	120µ	poly urethane	2	60µ	260µ
13	storage tanks Internal	Sa 2 ½				3 coats of amine adducts						400µ
14	DM water piping internal	Sa 2 ½				hard rubber lining min 4 mm thickness						4.0 mm
15	IDM water tank internal	Sa 2 ½	In organic Zn silicate	2	80 µ	HB coal tar epoxy	1	150µ	HB coal tar epoxy	1	150µ	380µ
16	Fuel Oil Tanks Internal	Sa 2 ½	In organic Zn silicate	2	80 µ	HB coal tar epoxy	1	150µ	HB coal tar epoxy	1	150µ	380µ
17	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2	75 µ							75 µ
18	For insulated piping < 125 °C	Sa 2 ½	Polyamide cured epoxy coating	2	250 µ							250 µ
19	Electrical parts, control panels, valves, pumps & motors (Indoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 µ				Chlorinated rubber	2	80µ	160µ
20	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2	80 µ				Chlorinated rubber	2	100µ	180µ
21	Switch Yard, floor grills, walk ways	Sa 2 ½				hot dip galvanising 80 µ						80µ

* Note: Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance

ISSUE
R1

SPECIFICATION. NO.

TATA CONSULTING ENGINEERS LIMITED

SECTION : C 19

TCE.7742B-C-540-001

**1X 40 MW CAPTIVE POWER PLANT FOR CDQ 10&11
TATA STEEL LIMITED, JAMSHEDPUR
STEAM TURBINE GENERATOR & AUXILIARIES
PAINTING**

SHEET 15 OF 15

ANNEXURE

A. Painting scheme for C4 and C5 environment

Sl no	Description	Surface Preparation	Primer		Intermediate paint		Finish coat		Total DFT
			paint	no of coats	paint	no of coats	paint	no of coats	
1	Boiler Structure, uninsulated ducts, superheaters, hangers temperature < 120 °C	Sa 2 ½	HB Zn Phosphate	2	HB MIO epoxy	2	epoxy PU HB	2	360µ
2	Indoor Structure	Sa 2 ½	HB Zn Phosphate	2	HB MIO epoxy	1	polyurethane	2	260µ
3	Insulated parts exposed to temp > 120 °C	Sa 2 ½	In organic Zn silicate	2					60 µ
4	Work Shop	Sa 2 ½	HB Zn Phosphate	2	HB MIO epoxy	1	polyurethane	2	260µ
5	Water Treatment Plant (external)	Sa 2 ½	Zn rich epoxy	2	HB MIO epoxy	2	epoxy PU HB	2	360µ
6	Coal Handling Plant	Sa 2 ½	HB Zn Phosphate	2	HB MIO epoxy	2	polyurethane	2	340µ
7	Coal Fuel pipings	Sa 2	Ethyl Zn silicate	1			HR aluminium paint	2	80 µ
8	Un insulated silencer, steel stacks > 120 °C	Sa 2 ½	Ethyl Zn silicate	1			HR silicone aluminium paint	2	80 µ
9	Above Ground piping	Sa 2 ½	In organic Zn silicate	2	HB MIO epoxy	1	polyurethane	2	260µ
10	Buried Piping (External)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel						4.0mm
11	Buried Piping (Internal)	Sa 2 ½	Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel						500µ
12	storage Tanks External	Sa 2 ½	In organic Zn silicate	2	HB MIO epoxy	2	polyurethane	2	340µ
13	storage tanks Internal	Sa 2 ½	In organic Zn silicate	2	HB MIO epoxy	2	polyurethane	2	400µ
14	DM water piping Internal	Sa 2 ½			hard rubber lining min 4 mm thickness				4.0 mm
15	DM water tank Internal	Sa 2 ½	In organic Zn silicate	2	HB coal tar epoxy	1	HB coal tar epoxy	1	150µ
16	Fuel Oil Tanks Internal	Sa 2 ½	In organic Zn silicate	2	HB coal tar epoxy	1	HB coal tar epoxy	1	150µ
17	Insulated parts continuously exposed to condensing water	Sa 2 ½	In organic Zn silicate	2					75 µ
18	For insulated piping < 125 °C	Sa 2 ½	Polyamide cured epoxy coating	2					250 µ
19	Electrical parts, control panels, valves, pumps & motors (indoor)*	Sa 2 ½	Zn phosphate epoxy	2			Chlorinated rubber	2	180µ
20	Electrical parts, control panels, valves, pumps & motors (outdoor)*	Sa 2 ½	Zn phosphate epoxy	2			Chlorinated rubber	2	180µ
21	Switch Yard, floor grills, walk ways	Sa 2 ½			hot dip galvanising coating Wt. 610 gms/M ² (coating thickness of 80 µ)				80µ

* Note: Manufacturer to specify details of painting system capable of withstanding environmental conditions for a period of 10 years before first maintenance

ISSUE
R1