Tenderer's Data Sheet

_____
(Tenderer's Name)

10.4 MISCELLANEOUS INSTRUMENTS AND CONTROL APPARATUS

	Manufacturer	Type and model
(1) Recorder		
Electric signal (V, mA etc.)	_____	_____
Temperature (for thermocouple, RTD)	_____	_____
(2) Indicator		
Dial type	_____	_____
Vertical type	_____	_____
(3) Transmitter		
Pressure (Draft)	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____
Analysis (conductivity, pH, etc. O_2, CO diss O_2/H_2 Hydrazin gas-chromatograph) (if required)	_____	_____
(4) Controller		
Pressure	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____
Analysis (conductivity, pH, etc.)	_____	_____
(5) Switch		
Pressure (Draft)	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

		Manufacturer	Type and model
	Limit switch	_____	_____
(6)	Local indicator		
	Pressure gauge	_____	_____
	Thermometer	_____	_____
	Flow (positive displacement type)	_____	_____
	Flow (other)	_____	_____
	Level	_____	_____
(7)	Sight glass		
	Sight flow	_____	_____
	Level glass gauge	_____	_____
(8)	Primary element		
	Thermocouple	_____	_____
	RTD	_____	_____
	Thermo-well	_____	_____
	Flow orifice	_____	_____
	Flow nozzle	_____	_____
	pH	_____	_____
	Hydrazin	_____	_____
	Conductivity	_____	_____
	Diss O_2/H_2, gas-chromatograph	_____	_____
(9)	Wind direction and speed sensor with recorder	_____	_____
		_____	_____
(10)	Control valve	_____	_____
(11)	Manometer	_____	_____
(12)	Thermocouple extension wire	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

		Manufacturer	Type and model
(13)	Control tubing	_____	_____
(14)	Flame viewing Color TV system		
	Camera with cooling equipment controller	_____	_____
	CRT (14 inches)	_____	_____
	Power consumption	(VA)	_____
(15)	Electronic Boiler dram level gauge system		
	Transmiter Vessel with drain valves	_____	_____
	Electrodes	_____	_____
	Electronic Unit with integral display	_____	_____
	Remote display unit	_____	_____
	Power souce & Power consumption	(VA)	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

10.5 POWER CONSUMPTION

(1) Instrument air (Nm^3/min) _____

(2) Electric power

AC 110 V (VA) _____

DC 220 V (W) _____

SECTION III

STEAM TURBINE AND AUXILIARY EQUIPMENT

SECTION-III: STEAM TURBINE AND AUXILIARY EQUIPMENT

Tenderer's Data Sheet

_____
(Tenderer's Name)

III. STEAM TURBINE AND AUXILIARY EQUIPMENT

The Contractor shall guarantee the items marked "*".

1. STEAM TURBINE

1.1 TURBINE

(1) Type _____

(2) Manufacturer _____

(3) Speed (rpm) _____

(4) Number of extraction _____

Tenderer's Data Sheet

(Tenderer's Name)

(5) Performance data

		Minimum load	50% of rated load	75% of rated load	ECR	MCR	Maximum load
Output	(MW)					*	
Turbine-generator heat rate	(kcal/KWh)				*		
Steam pressure Main steam	(kg/cm^2g)						
Steam pressure RH steam	(kg/cm^2g)						
Steam temperature Main steam	(^oC)						
Steam temperature RH steam	(^oC)						
Steam flow Main steam	(kg/h)						
Steam flow RH steam	(kg/h)						
Exhaust steam pressure	(mmHg abs)						
Exhaust steam flow	(kg/h)						
Make up water	(%)						
Feedwater temperature at HP final heater outlet	(^oC)						
Generator power factor							
Generator short circuit ratio							
Generator hydrogen pressure	(kg/cm^2g)						

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Tenderer's Data Sheet

(Tenderer's Name) _____

(6) Extraction steam conditions at turbine connections (at ECR) (not install neck heater in condenser)

Extraction number	Flow (kg/h)	Pressure (kg/cm2g)	Temperature (oC)
No. 1 (to HP No. 7 heater)			
No. 2 (to HP No. 6 heater)			
No. 3 (to HP No. 5 heater)			
No. 4 (to deaerator)			
No. 5 (to LP No. 3 heater)			
No. 6 (to LP No. 2 heater)			
No. 7 (to LP No. 1 heater)			

(7) Approximate minimum load at unit can operate satisfactorily for continuous (KW) _____

(8) Time required for pick up from minimum load to maximum load (min) _____

(9) Critical speed (Composition and each rotor) (rpm) _____

(10) Dimension

Rotor length (each rotor) (mm) _____

Width (each turbine) (mm) _____

Turbine bearing span (each turbine) (mm) _____

Height of top above operating floor (mm) _____

(11) Weight (approx.)

Rotor (each rotor) (kg) _____

Upper casing (each casing) (kg) _____

Lower casing (each casing) (kg) _____

Assembled weight (each turbine) (kg) _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

(12) Length of last stage blade (mm) _____

(13) Annulus area of last stage blade _____

(14) Bearing

Type _____

Number _____

(15) Thrust bearing type _____

(16) Material

Turbine rotor (each rotor) _____

Casing (each casing) _____

Blade (each blade) _____

Casing bolt (each bolt) _____

Steam chest _____

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Tender's Data Sheet

(Tenderer's Name)

1.2 SPEED, LOAD CONTROL AND PROTECTION SYSTEM

(1) EHC system type _____

(2) Control valve

Type _____

Number _____

Material _____

(3) Load limitter Yes , No

(4) Full-arc admission Yes , No

(5) Main stop valve

Number _____

Size (mm) _____

Material of body and stem _____ _____

(6) Combined reheat valve

Number _____

Size (mm) _____

Material of body and stem _____ _____

(7) HP turbine exhaust check valve (if provided)

Number _____

Size (mm) _____

Material of body and stem _____ _____

(8) Emergency governor type _____

(9) Emergency trip device

Thrust failure protection device Yes , No

Vacuum trip device Yes , No

Low bearing oil pressure trip device Yes , No

Tenderer's Data Sheet

(Tenderer's Name)

LP turbine exthoust temperature High trip device — Yes , No

(10) Vacuum breaker

Type and size

(11) Initial pressure regulator — Yes , No

(12) Atmospheric relief diaphragm

dia. x thickness (mm) — x

Material

(13) Turbine exhaust spray water flow (kg/h)

(14) Extraction steam reverse current valve size and rating

Extraction number	Size (mm)	Rating (kg/cm^2)
No. 1		
No. 2		
No. 3		
No. 4		
No. 5		
No. 6		
No. 7		

Tenderer's Data Sheet

_____
(Tenderer's Name)

1.3 LUBRICATING AND HYDRAULIC OIL SYSTEM

(1) Brand of using oil _____

(2) Oil capacity of system (m^3) _____

(3) Bearing oil circulation rate (m^3/h) _____

(4) Bearing oil pressure (kg/cm^2g) _____

(5) Control oil pressure (kg/cm^2g) _____

(6) Main oil tank

Type _____

Manufacturer _____

Capacity (m^3) _____

Dimension (mm) _____ x _____ x _____

Material _____

Weight complete (kg) approx. _____

Flow back oil (m^3) _____

(7) Main oil pump

Type _____

Manufacturer _____

Capacity (m^3/h) _____

Discharge and suction pressure (kg/cm^2g) _____

Material

Casing _____

Shaft _____

Impeller _____

Weight complete (kg) approx. _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

(8) Relay dump valve

Type		_____
Valve size	(mm)	_____

(9) Oil cooler

Type		_____
Manufacturer		_____
Number		_____
Cooling surface area	(m^2)	_____
Cooling water inlet design temperature	(^oC)	_____
Oil outlet temperature	(^oC)	_____
Cooling water flow	(m^3/h)	_____
Oil flow	(m^3/h)	_____
Tube size (outside diameter x thickness)	(mm)	_____ x _____

Design pressure

Tube side	(kg/cm^2g)	_____
Shell side	(kg/cm^2g)	_____

Heat transfer coefficient
Kcal/h/m^2/^oC

Design temperature

Tube side	(^oC)	_____
Shell side	(^oC)	_____

Material

Tube	_____
Shell	_____
Water chamber	_____
Tube sheet (clad)	_____

(Tenderer's Name) _____

Dimension (mm) _____

Weight (each) (kg) approx. _____

(10) Auxiliary oil pump

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

Speed (rpm) _____

Material

Casing _____

Shaft _____

Impeller _____

Motor

The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(11) Turning gear oil pump

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

Speed (rpm) _____

Material

Casing _____

Shaft _____

_____
(Tenderer's Name)

Impeller _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(12) Emergency oil pump

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

Speed (rpm) _____

Material

Casing _____

Shaft _____

Impeller _____
(Tenderer's Name)

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(13) Jacking oil pump (if provided)

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

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(Tenderer's Name)

Discharge pressure	(kg/cm^2g)	
Speed	(rpm)	
Material		
Casing		
Shaft		
Plunger		
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
Weight complete	(kg) approx.	

(14) Oil conditioner

Type		
Manufacturer		
Number		
Capacity	(m^3/h)	
Dimension	(mm)	
Weight complete	(kg) approx.	

(15) Oil filter pump

Type		
Manufacturer		
Number		
Capacity	(m^3/h)	
Discharge pressure	(kg/cm^2g)	
Speed	(rpm)	
Material		
Casing		

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Tenderer's Data Sheet

_____
(Tenderer's Name)

Shaft _____

Impeller or gear _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(16) Vapor extractor for main oil tank

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(17) Vapor extractor for oil conditioner

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(18) Turbine oil storage tank

Type _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Manufacturer _____

Capacity (m^3) _____

Dimension (mm) _____

Material _____

Weight complete (kg) approx. _____

(19) Oil transfer pump

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

Speed (rpm) _____

Material

Casing _____

Shaft _____

Impeller or gear _____

Motor

The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight (kg) approx. _____

(20) Oil Driven booster pump

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

Speed (rpm) _____

Material

Casing _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Shaft _____

Impeller or gear _____

Tenderer's Data Sheet

(Tenderer's Name)

1.4 TURNING EQUIPMENT

(1) Type

(2) Turning speed (rpm)

(3) Motor

The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Tenderer's Data Sheet

_____
(Tenderer's Name)

1.5 GLAND STEAM SEAL SYSTEM

(1) Gland steam seal regulator

Type _____

Size _____

Regulating pressure (kg/cm^2g) _____

(2) Gland steam exhaust blower

Type _____

Manufacturer _____

Number _____

Capacity (m^3/h) _____

Exhaust pressure (mmHg) _____

Speed (rpm) _____

Material

Casing _____

Shaft _____

Impeller _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight complete (kg) approx. _____

(3) Gland steam condenser

Type _____

Manufacturer _____

Cooling surface area (m^2) _____

Cooling water flow (m^3/h) _____

Tube size and thickness (mm) _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Number of tube _____

Heat transfer coefficient (kcal/h/m^2/°C) _____

Friction loss through tubes (kg/cm^2) _____

Dimension

Total length (mm) _____

Shell diameter (mm) _____

Design pressure

Tube side (kg/cm^2g) _____

Shell side (kg/cm^2g) _____

Design temperature

Tube side (°C) _____

Shell side (°C) _____

Material

Tube _____

Shell _____

Water box _____

Tube sheet (clad type) _____

Weight (kg) approx. _____

(4) Steam seal diverting valve

Type _____

Manufacturer _____

Number _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

2. SURFACE CONDENSER

(1) Condenser

Type _____

Manufacturer _____

Performance data

Design heat duty (at MCR)	(kcal/h)	_____
Design absolute pressure	(mmHg abs.)	_____
Heat transfer coefficient	(kcal/h/m^2/^oC)	_____
Circulating water quantity	(m^3/h)	_____
Circulating water inlet temperature	(^oC)	_____
Circulating water outlet tempeature	(^oC)	_____
Cleanliness factor	(%)	_____
Condensate oxygen content	(cc/liter)	_____
Water velocity in tube	(m/sec)	_____
Friction loss through tube	(kg/cm^2)	_____
Total effective tube surface	(m^2)	_____

Tube

Effective tube length	(mm)	_____
Overall tube length	(mm)	_____
Size and thickness	(mm)	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Number of tube		_____
Number of tube in air cooling zone		_____
Material		_____
Dimension		
Overall length	(mm)	_____
Height (including neck)	(mm)	_____
Overall width	(mm)	_____
Material		
Shell		_____
Water box (with rubber lining)		_____
Tube sheet (clad type)		_____
Hot well		_____
Tube support plate		_____
Metal thickness		
Shell	(mm)	_____
Water box	(mm)	_____
Tube sheet	(mm)	_____
Hot well	(mm)	_____
Hot well capacity	(m^3)	_____
Design pressure		
Water box and tube	(kg/cm^2g)	_____
Shell	(kg/cm^2g)	_____
Weight		
Empty	(kg) approx.	_____
Operating	(kg) approx.	_____

(Tenderer's Name)

Flooded (kg) approx. _____

Divided package number of shipping _____

(2) Expansion joint for turbine exhaust connection

Material _____

Thickness (mm) _____

(3) Butterfly valve

Type _____

Manufacturer _____

Number _____

Size (mm) _____

Material (with rubber lining) _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight (kg) approx. _____

(4) Expansion joints for circulating water piping inlet and outlet

Type _____

Number _____

Size (mm) _____ x _____

Material _____

Number of ply _____

3. AIR EXTRACTION EQUIPMENT

	Hogging operation	Holding operation
(1) Air extraction vacuum pump of condenser water box		
Type	_____	_____
Manufacturer	_____	
Number	_____	_____
Air suction capacity (kg/h)	_____	_____
Suction vacuum (mmHg abs.)	_____	_____
Speed (rpm)	_____	_____
Material		
Casing	_____	_____
Rotor	_____	_____
Shaft	_____	_____
Air ejector (if applicable)	_____	_____
Motor	The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.	
Water separation tank		
Capacity (m^3)	_____	_____
Material	_____	_____
Weight (assembly) (kg) approx.	_____	_____

(2) Starting air ejector (if applicable) of condenser water box

Type	_____
Manufacturer	_____
Number	_____
Air suction capacity (kg/h)	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

Suction vacuum	(mmHg abs.)	_____
Operating steam pressure	(kg/cm^2g)	_____
Steam consumption	(kg/h)	_____
Material		
Suction chamber		_____
Steam nozzle		_____
Weight	(kg) approx.	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

3A (AIR EJECTOR)

(1) Steam jet air ejector with condenser

Type _____

Manufacturer _____

Number _____

Air suction capacity (kg/h) _____

Suction vacuum (mmHg abs.) _____

Operating steam pressure (kg/cm^2g) _____

Operating steam temperature (^oC) _____

Steam consumption (kg/h) _____

Condenser

Cooling surface area (m^2) _____
(intercondenser, aftercondenser)

Tube size and thickness (mm) _____

Tube length (mm) _____

Tube number _____

Heat transfer coefficient ($kcal/h/m^2/^oC$) _____

Design cooling water capacity (kg/h) _____

Minimum cooling water capacity (kg/h) _____

Friction loss through tube (kg/cm^2) _____

Design pressure

Tube side (kg/cm^2g) _____

Shell side (kg/cm^2g) _____

Tenderer's Data Sheet

____
(Tenderer's Name)

Dimension

Overall length (mm) ______________________

Shell diameter (mm) ______________________

Material

Tube ______________________

Shell ______________________

Water box ______________________

Tube sheet ______________________

Suction chamber ______________________

Steam nozzle ______________________

Weight (assembly) (kg) approx.) ______________________

(2) Starting air ejector

Type ______________________

Manufacturer ______________________

Number ______________________

Air suction capacity (kg/h) ______________________

Suction vacuum (mmHg abs.) ______________________

Operating steam pressure (kg/cm^2g) ______________________

Steam consumption (kg/h) ______________________

Material

Suction chamber ______________________

Steam nozzle ______________________

Weight (kg) approx. ______________________

Tenderer's Data Sheet

_____
(Tenderer's Name)

4. CIRCULATING WATER PUMP

(1) Circulating water pump

Type		_____
Manufacturer		_____
Number		_____
Performance		
Capacity	(m^3/h)	_____
Total head	(m)	_____
Shut off head	(m)	_____
Pump efficiency	(%)	_____
Shaft horse power	(KW)	_____
NPSH required	(m)	_____
Speed	(rpm)	_____
Dimension		
Pump shaft length	(mm)	_____
Pump shaft diameter	(mm)	_____
Suction bell mouth diameter	(mm)	_____
Discharge connection diameter	(mm)	_____
Lubricating water system		
Water capacity	(m^3/h)	_____
Lubricating water pump		Yes , No
Material		
Impeller		_____
Suction bell mouth and discharge ball		_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

	Column and sicharge elbow	_____
	Shaft	_____
	Shaft enclosing tube	_____
	Bearing	_____
	Motor	The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
	Anode plate	Yes , No
	Weight	
	Pump (kg) approx.	_____
	Motor (kg) approx.	_____
	Assembly (kg) approx.	_____
(2)	Discharge valve	
	Type	_____
	Manufacturer	_____
	Number	_____
	Size (mm)	_____
	Material (with rubber lining)	_____
	Motor	The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
	Weight (kg) approx.	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

(3) Expansion joint of pump discharge

Type		_____
Number		_____
Size	(mm)	_____ x _____
Material		_____

(4) Inter connection valve

Type		_____
Manufacturer		_____
Number		_____
Size	(mm)	_____
Material (with rubber lining)		_____
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
Weight	(kg) approx.	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

5. CONDENSATE PUMP

(1) Condensate pump

Type _____

Manufacturer _____

Number _____

Performance

Capacity	(ton/h)	_____
Total head	(kg/cm^2g)	_____
Shut off head	(kg/cm^2g)	_____
Pump efficiency	(%)	_____
Shaft horse power	(KW)	_____
NPSH required	(m)	_____
Speed	(rpm)	_____

Number of stage _____

Connection size

Suction	(mm)	_____
Discharge	(mm)	_____

Dimension

Pit can depth	(mm)	_____
Pit can diameter	(mm)	_____

Material

Impeller	_____
Casing	_____
Shaft	_____
Outer barrel	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Motor

The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight

Pump	(kg) approx.	_____
Motor	(kg) approx.	_____
Assembly	(kg) approx.	_____

(2) Suction strainer

Type	_____
Manufacturer	_____
Number	_____
Mesh	_____
Material	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

6. FEEDWATER HEATER

(1) Low pressure feedwater heaters (not install neck heater in condenser)

		No. 1 Heater	No. 2 Heater
Type			
Manufacturer			
Tube surface area			
Condensing zone	(m^2)		
Drain cooling zone	(m^2)		
Total	(m^2)		
Water velocity in tube	(m/sec)		
Friction loss through tube	(kg/cm^2)		
Design water flow	(kg/h)		
Heat transfer coefficient	(kcal/h/m^2/^oC)		
Tube			
Size and thickness	(mm)		
Number of tube			
Number of tube pass			
Dimension			
Overall length	(mm)		
Shell diameter	(mm)		
Shell thickness	(mm)		

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Tenderer's Data Sheet

_____
(Tenderer's Name)

		No. 1 Heater	No. 2 Heater
Material			
Channel and channel cover		_____	_____
Shell		_____	_____
Tube		_____	_____
Tube sheet		_____	_____
Design pressure and temperature			
Tube side	(kg/cm^2g, ^oC)	_____	_____
Shell side	(kg/cm^2g, ^oC)	_____	_____
Design terminal temperature difference	(^oC)	_____	_____
Design drain cooler approach	(^oC)	_____	_____
Weight			
Empty	(kg) approx.	_____	_____
Operating	(kg) approx.	_____	_____
Flooded	(kg) approx.	_____	_____

		No. 3 Heater
Type		_____
Manufacturer		_____
Tube surface area		
Condensing zone	(m^2)	_____
Drain cooling zone	(m^2)	_____
Total	(m^2)	_____
Water velocity in tube	(m/sec)	_____
Friction loss through tube	(kg/cm^2)	_____
Design water flow	(kg/h)	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

No. 3 Heater

Heat transfer coefficient (kcal/h/m^2/^oC)	_____
Tube	
Size and thickness (mm)	_____
Number of tube	_____
Number of tube pass	_____
Dimension	
Overall length (mm)	_____
Shell diameter (mm)	_____
Shell thickness (mm)	_____
Material	
Channel and channel cover	_____
Shell	_____
Tube	_____
Tube sheet	_____
Design pressure and temperature	
Tube side (kg/cm^2g, ^oC)	_____
Shell side (kg/cm^2g, ^oC)	_____
Design terminal temperature difference (^oC)	_____
Design drain cooler approach (^oC)	_____
Weight	
Empty (kg) approx.	_____
Operating (kg) approx.	_____
Flooded (kg) approx.	_____

Tenderer's Data Sheet

(Tenderer's Name)

(2) High pressure feedwater heaters

		No. 5 Heater	No. 6 Heater
Type			
Manufacturer			
Tube surface area			
Desuperheater zone	(m^2)		
Condensing zone	(m^2)		
Drain cooling zone	(m^2)		
Total	(m^2)		
Water velocity in tube	(m/sec)		
Friction loss through tube	(kg/cm^2)		
Design feedwater flow	(kg/h)		
Heat transfer coefficient	($kcal/h/m^2/^oC$)		
Tube			
Size and thickness	(mm)		
Number of tube			
Number of tube pass			
Dimension			
Overall length	(mm)		
Shell diameter	(mm)		
Shell thickness	(mm)		
Material			
Channel and channel cover			
Shell			
Tube			

Tenderer's Data Sheet

_____
(Tenderer's Name)

	No. 5 Heater	No. 6 Heater
Tube sheet		
Design pressure and temperature		
Tube side (kg/cm^2g, ^oC)		
Shell side (kg/cm^2g, ^oC)		
Design terminal temperature difference (^oC)		
Design drain cooler approach (^oC)		
Weight		
Empty (kg) approx.		
Operating (kg) approx.		
Flooded (kg) approx.		

	No. 7 Heater
Type	
Manufacturer	
Tube surface area	
Desuperheater zone (m^2)	
Condensing zone (m^2)	
Drain cooling zone (m^2)	
Total (m^2)	
Water velocity in tube (m/sec)	
Friction loss through tube (kg/cm^2)	
Design feedwater flow (kg/h)	
Heat transfer coefficient ($kcal/h/m^2/^oC$)	

Tenderer's Data Sheet

_____
(Tenderer's Name)

No. 7 Heater

Tube

Size and thickness (mm) _____

Number of tube _____

Number of tube pass _____

Dimension

Overall length (mm) _____

Shell diameter (mm) _____

Shell thickness (mm) _____

Material

Channel and channel cover _____

Shell _____

Tube _____

Tube sheet _____

Design pressure and temperature

Tube side (kg/cm^2, ^oC) _____

Shell side (kg/cm^2, ^oC) _____

Design terminal temperature difference (^oC) _____

Design drain cooler approach (^oC) _____

Weight

Empty (kg) approx. _____

Operating (kg) approx. _____

Flooded (kg) approx. _____

_____
(Tenderer's Name)

(3) Drain pump and drain tank

		Pump	Tank
Type		_____	_____
Manufacturer		_____	_____
Number		_____	_____
Capacity	(m^3/h, m^3)	_____	_____
Discharge pressure	(kg/cm^2g)	_____	_____
Pressure (Maximum)	(kg/cm^2g)		_____
Speed	(rpm)	_____	
Material			
Casing		_____	_____
Shaft		_____	
Impeller		_____	
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.	
Weight complete	(kg) approx.	_____	_____

Tenderer's Name _____
(Tenderer's Name)

7. DEAERATOR

(1) Deaerating heater

Type		_____
Manufacturer		_____
Design capacity	(ton/h)	_____
Oxygen content	(cc/liter)	* _____
Dimension		
Overall length	(mm)	_____
Diameter	(mm)	_____
Shell thickness	(mm)	_____
Material		
Shell		_____
Tray		_____
Spray valve		_____
Design pressure	(kg/cm^2g)	_____
Design temperature	(^oC)	_____
Weight		
Empty	(kg) approx.	_____
Operating	(kg) approx.	_____
Flooded	(kg) approx.	_____
Relief valve		
Type		_____
Manufacturer		_____

(2) Storage tank

Capacity at operating level	(m^3)	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Dimension

Overall length	(mm)	_____
Diameter	(mm)	_____
Shell thickness	(mm)	_____
Shell material		_____
Weight		
Empty	(kg) approx.	_____
Operating	(kg) approx.	_____
Flooded	(kg) approx.	_____

(Tenderer's Name)

8. BOILER FEED PUMPING EQUIPMENT

(1) Boiler feed pump (Motor driven BFP)

Type		
Manufacturer		
Number		
Capacity	(ton/h)	
Total head	(kg/cm^2g)	
Discharge head	(kg/cm^2g)	
Shut off pressure	(kg/cm^2g)	
Feed water temperature	(^oC)	
Minimum flow	(ton/h)	
Pump efficiency	(%)	
Shaft horse power	(kW)	
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
NPSH required	(m)	
Noise (at a complete set)	db(A)	
Number of stage		
Type of bearing		
Type of seal		
Type of coupling		
Connection size		
Suction	(mm)	
Discharge	(mm)	

Tenderer's Data Sheet

_____
(Tenderer's Name)

Material

Outer casing _____

Inner casing _____

Shaft _____

Impeller _____

Sleeve _____

Foundation _____

Minimum flow orifice _____

Warm-up orifice _____

Weight

Pump (kg) approx. _____

Motor (kg) approx. _____

Speed increasing gear (kg) approx. _____

Booster pump (if necessary) (kg) approx. _____

Assembly (kg) approx. _____

(2) Speed increasing gear for motor driven BFP

Type _____

Manufacturer _____

Number of set _____

Type of bearing _____

Material

Casing _____

Drive gear _____

Driven gear _____

Bearing _____

T

Direct driven L.O. pump capacity

Type _____

Capacity (m^3/h) _____

Discharge pressure (kg/cm^2g) _____

(3) Booster pump for motor driven BFP

Type _____

Manufacturer _____

Number _____

Capacity (ton/h) _____

NPSH required (m) _____

Total pressure (kg/cm^2g) _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Connection bore of suction/discharge (mm) _____ / _____

Gland type _____

Material

Casing _____

Impeller _____

Shaft _____

NPSH design data

Vertical height between deaerator lowest water level and pump impeller center (m) _____

Piping head loss from deaerator outlet to boiler feed pump inlet (m) _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Available NPSH (m) _____

Flow at feed pump inlet (m^3/h) _____

Pressure at feed pump inlet (kg/cm^2g) _____

Temperature at feed pump inlet (^oC) _____

Suction pipe

Nominal bore x thickness (mm) _____ x _____

Material _____

(4) Suction strainer

Type _____

Manufacturer _____

Number of set _____

Strainer mesh _____

Material

Casing and cover _____

Strainer _____

(5) Recirculation control valve

Type _____

Manufacturer _____

Number of set _____

Flow capacity (m^3/h) _____

Fluid temperature (^oC) _____

Fluid pressure (kg/cm^2g) _____

Material

Body _____

Bonnet _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Disc _____

Seat _____

Stem _____

(6) Orifice

Type _____

Number of set _____

Flow (m^3/h) _____

Inlet/Outlet pressure (kg/cm^2g) _____

Material _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

9. CLOSED CYCLE COOLING WATER SYSTEM

(1) Bearing cooling water heat exchanger

Type _____

Manufacturer _____

Number _____

Tube surface area (m^2) _____

Water velocity in tube (m/sec) _____

Friction loss at design flow

Tube side (kg/cm^2) _____

Shell side (kg/cm^2) _____

Secondary cooling water flow (m^3/h) _____

Primary cooling water flow (from CWP) (m^3/h) _____

Heat transfer coefficient ($Kcal/h/m^2/^oC$) _____

Secondary cooling water temperature

Inlet (^oC) _____

Outlet (^{o}) _____

Primary cooling water design temperature (from CWP)

Inlet (^oC) _____

Outlet (^oC) _____

Tube

Size and thickness (mm) _____

Number of tube _____

Number of tube pass _____

Anode plate Yes No

Tenderer's Data Sheet

_____
(Tenderer's Name)

Dimension

Overall length (mm) _____

Shell diameter (mm) _____

Material

Water box and cover _____

Shell _____

Tube _____

Tube sheet (clad) _____

Design pressure

Tube side (kg/cm^2g) _____

Shell side (kg/cm^2g) _____

Weight

Empty (kg) approx. _____

Operating (kg) approx. _____

Flooded (kg) approx. _____

(2) Sea water auxiliary pump

Type _____

Manufacturer _____

Number _____

Performance

Capacity (m^3/h) _____

Total head (kg/cm^2g) _____

Shaft horse power (KW) _____

Speed (rpm) _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Connection size		
Suction	(mm)	_____
Discharge	(mm)	_____
Material		
Casing		_____
Impeller		_____
Shaft		_____
Type of shaft seal		
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
Dimension	(mm)	_____
Weight (assembly)	(kg) approx.	_____
Strainer		
Type		_____
Manufacturer		_____
Number		_____
Mesh		_____
Material		
Outer casing		_____
Inner parts		_____
Lifting equipment		Yes No

(Tenderer's Name)

(3) Bearing cooling water pump

Type		
Manufacturer		
Number		
Performance		
Capacity	(m^3/h)	
Total head	(kg/cm^2g)	
Shaft horse power	(KW)	
Speed	(rpm)	
Connection size		
Suction	(mm)	
Discharge	(mm)	
Material		
Casing		
Impeller		
Shaft		
Type of shaft seal		
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
Dimension	(mm)	
Weight (assembly)	(kg) approx.	

(4) Chemical injection pump

Type	
Manufacturer	
Number	

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Tenderer's Data Sheet

_____
(Tenderer's Name)

Capacity (l/min) _____

Discharge pressure (kg/cm^2g) _____

Material

Cylinder casing _____

Plunger _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight (kg) approx. _____

(5) Chemical solution tank

Type _____

Number _____

Capacity _____

Material _____

Mixer

Type _____

Material _____

Motor — The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight (kg) approx. _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

10. MAKE UP WATER TRANSFER PUMP AND TANK

(1) Make up water transfer pumps

Type		_____
Manufacturer		_____
Number		_____
Capacity	(m^3/h)	_____
Total head	(kg/cm^2g)	_____
Shaft horse power	(KW)	_____
Speed	(rpm)	_____
Connection		
Suction	(mm)	_____
Discharge	(mm)	_____
Material		
Casing		_____
Impeller		_____
Shaft		_____
Type of shaft seal		_____
Motor		The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.
Dimension	(mm)	_____
Weight	(kg) approx.	_____

(2) Make up water tank

Type	_____
Manufacturer	_____
Number	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Capacity	(m^3)	*	
Inside diameter	(mm)		
Shell height	(mm)		
Material and thickness		Material	Thickness (mm)
Wall plate			
Bottom plate			
Roof plate			
Floating deck			
Air tight seal			
Vertical number of course			
Painting material			
Inner surface			
External surface			
Weight	(kg) approx.		
Divided package number for shipping			

Tenderer's Data Sheet

_____
(Tenderer's Name)

11. TUBE CLEANING EQUIPMENT

Type		_____
Manufacturer		_____
Number		_____
Automatic operation		_____
Ball		
Material		_____
Size	(mm)	_____
Number		_____
Material		
Recirculation pump		_____
Collector		_____
Ball injector nozzle		_____
Ball distributor		_____
Screen		_____
Casing		_____
Element		_____
Piping (within Strainer)		_____
Control panel		
Type		_____
Size	(mm) approx.	_____
Weight (assembly)	(kg) approx.	_____
Anode plate		Yes ____ No ____

Tenderer's Data Sheet

_____
(Tenderer's Name)

12. TURBINE CLEAN DRAIN TANK

(1) Drain tank

Type		_____
Number		_____
Manufacturer		_____
Capacity	(m^3)	_____
Size		
Length		_____
Width		_____
Height		_____
Material		_____
Weight empty	(kg) approx.	_____
flooded	(kg) approx.	_____

(2) Condensate return pump

Type		_____
Number		_____
Manufacturer		_____
Performance		
Capacity	(ton/h)	_____
Total head	(mAq)	_____
Pump efficiency	(%)	_____
Shaft horse power	(kW)	_____
NPSH required	(m)	_____
Speed	(rpm)	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

Material

Impeller _____

Casing _____

Shaft _____

Motor

The Tenderer shall indicate the motor specification in accordance with sub-clause 10 of "Electric Motor" in Clause V of Tenderer's Data Sheet.

Weight

Pump (kg) approx. _____

Motor (kg) approx. _____

Assembly (kg) approx. _____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

13. DEBRIS FILTER (ALATERNATIVE)

Type		_____
Manufacturer		_____
Material		
Body		_____
Punched plate		_____
Expanded Arear (punched plate area)		_____
Number		_____
Dimention	(mm)	_____
Inlet/outlet pipe size	(mm)	_____
Washing Valve		
Type (Motor driven)		_____
Valve size	(mm)	_____
Anode plate		Yes ____ No ____

Tenderer's Data Sheet

_____
(Tenderer's Name)

14. PIPING FOR STEAM TURBINE AND AUXILIARY EQUIPMENT

(1) Steam turbine	Material	Size (mm)
Turbine lead piping	_____	_____
Lubricating oil piping	_____	_____
Gland steam seal piping	_____	_____
Turbine drain piping	_____	_____

(2) Steam turbine auxiliary equipment	Material	Size (mm)
Make up water piping system		
Supply	_____	_____
Return	_____	_____
Condensate piping system		
Condensate pump suction	_____	_____
Condensate pump - Deaerator	_____	_____
Boiler feed water piping system		
BFP Suction	_____	_____
BFP - Feed water control valve	_____	_____
Feedwater control valve - final HP heater outlet	_____	_____
BFP minimum flow	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Circulating water piping system	Material	Size (mm)
Each circulating water pump discharge		
Circulating water pump discharge common header		
Underground installation		
Condenser inlet and outlet		
Priming vacuum piping system		
Condenser air extraction piping system		
Condenser - air extraction pump		
Starting air ejector exhaust pipe		
Bearing cooling water piping system		
Main (supply, return)		
Stand pipe		
Circulating water pump motor cooling		
Primary cooling water piping system		
Bearing cooling water heat exchanger supply		
Return		
Extraction steam piping system		
No. 1 extraction		
No. 2 extraction		
No. 3 extraction		
No. 4 extraction		
No. 5 extraction		
No. 6 extraction		

Tenderer's Data Sheet

(Tenderer's Name)

	Material	Size (mm)
No. 7 extraction		
High pressure auxiliary steam piping system (from high pressure auxiliary steam header)		
Air ejector supply		
Steam seal supply		
Deaerator supply		
Feedwater heater drain and vent piping system		
No. 7 HP heater drain		
No. 6 HP heater drain		
No. 5 HP heater drain		
No. 3 LP heater drain		
No. 2 LP heater drain		
No. 1 LP heater drain		
HP heater vent		
LP heater vent		
Service air piping system		
Instrument air piping system		
N_2 gas injection piping system		
Seal water piping system		
Condenser tube cleaning water		
Make up water piping		

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Tenderer's Data Sheet

_____
(Tenderer's Name)

	Material	Size (mm)
(3) Temporary piping		
For turbine lubricating oil flushing	_____	_____
For hydrostatic test	_____	_____
For water flushing	_____	_____
For trial operation of auxiliary equipment	_____	_____
(4) Total weight of piping for steam turbine and auxiliary equipment (ton) approx.	_____	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

15. INSULATION AND LAGGING FOR STEAM TURBINE AND AUXILIARY EQUIPMENT

(1) Heat insulation material	Heat transfer coefficient (Kcal/mH^{o}C)	Maximum allowable (^{o}C)
Calcium silicate		
Rock wool		
Hard cement		
Calcium silicate paste		
Other material ( )		

(2) Insulation material

Turbine casing _____

Feedwater heater _____

Deaerator _____

Boiler feed pump _____

Piping

Turbine lead piping _____

Gland steam seal piping _____

Turbine drain piping _____

Reheat piping _____

Condensate piping _____

Turbine bypass system piping _____

Boiler feedwater piping _____

Extraction steam piping _____

High pressure auxiliary steam piping _____

Feedwater heater drain piping _____

Outer drain and vent piping _____

Tenderer's Data Sheet

_____
(Tenderer's Name)

Valve _____

(3) Description of safety insulation _____

_____

_____

(4) Lagging

Material _____

Thickness (mm) _____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

16. PAINTING FOR STEAM TURBINE AND AUXILIARY EQUIPMENT

		Kind of paint	
		Primary painting	Finished painting
(1)	Turbine casing	_____	
(2)	Turbine metal lagging	_____	_____
(3)	Main oil tank	_____	_____
(4)	Turbine oil storage tank	_____	_____
(5)	Turbine lubricating oil equipment	_____	_____
(6)	Gland steam condenser and exhaust blower	_____	_____
(7)	Surface condenser	_____	_____
(8)	Air extraction equipment	_____	_____
(9)	Priming vacuum pump and motor	_____	_____
(10)	Circulating water pump and motor	_____	_____
(11)	Condensate pump and motor	_____	_____
(12)	Feedwater heater (including drain pump & tank)	_____	
(13)	Deaerator	_____	
(14)	Boiler feed pump and motor	_____	_____
(15)	Bearing cooling water heat exchanger	_____	_____
(16)	Bearing cooling water pump and motor (including booster pump)	_____	_____
(17)	Chemical injection equipment of bearing cooling water	_____	_____
(18)	Make up water transfer pump	_____	_____
(19)	Insulated piping	_____	_____
(20)	Uninsulated piping	_____	_____

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Tenderer's Data Sheet

_____
(Tenderer's Name)

		Kind of paint	
		Primary painting	Finished painting
(21)	Panel	_____	_____
(22)	Make up water tank	_____	_____

Tenderer's Data Sheet

(Tenderer's Name)

17. INSTRUMENTATION

17.1 ELECTRO-HYDRAULIC GOVERNOR CONTROL SYSTEM

(1) Type

(2) Signal range
(From/to another system)

(3) Manufacturer, Model No.

(4) Number

(5) System cabinet

Dimension (mm) W x D x H _____ x _____ x _____

Grounding wire

Anti-vibration rubber Yes / No

(6) Transmitter & actuator type

(7) Redundant or 2 out of 3 transmitter

(8) Control system block diagram with main interlock system by No.

(9) Power supply system block diagram by No.

(10) Outline arrangement of man-machine communication device by No. including maintenance tool

(11) Turbine trip circuit power source

(12) Outline composition of backup system for digital control system by No.

(13) Operating condition of control system

Temp. _____ °C - _____ °C

Humidity _____ % - _____ %

(14) Power source and consumption

DC _____ V _____ W

AC _____ V _____ VA / W

Air _____ Nl/min

Oil _____ kg/cm²g

Tenderer's Data Sheet

_____
(Tenderer's Name)

(15) MTBF more than 10^5 hours

Yes _____ No _____

Tenderer's Data Sheet ______________________ (Tenderer's Name)

17.2 TURBINE SUPERVISORY INSTRUMENT (TSI)

(1) Type ______________________

(2) Manufacturer ______________________

(3) Number ______________________

(4) Items

Eccentricity	Yes ,	No
Control valve position	Yes ,	No
Speed	Yes ,	No
Vibration (on shaft)	Yes ,	No
Expansion	Yes ,	No
Acceleration	Yes ,	No
Differential expansion	Yes ,	No
Rotor Position	Yes ,	No
Bearing (metal, drain) temperature	Yes ,	No
Shell metal temperature	Yes ,	No
Others		

(5) Vibration recorder

Manufacturer ______________________

Type and No. ______________________

(6) Digital indicator (Shaft, Speed, MW vibration) Yes , No

(7) Turbine/generator bearing temp. recorder

Manufacturer ______________________

Type and No. ______________________

(8) Turbine casing metal temp. recorder

Manufacturer ______________________

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Tenderer's Data Sheet

_____
(Tenderer's Name)

Type and No. _____

(9) Turbine eccentricity, rotor Position CV position & expansion

Manufacturer _____

Type and No. _____

Tender's Data Sheet

(Tenderer's Name)

17.3 SPECIAL INSTRUMENTS

(1) Make up water flow meter

Type		Positive displacement
Manufacturer		
Flow range	(m^3/h)	
Accuracy	(%)	
Calibrated by (Institute, laboratory)		

(2) Condenser circulating water leak detector (if equired)

Type	
Sampling points (4 points or more)	
Manufacturer	
Outline arrangement of leak detector system	
Panel (H x W x D) mm	

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Tenderer's Data Sheet

_____
(Tenderer's Name)

17.4 MISCELLANEOUS INSTRUMENTS AND CONTROL APPARATUS

	Manufacturer	Model No.
(1) Recorder		
Electric signal (V, mA etc.)	_____	_____
	_____	_____
Temperature (for thermocouple, RTD)	_____	_____
	_____	_____
(2) Indicator		
Dial type	_____	_____
Vertical type	_____	_____
(3) Transmitter		
Pressure (Draft)	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____
Analysis (conductivity, pH, etc.)	_____	_____
(4) Controller		
Pressure	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____
Analysis (conductivity, pH, etc.)	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

	Manufacturer	Model No.
(5) Switch		
Pressure (Draft)	_____	_____
Temperature	_____	_____
Flow	_____	_____
Level	_____	_____
Limit switch	_____	_____
(6) Local indicator		
Pressure gauge	_____	_____
Thermometer	_____	_____
Flow (positive displacement type)	_____	_____
Flow (other)	_____	_____
Level	_____	_____
(7) Sight glass		
Sight flow	_____	_____
Level glass gauge	_____	_____
(8) Primary element		
Thermocouple	_____	_____
RTD	_____	_____
Thermo-well	_____	_____
Flow orifice	_____	_____
Flow nozzle	_____	_____
pH	_____	_____
Conductivity	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

		Manufacturer	Model No.
(9)	Control valve	_____	_____
		_____	_____
(10)	Manometer	_____	_____
(11)	Thermocouple extension wire	_____	_____
(12)	Control tubing	_____	_____

Tenderer's Data Sheet

_____
(Tenderer's Name)

17.5 POWER CONSUMPTION

(1) Instrument air	(Nm^3/min)	_____	_____
(2) Electric power			
AC 110V	(KW)	_____	_____
AC 220V	(KW)	_____	_____
DC 220V	(VA)	_____	_____