Part II – Technical Specifications

A. <u>Schedule of Requirements</u>:-

i. Short description (Name) of Plant / Machine: - **"Supply, Erection & Commissioning of 10 TPH Boiler".**

ii. Detailed Description and Quantity: - **"Supply, Erection & Commissioning of 10 TPH Boiler", Quantity: 02 Nos.**

1.	**a. DESCRIPTION**: Supply, Erection & Commissioning of Horizontal, Furnace Fuel Oil Fired, three pass and wet back Fire tube fully automatic operation Boiler along with chimney & water softening plant.
	b. Quantity: 02 Sets of Boilers **(Installation: one each at two different station located at 3 km distance)**
2.	**TECHNICAL PARAMETER OF BOILER:** a. Boiler Type: Three pass, Wet Back, Fire tuber, Horizontal Boiler.
	b. Design Code: IBR 1950 (With Latest Amendment)
	c. Steam Output (kg/hr): **10000 kg/hour F & A 100 degree Celsius**
	d. Design Pressure (Kg/cm^2(g)): **10 to 12** (Option should be provided to operate the boiler from 6 kg/cm^2 to design pressure)
	e. Thermal Efficiency on NCV (%):Minimum 88%
	f. Dryness Fraction (%): 98 %
	g. Degree of Super Heat: Saturated Steam
	h. Volumetric Heat Release Rate (1000000 kcal/hr.m^3): 0.70 to 0.80
	i. Heating Surface (m^2): By Vendor
	j. Water Holding Capacity up to NWL (m^3): By Vendor
	k. Steam Space (m^3): By Vendor
	l. Stack Temperature (degree Celsius): By vendor
	FUEL
	Type`: Furnace Oil
	NCV of Furnace Oil (Kcal/kg): 9650
	Consumption Rate (Kg/hr): By vendor **(guaranteed value)**
3.	**SCOPE OF SUPPLY ALONG WITH BOILER UNIT:** **A. BURNER & MODULATION:** a. Burner Type: Industrial-Pressure Jet with spill return type burner.
	b. Accessories & Fittings: Complete burner assembly with all accessories with inlet & outlet oil line pressure gauges. Oil temperature sensor at burner inlet with value display on control panel.
	c. Ignition /Light Up & Sensor: High Voltage Spark/Pilot Flame with flame detection photo sensor for auto mode operation.

	B. Modulation Type (oil): Step less modulation with combustion air control system having air dampers & oil control valve connected with mechanical linkages & servo motor.
	C. FORCE DRAFT COMBUTION AIR FAN: a. Type: Centrifugal backward curved impeller directly mounted on motor shaft.
	b. Frame & Accessories: Motor for fan, Base Frame for mounting of Motor & Impeller. Suction screen to prevent entry of foreign particles in to the fan casing. Silencer at suction, Air Flow pressure gauge at burner inlet, Ducting from FD Fan up to burner & safety canvas joint.
	D. OIL PUMPING AND HEATING UNIT: **a. DUPLEX BUCKET OIL FILTER:** Duplex Bucket filter having 80-120 Mesh filtering element with 3 way valves for isolation and bypass.
	b. OIL DEGASSER ASSEMBLY: Oil Circulating header with valves, piping, & Instruments as per standard. However, a pressure switch is to be provided for protection of fuel pump.
	c. OIL PRE HEATER: **Type:** Shell & Tube
	d. Heating Medium: Indirect Heating type, steam cum electric heating tank with coil & tube immersed in water bath. Provision should be made for supplying steam from main steam header to oil pre-heater with standard arrangement.
	e. FUEL PUMP: i. Fuel Oil Screw/Gear Pumps with motor and base frame in 01 working + 01 standby configuration.
	ii. Valves & Instruments as per the standard – by vendor.
	f. Oil Line Heating Media: Oil line starting from Furnace Oil service tank up to burner & return has to be wrapped with flexible electric heater trace lines to keep it warm while boiler is not in working to prevent solidification of oil inside line. Max line temp to maintain is 60 Degree Celsius with DOL type Start & Stop switch.
	g. RING MAIN SYSTEM: Consisting of : i. Pump(Fuel Pump) with motor 1W+1S configuration.
	ii. Isolation valve at pumps inlet & out let.
	iii. Back pressure control valve for fuel pumps.
	iv. Oil circulating header.
	v. Local temperature indicator on the header.
	vi. Pressure gauge with isolation valve on header.
	vii. Set of globe valves at inlet & out let of oil header.
	viii. Set of filters at out let of pumps of size 80-120 mesh with 1W+1S configuration.
	ix. Oil Delivery header for both pumps with inlet & out let Valves, Local pressure Gauge & Temperature Gauges.

	h. FEED WATER PUMP: i. Centrifugal multi stage vertical/horizontal pumps with motor in 01 working + 01 standby configuration.
	ii. Valves, accessories & Instruments as per standard- by vendor
	i. BOILER MOUNTINGS: Valves & Instruments as per IBR & Standard Engineering Design
	j. CHEMICAL DOSING SYSTEM: i. Consisting of pump, mixing tank with Agitator
	ii. Connecting lines of SS116 material , valves gauges etc.
	iii. Accessories & Instruments as per Standard- by vendor
	E. OIL SUPPLY MANIFOLD: **a. Day Oil Service Tank:** i) Furnace Oil Reserve tanks 01 working + 01 Stand by configuration with Electric & Steam heating facility. Material: IS 2062, Grd.-A, 4500 Litr Capacity.
	ii) Out Let filters: 60 mesh size, Filter isolation valves , drain valves, local temperature gauges.
	iii) Fittings, Accessories & other arrangement as per standard engineering practice- by vendor.
	b. Oil Pumping Unit: Oil Pumping Unit to supply Furnace Oil from Day Oil Tank to burner with complete accessories.
	F. FEED WATER GENERATION SYSTEM: **a. Pressurized feed water tank:** i. Feed water Tank – 01 No Material : IS2062 , Grd: A , Capacity 10 KL
	ii. Standard arrangement for de-oxidising of feed water with steam heating at 80 Degree Celsius.
	iii. Valves , Accessories & instruments as per standard
	b. Water softening plant: i. Water softening plant to meet the boiler capacity having pre-filtering media
	ii. Pre-filtering media with 1w +1S configuration having arrangement for by-pass system for one while another is on working.
	iii. Water softening media with 1W+1S configuration having arrangement for by-pass system for one while another is working.
	iv. Arrangement shall be provided for re-charging with brine solution for the softening media while another softening media is on line/working.
	G. CHIMNEY & DUCTING: **a. CHIMNEY:** Self-supported metallic chimney with connected ducting & expansion joints to meet the capacity of boiler 1 boiler with 20% extra as per IS 6533 code.
	b. DUCTING: i. Connection of flue gas ducting from Boiler Unit up to the chimney. Ducting Material: IS 2062, Grade-A, Thickness 3 to 4 mm.

	ii. Expansion bellow Joints as per standard for flue gas duct.
	iii. Combustion Air Ducting from FD fan to Burner, Material: IS 2062 Grade-A, Thickness 3 to 4 mm.
	H. PIPING: - **a. Non IBR Piping:** i. Feed Water piping from feed water tank to feed water pump. Material: IS 1239, Med Grade.
	ii. Fuel line piping from Day Oil Service tank up to oil header. Material: IS 1239 Med Grade.
	iii. Oil Piping from Oil Header to duplex-filter-fuel pump- to boiler burner – and return line up to oil header. Material: IS 1239, Med Grade.
	b. IBR Piping: i. Feed water piping from feed pump up to boiler inlet. Material SA 106 Grade-B, Schedule-40.
	ii. Steam piping from boiler stop valve to steam header with isolation valves.
	iii. Steam piping from common steam header to Low pressure utility steam header with isolation valve arrangement.
	c. Miscellaneous Piping: i. Blow down piping from blow down valve to blow down vessel & out let pit. Material SA106 Gr-B Schedule-40
	ii. Open Drain pipe line network from boiler instruments drain to blow down pit IS 1239 Med. Grade.
	iii. Drain piping from feed water drain instruments drain to drain pit IS 1239 Med Grade.
	iv. Drain piping from fuel tanks instrument drains to drain pit SA106 Gr-B IS 1239 Med Grade.
	v. Instrument drain piping- as per standard
	vi. Boiler water sampling piping IS 1239 Med Grade.
	vii. Air Vent piping from boiler to safe elevation- SA 106 Gr-B
	viii. Safety valve exhaust piping from boiler to safe elevation IS 1239 Med Grade.
	I. STEAM HEADERS:- **a. Main HP Steam header:** i. Steam header at out let of the boiler of IBR standard.
	ii. Steam piping connection to main service line for use with isolation valve.
	iii. Auto drain trap and drain valves as per standard.
	b. Blow down vessel: Blow down vessel , Capacity 1 to 2 KL Material: IS 2062 Grade-A
	c. STRUCTURE: i. Supporting Structures for flue gas ducting from boiler up to the existing chimney duct. Material : IS 2062 Grade-A
	ii. Supporting Structure for piping , Material IS 2062 Gr-A

	iii. Supporting structure for feed water tank assembly. IS 2062 Gr-A
	iv. Supporting Structure for day oil service tank unit IS 2062 Gr-A
	v. Supporting structure for steam headers IS 2062 Gr-A
	vi. Supporting Structure for blow down vessel IS 2062 Gr-A
	d. PAINTING i. Painting non-heating pipes, structures, foundation bases etc with standard 02 coats of synthetic enamel paint after application of 01 coat of iron oxide paint.
	ii. Painting of heat exposing items with 02 coats of heat resistant paint.
	e. INSULATION i. Boiler Pressure part : 100 mm thick thermal insulation with 22 gauge Aluminium cladding.
	ii. FO Day Service tank: 50 mm thick thermal insulation with 24 gauge aluminium cladding.
	iii. Flue gas ducting 75 mm thick thermal insulation with 24 gauge AL cladding.
	iv. Feed water tank: 50 mm thick thermal insulation with 24 gauge AL cladding.
	v. Feed water piping: 50 mm thick thermal insulation with 24 gauge AL cladding.
	vi. Blow Down Vessel & Blow down piping: 75 mm thick thermal insulation with 24 gauge AL cladding.
	vii. Drain & vent piping with in boiler house: 50 mm thick thermal insulation with 24 gauge AL cladding.
	viii. Safety Valve piping: 50 mm thick thermal insulation with 24 gauge AL cladding.
	ix) All fuel oil piping: 50 mm thick thermal insulation with 24 gauge AL cladding.
	x) Valve & Flange boxes: 75 mm thick thermal insulation with 24 gauge AL cladding.
4.	**ADDITIONAL EQUIPMENTS :** **A. Steam Flow Meter:** a. Steam Flow meter with panel display facility.
	b. Hourly Steam consumption recorder in the form of soft data.
	B. Oil Flow Meter: a. Oil Flow meter with panel display facility in common.
	b. Hourly rate of consumption recorder in the form of soft data.
	C. Water Flow meter: a. Water Flow meter with panel display facility in common.
	b. Hourly rate of consumption recorder in the form of soft data.
	D. Automated Blow Down System: Automated blow down facility with panel indication.
	E. Automated soot blow system: Automated soot blowing facility with panel indication.

	F. Heat Recovery Unit/Economizer: Heat recovery unit to utilise flue gas heat to maximize the efficiency of boiler with set of dampers, accessories, soot blower assy, instruments like heat sensor etc.
	G. ONLINE BOILER EFFICIENCY MONITORING SYSTEM: Automated boiler efficiency monitoring system with panel display facility to analyse the parameters.
5.	**ELECTRICAL & INSTRUMENTAION COMPONENTS:** **POWER SUPPLY:** **A. Power Section:** Electrical Panel: Free standing type, conforming to IP 42 degree of protection. The panel shall be made out of 14/16SWG CRCA sheets and painted with polyurethane/synthetic enamel paint. The power section shall be provided with MCCB. Ammeter and Voltmeter shall be provided at the incomer. The required switch gears for all drives shall be housed in the power section panel.
	B. Power drive equipment's: a. FD Fan, Start: S/D
	b. Feed Water pumps 1 W + 1 S, Start : DOL
	c. FO Pumps 1W+1S , Start: DOL
	d. Electrical Heater OPH 1W , Start: STAR
	e. Electrical heater Day Oil Service tank 1W+1S Start: STAR
	f. Ring Main pumps1 W+ 1S, Start : DOL
	C. Control Section: a. Microprocessor based control panel with 12" colour Touch screen HMI (Human Machine Interface) system.
	b. Digital & Analog Input/ Output cards/instruments with 20% spares provision in panel.
	D. Wiring: All electrical wiring of machines should be provided through exact size and standard of multi strand copper wires/cables of ISI marked having 1.1 kv grade with Dust Tight Glands duly certified by National/International Agency Authorised for the purpose. All wiring must have input and output ferrule tags for easy identification of connected wires.
	E. Earthing: Standard earthings for panel & instruments on Firm's scope.
	F. Miscellaneous: a. Standard Cable Glands, Lugs(Crimping type), Cable trays (Inside Boiler House), Earthing, Junction Box if any, Tubing/piping and other hardwires required for wiring to be provided by the firm.
	b. Electrical Main Panel power supply connections should be suitable for 400±6% , 3Phase, 50 HZ, 4Wire plus ground.
	G. CONTROLS IN CONTROL PANEL: a. Boiler Steam pressure control
	b. Boiler water level control with panel display.
	c. Burner modulation control

	d. Burner management system: Inter lock with Air Flow, Fuel Flow, Fuel Pump, Water level etc.
	e. Flue Gas temp. Indication at boiler outlet.
	f. Controlled shutdown of boiler with the help of pressure switch.
	g. Fuel Oil temperature control
	h. Flame failure indication with burner interlock
	i. ON/OFF for all the feeders
	j. Alarms & inter lock for safety.
	k. Feed Water Tank water level control with feed pump inter lock
	l. Fuel Oil tank oil level control with supply pumps interlock to prevent over flow.
	m. Oil tank & OPH Oil temperature control.
	n. Low Fuel oil pressure control with burner inter lock.
	H. SAFETY: a. Double safety valve on boiler steam drum.
	b. High steam pressure safety switch with burner interlock
	c. High Flue gas temperature cut off with burner inter lock.
	d. Low/Extra low boiler water level cut off with burner interlock.
	e. Double Fusible plug protection for extreme boiler temperature protection.
	f. Visual water level monitoring system with help of gauge glass.
	I. Terms & Conditions for Electrical Section: a. The Electrical control panels should have dust proof enclosure.
	b. All the test and calibration certificate for the instruments should be submitted by the firm. The same shall be shown to the inspection authority at the time of inspection.
	c. Electrical Spares for critical machines & Instruments for a period of two years shall be supplied by the firm.
	d. Firm shall submit an under taking to supply spare parts for the boiler for a period of minimum10 years on our demand.
	e. Supplier has to provide the block diagram of the plant, control circuit diagram & power circuit diagram for control panel and equipment's for electrical & electronics circuit.
	f. All software involved in the system is to be provided in CDs/DVDs and that should be licensed to The General Manager, Ordnance factory Badmal.
	g. P&I diagrams & Elementary for the plant are to be provided by the firm.
	h. Equipment Location diagram should be provided.
	i. Trouble shooting chart to be provided by firm.

	j. Electrical Maintenance Manual in details having equipment descriptions, Preventive measures, Spare Parts list with part number if any & suppliers address, Functioning & maintenance of equipment's etc.
6.	**ERECTION & COMMISSIONING:** **A. Removal of existing Boiler:** a. Dismantling and removal of existing boiler will be on firm's scope.
	b. Any other old parts require to remove during erection will be carried out by the firm.
	B. Erection, Unloading, IBR & Field work: Supply, Unloading, civil works, IBR, Labour Works & Tools tackles will be on firm's scope.
	C. Civil work: Foundation for Boiler Unit, foundation for Structures like Day Tank & Feed Water Tank foundation and Earthing pit will be on firm's scope
	D. Standard Terms & Conditions: a. Boiler registration as per IBR 1950 with latest amendment will be on firm's scope.
	b. IBR certificate for firing permission of boiler will be on firm's scope.
	c. Related IBR documents for the pressure parts & Boiler accessories shall be submitted by the firm.
	d. Spares, Chemicals, Lubricants & consumables required for initial trial run will be on firm's scope.
	e. IBR accessories & Equipment's shall be minimum of ANSI class 300.
	f. Software and license for PLC & HMI by the firm.
	E. Equipment's & Instruments Standards: All equipment's, instruments of both electrical & mechanical should be of reputed make with label mark of standards like ISI marks etc.
	F. Work Standard: All works shall be executed as per Standard Engineering Practice.
	G. STACK EMISSION LIMIT: Stack Emission getting out from the chimney should be with the prescribed limit as per the standard of SPCB, Odisha.
	H. SPARES: Contractor has to provide manufacturer's recommended list of spares to sustain the equipment for a period of two years after warrantee period.
	I. DRAWINGS: Firm shall furnish the drawings (6 copies) for each boiler: terminal point, layout foundation details, boiler, and electrical wiring diagram.
	J. DOCUMENTS: Documents (06 copies) like Installation Manual, Operation & Maintenance Manual (Separately for Mechanical & Electrical Maintenance), IBR folder containing related documents of IBR approval and IBR Test certificated of accessories /equipment's, Technical specification of boiler and accessories/equipment's, Spare Part manual with manufacturer part numbers & Address.

	K. TRAINING: Firm has to arrange proper in house/ onsite training minimum 01 week time period for the supervisory staff and workmen (Boiler attendant, Fitter & Electrician and supervisory staff) regarding the boiler operation, its maintenance & Efficiency monitoring & calculation.
	L. Other Terms & Conditions: Firm should visit OFBL site before submitting of quotation for better assessment of the site condition.