WTP ,DM & CPU PLANT; HURL GORAKHPUR
NIT NO.: PNMM/PC161/E/001
CORRIGENDUM -4.0 TECHNICAL(PROCESS), DATE:04.05.2018

S. No	Part / Sec	Page	Clause No.	Description	AMENDMENT TYPE M/D/A/C	Amendment
1.	Part II : Technical Section - 4.0,	3 of 28	2.1	Lamella clarifier	**A**	Lamella Clarifier / HRSCC/ Tube Settler or equivalent to be considered. Bidder to submit PTR of the same along with Bid.
2.	Part II : Technical Section - 2.0,	3 of 6	2.0	Treated Water Quality : SDI < 3#	**A**	SDI at WPT outlet not to be considered
3.	Part II : Technical Section - 3.0, & Part II : Technical Section - 4.0,	5 of 34 & 17 of 28	1.1.1 & 3.2 (14)	One (1) no. neutralizing Pit in two compartments complete with integral pipe, valves & accessories common for DM & CPU regeneration waste. & Capacity: Capacity of each compartment shall besufficient to hold waste water generated in 24 Hrs. For WPTP+DM+CPU	**C**	Regenerated effluent only from DM and CPU Plants shall be transferred to Neutralisation Pit and accordingly Neutralisation Pit shall be designed.
4.	Part II : Technical Section - 4.0,	20 of 28	3.3 - 7 (b)	Mixed Bed : Cycle time :68 hours	**M**	Cycle time shall be 72 hours
5.	Part II : Technical Section - 4.0, & Part II : Technical Section - 5.1 ,	5 of 28 & 6 of 8	3.1, 1 & 5.0	Water Pre Treatment Plant: Retention Time : 1 Mins & Flash mixer : 5 Mins	**C**	Vendor to provide adequate retention time as per their design However, Minimum Hydraulic Retention Time for flash mixer shall be 1 min.
6.	Part II : Technical Section - 3.0, & Part II : Technical Section - 9.0	13 of 34, 32 of 34 & 3 of 32	1.1.4.2 Static Scope, 6.0 Spares Two Years Recommended Spares & 2.0 SPARE PARTS FOR	Supply of mandatory **(spare parts for two year operation)** and commissioning spares attached elsewhere in bid package, Two years normal operation spares required are to be identified by the bidder. & 2.1 to 2.11	**C**	We understand that spare Parts as listed in Section-9 (clause 2.1 to 2.11) are referred as Mandatory Spares and the same shall be quoted by bidder within the Lump SumPrice. Bidder needs to submit the Separate List of Recommended Spares (2 Years Spares) in addition to the Mandatory Spares" ***and same shall not be part of quoted Lump Sum Price"***. Please confirm our understanding.

			TWO YEARS OPERATION (MANDATORY SPARES):			
7.	Part II : Technical Section - 2.0	2 of 6	1.1	Raw Water Temperature : Ambient	**M**	Following shall be operating / design parameters: Utility Facilities: Temperature (Deg C) Min/Nor/Max/design) Raw Water : -/Ambient/47/- DM Water: -/25/-/70 Process Condensate (Ammonia Plant): - / 47 / - / 85 Process Condensate (Urea Plant): - / 50 / 70 / 120 Turbine Condensate (Ammonia Plant): 40/ 46.1 / 50 / 70 Steam/Turbine Condensate (Urea Plant) : - / 50 / - / 85 Turbine Condensate (O&U): - / 50 / - / 80
8.	Part II : Technical Section - 2.0,	3 of 6	1.2	Turbine Condensate Quality: Iron as Fe : 0.2	**C**	Iron mentioned as Fe is 0.2 mg/l.
9.	Part II : Technical Section - 2.0	4 of 6	2.0	Treated Water Quality: Colloidal Silica as SiO2 : BDL	**C**	Removal of Colloidal Silica in WTP plant is not required.
10.	Part II : Technical Section - 4.0	3 of 28	2.1	The raw water shall be directly fed to flash mixerwhere it will be mixed with Alum/FeCl3,	**C**	Alum/FeCl3 can be used as floculant
11.	Part II : Technical Section - 2.0 & Part II : Technical Section - 4.0	2 of 6 & 5 of 28	1.1 & 3.1	Raw Water: Turbidity : 50 NTU & Water Pre Treatment Plant: Inlet Turbidity : 100 NTU	**C**	Design turbidity shall be 100NTU
12.	Part II : Technical Section - 2.0 & Part II : Technical Section - 4.0	4 of 6 & 5 of 28	2.0 & 3.1	Treated Water Quality: Turbidity : <1 NTU & Water Pre Treatment Plant - (11) Dual Media Filters Guaranteed Effluent Turbidity : <2 NTU	**C**	Turbidity Guarantee values shall be <2 NTU

13.	Part II : Technical Section - 4.0 & PID No : PC161-7316-0027	21 of 28	3.4	Turbine Condensate Unit: (2) Cartridge Filter Feed Pumps : Two (2) & Cartridge Filter Feed pumps : Three (3) nos.	**C**	Cartridge Filter Feed Pumps shall be Three
14.	Part II : Technical Section - 4.0 & PID No : PC161-7316-0027	21 of 28	3.4	Turbine Condensate Unit: (3) Activated Carbon Filters: Two (2) & Activated Carbon Filter :Three (3) nos.	**C**	Activated Carbon Filters shall be Three
15.	Process Flow Diagram Water Pre Treatment Plant Dwg No : PC161-7112/7/7113-0046 & Part II : Technical Section - 4.0	7 of 28	Process Flow Diagram (Water Pre Treatment Plant) (11) Dual Media Filters	Number of Dual Media Filters : 6+2, & No. of Dual Media Filters: 8 (7W+1S)	**C**	No. of Dual Media Filters shall be 8 (7W+1S)
16.	Process Flow Diagram Condensate Polishing Unit			Condensate Off-Spec to ETP	**C**	Condensate Off Spec shall be routed to ETP By Client pipeline. Bidder will make all provision till battery limit.
17.	Piping and Instrumentation Diagram DM Water Plant Dwg No : PC161-7113-0024			Chemical Dosing at SAC outlet Line	**C**	No chemical dosing is required after SAC and before degasser
18.	Piping and Instrumentation Diagram DM Water Plant Dwg No : PC161-7113-0024			SMBS and Antiscalant Dosing	**M**	SMBS dosing is not required at UF outlet
19.	Part II : Technical Section - 4.0	12 of 28	3.2 DM Plant: (2) Ultra Filtration	No. of Skids : Two(2) Permeate Flowrate : 160 m3/hr	**A**	UF Skid shall be 2W+1S and each stream permeate flow shall be 120 m3/hr.
20.	Part II : Technical Section - 4.0 & Part II : Technical Section - 4.0	12 of 28	3.2 DM Plant: (2) Ultra Filtration & 4. UF Feed Pumps	Feed Flowrate : 180m3/hr & Numbers : Three (2W+1S) Capacity : 120 m3/hr	**C**	Total UF Feed flow with Two(2) nos. pumps working will be 240 m3/hr

21.	Part II : Technical Section - 4.0	12 of 28	2.a)	MWCO for UF	**M**	MWCO for UF shall be 10 KD
22.	Part II : Technical Section - 2.0,	3 of 6,	1.3	Process condensate quality	**M**	In Process condensate quality, two values - one for Ammonia B/L and the other for Urea B/L However, Plant should be designed on higher value of contaminant and quality as per Flow scheme.
23.	Part II : Technical Section - 2.0,	6 of 6	3.1.7	List of laboratory instruments and equipments	**M**	apart from lab instruments provided in main laboratory ,bidder shall provide all lab instruments for day to day operation of WPT/DM plants.
24.	Part II : Technical Section - 2.0,	6 of 6	2.3.6	Total Silica at MB outlet	**M**	Vendor to guarantee Total Silica (as SiO2) at the outlet of MB in Condensate Polishing Plant/ DM Plant.
25.	Part II : Technical Section - 3.0,	5 of 34	iv & v	ACF backwash pumps	**C**	ACF backwash pumps and blowers may not be considered if not required and the same is replaced by Feed Pumps by Bidder.
26.	Part II : Technical Section - 3.0	5 of 34 & 6 of 34	1.1.1.n) & x) and g)	Auto valves	**C**	All auto valves above 150 NB to be pneumatically operated butterfly valves (Leakage class V) except for drain valves on vessels.
27.	Part II : Technical Section - 4.0	3 of 28	B	Design Capacity– DM Water Plant	**C**	240 m3/hr net output is required at UF outlet.
28.	Part II : Technical Section - 4.0	6 of 28	6	Chemical house	**A**	30 daysto be considered for design of chemical storage area in chemical house.
29.	Part II : Technical Section - 4.0	7 of 28	9	Sludge sump	**C**	sludge sump is Single compartment
30.	Part II : Technical Section - 4.0	9 of 28&6 of 8	16&5.0	Capacity of Fire water storage tank	**C**	capacity of Fire Water Storage Tankshall be 2 x 4100 m3
31.	Part II : Technical Section - 4.0	12 of 28	2	UF skid capacity	**C**	Output capacity at UF plant shall be 120 M3/hr of each stream
32.	Part II : Technical Section - 4.0	19 of 28	7.a	Capacity of SAC exchanger	**C**	Bidder to fix capacity as per the Plant capacities of DM / CPU Plant
33.	Part II : Technical Section - 4.0	19 of 28	7.b	Turbine condensate plant MB capacity	**C**	Mixed bed is common for both the process condensate and turbine condensate. Capacity of each mixed bed shall be for 300 m3/hr

34.	Part II : Technical Section - 4.0	18 of 28 & 22 of 28	3.3 - 3.a & 3.4 - 3.a	Grade of Activated carbon	**M**	Activated carbon shall be of deoiling grade for Process and turbine condensate.
35.	Part II : Technical Section - 4.0	21 of 28	3.4 (2, 3)	Turbine condensate unit - no. of cartridge filter feed pump and activated carbon filters	**C**	cartridge filter feed pump and activated carbon filters shall be three (2W+1S).Three MB units are common for both process condensate and turbine condensate.
36.	Part II : Technical Section - 4.0	25 of 28	5.1	MOC of tanks 1) Anion Hot water tank 2) Acid dilution tank (Cation) 3) Acid dilution tank (Mixed bed) 4) Acid tank for neutralization pit	**M**	MOC of MSRL/ CS FRP lined to be considered.
37.	Part II : Technical Section - 4.0	25 of 28	5.2	MOC of piping 1) Acidic water 2) Alkali (sodium hydroxide) dilute 3) Alkali (Sodium hydroxide) strong 4) Waste effluent from DM plant vessel & chemical solution tank	**M**	MOC of MSRL/ CS FRP lined to be considered.
38.	Dwg. No. PC161-7318-0028 Rev. 0	1 of 1		Piping MOC	**A**	Piping MOC upto SAC shall be SS 304 and further from SAC shall beMSRL.
39.	Part II : Technical Section - 2.0	5 of 6	2.1	Treated water quality at drinking water plant outlet	**C**	In case of variation in Raw Water quality, Guarantee Deviation will apply on overall chemical load variation.
40.	General			DM Plant - Chemical dosages (Guarantees)	**C**	Regeneration reaction stoichiometric equations along with resin curve to be submitted in Technical Bid along with minimum chemical consumption/m3 PMC/Owner reserves the right to assess the dosage. Bidder has to mandatory submit the above details in their technical bid

41.	General			ClO2 system	**C**	ClO_2 dosing System shall be for pre & post chlorination. Capacity of ClO2 generator for pre chlorination shall be min 5 kg.
42.	Part II : Technical Section - 4.0	57/1510		Stilling chamber / Inlet chamber	**A**	Stilling chamber or inlet chamber for pre-chlorination of raw water before the flash mixer is acceptable.
43.	Part II : Technical, Section-4.0 & PFD	7 of 28 & PC161-7112/7/7113-0046	3.1 (11)	Number of working DMF	**C**	Dual media filters shall be 8 nos.(7working+1Standby)
44.	Part II : Technical, Section-4.0	12 of 28	3.2 (2)	Number and Capacity of UF Skid	**C**	UF Skid shall be 2W+1S and each stream permeate flow shall be 120 m3/hr.
45.	Process Flow Diagram	PC161-7112/7/7113-0045		Air Blower for DMF and MB units	**A**	Bidder to consider separate air blowers(1W+1S) for DMF and MB units
46.	General			Fire Fighting System	**C**	Fire fighting system & Fire protection system for entire plant is in client's scope of supply.
47.	Part II : Technical, Section-4.0	4 of 6	2.0	Treated water quality	**C**	1. pH value of 6.5-8.5 shall be maintained, with pH correction (if required) by bidder.
48.	Part II : Technical, Section-2.0	3 of 6	1.2	Turbinecondensate quality Ammonia, Urea and O&U	**C**	Silica as SiO2 <0.02 ppm as inlet for Turbine condensate quality Ammonia plant shall be considered as Reactive Silica.
49.	Part II : Technical, Section-2.0	3 of 6	1.3	Process Condensate quality Ammonia and Urea	**C**	MeOH max 20 ppm in inlet of CPU
50.	Part II : Technical, Section-2.0	6 of 6	2.3	Total silica in Polished condensate	**M**	Guarantee of Total silica shall be SiO2 < 0.01 ppm in Polished condensate.
51.	Part II : Technical Section - 3.0	16 of 34	1.1.6.1	General scope of Work and services– Construction/Erection clause no:1.28 Hazop study	**C**	External agency / Examiner for Hazop study is to be considered by Bidder.
52.	Part II : Technical Section - 3.0	27 of 34	4.0	Mechanical maintenance	**C**	Hydra, Fork lifts, Cranes etc will be in the supply of contractor scope. Quantity shall be as per requirement of successful bidder
53.	Part II : Technical Section - 2.0	5 of 6	3.1.6	Scope w.r.t Interconnecting piping between O&U and	**C**	Please refer the P&ID no PC161-7112/7113-0023/24/25/26/27/28/29

				facilities under Bidder's scope		
54.	Part-II Technical PC161-G-101-P-II/1.0	5 of 6	3.1.7	Chemical lab -Minimum laboratory requirement	**C**	Apart from lab instruments provided in main laboratory,bidder shall provide lab instruments for day to day operation of WPT/DM plants.
55.	Process flow diagram PC161-7112/7113-046	1 of 1		Process flow diagram - Scope w.r.t fire water tank & Nozzles, fire water pumps & inter connecting pipes.	**C**	fire water pumps & inter connecting pipes shall be in the scope of Client which is already shown in the P&ID. Please refer the P&ID no PC161-7112/7113-0023
56.	Part II : Technical Section - 4.0	28 of 28	7.0	Cooling water shall be provided at the ISBL battery limit by client. Further distributionof plant air to various distribution points shall be done by Contractor.	**C**	Please refer the P&ID no PC161-7112/7113-0023
57.	Part II : Technical Section - 12.0	6 of 20	5.6	It shall be the responsibility of Construction contractor to provide suitableaccommodation including necessary facilities for their labour and staff.	**C**	Land for labour colony shall be arranged by bidder. Land For temporary facility (store fabrication yard and area for offices) shall be provided as is where is basis
58.	General			O & M power cost	**C**	Approximate 10 Rs/ kwh
59.	Part II : Technical Section - 2.0,	2 of 6	1.1	Raw water Quality	**M**	Bidder to consider the latest / revised raw water analysis report enclosed.  Revised Raw water quality.pdf
60.	Part II : Technical Section - 2.0,	2 of 6	1.1	Raw water Quality - Feed raw water quality available in the Battery Limit of Water Pre Treatment plant (WTP)	M	The DM plant shall be designed based on design raw water analysis given in NIT however DM PLANT capacity output shall be assessed based on actual input water quality available at the time of performance test.
61.	Part II : Technical Section - 2.0,	3 of 6	1.2	Turbine Condensate Quality – Conductivity	**C**	Conductivity in the turbine condensate shall be due to boiler feed water dosing chemicals.

62.	Part II : Technical Section - 2.0,	3 of 6	1.3	Process Condensate Quality	**C**	In process condensate no silica and iron is to be considered.
63.	Part II : Technical Section - 2.0,	5 of 6	2.2	Polished water Quality From DM Plant	**M**	Silica in DM water shall be considered as less than 0.01 PPM
64.	Part II : Technical Section - 2.0,	5 of 6	2.3	Polished water Quality From CPU	**M**	Silica in Polished waterfrom CPUshall be considered as less than0.01 ppm.
65.	Part II : Technical Section - 4.0	7 of 28	1.0	Turbine condensate Quantity	**C**	turbine condensate shall be (1W+1S) of capacity 300 m3/hour
66.	Part II : Technical Section - 3.0,	21 of 34	1.1.1	Turbine Condensate Polishing Plant : Quantity of activated Carbon filter.	**C**	Activated Carbon Filters shall be Three
67.	Part II : Technical Section - 3.0,	4 of 34	1.1.1	Fire water storage Tank Capacity	**C**	Fire water storage tank capacity shall be 2X 4100 cum
68.	Part II : Technical Section - 4.0,	12 of 28	2	UF Capacity	**C**	UF Skid shall be 2W+1S and each stream permeate flow shall be 120 m3/hr.
69.	Process Flow Diagram PC161-7112/7/7113-0046			Vendor scope – Fire water Tank & filter water tank	**C**	Fire water Tank & filter water tank shall be in bidder scope
70.	Part II : Technical Section - 3.0,	21 of 34	4.0	It may also be mentioned that operation of WPTP and DM plants during the initial 12 months is expected to be intermittent. Contractor to plan manpower deployment considering intermittent operation of WPTP and DM plant during first year as per requirement of Ammoniaand urea plant contractor.	**A**	The month wise Process water & DM water requirement schedule is enclosed. Bidder to plan their manpower deployment accordingly.  UTILITIES REQUIRED.pdf
71.	Part II : Technical Section - 3.0,	22 of 34	4.0	**Mechanical Maintenance** Top up/ replacement of resin's /filters media, & repair of lining of vessels, acid/alkali & other chemicals shall also be in the	A	Supply of all chemicals and consumables required for the Operation and Maintenance of the plant during start-up, pre-commissioning, commissioning, trial runs and performance guarantee test runs upto Preliminary Acceptance Test of complete system + 3 months during O&M period shall be in the scope

				scope of contractor.		of supply of the Vendor. The month wise DM water and Treated water requirement schedule may be referred for consideration of chemical consumption. It is further clarified that chemical consumption after commissioning of 1 stream till PAC of plant shall be in bidders scope. The month wise process water & DM water requirement schedule from commissioning of one stream to PAC is enclosed herewith.
72.	General			Termination points	**M**	Tie in points/Coordinates for WTP, DM and Condensate Polishing Plantshall be provided by owner at package battery limit. Bidder to provide their layout.Further, the same shall be finalised during detailed engineering
73.	Part II : Technical Section - 2.0,	3 of 6	1.2 & 1.3	Condensate influent quality	**C**	Oil content to be considered as free oil.
74.	Part II : Technical, Section - 4.0,	4 of 28	2.2	General - Turndown	**M**	Minimum Turndown ratio for the Plant under bidder's scope shall be 50 %
75.	General			CLO_2 SYSTEM	**C**	CLO2 System: For Raw water 5 kg/hr (1W+1S) For Drinking water 1 kg/hr (1W+1S) Dosing Pump: (1W+1S) for each
76.	General			WPTP - Chemical Consumption (Guarantees)		Bidder to submit minimum chemical consumption/m3 figures in their technical bid. PMC/Owner reserves the right to assess the dosages. Bidder has to mandatory submit the above details in their technical bid
77.	General			B.L Pressure of utilities	**M**	Following utilities shall be made available at pressure indicated below at Vendor's battery limit (± 0.5 kg/cm^2): 1) Cooling water make up pump : 6.5 kg/cm^2g 2)Service water Pump 6.0 kg/cm^2g 3) Polished/DM water transfer pump 6.5 kg/cm^2g

						4) Drinking water pump for plant distribution: 7.0 Kg/cm^2g. 5) Drinking water pump for Township distribution: 7.0 Kg/cm^2g. However, availability of above utilities with pressure figures at battery limit shall be finalized and in case of any variation beyond the, the same shall be mutually agreed.
78.	General				**C**	For calculation of guaranteed power consumption only continuous running motor shall be considered. Following continuous running drives shall be considered A) WTP 1) Flash mixer &Floculator 2) Filter feed pump 3) DM Plant feed pump 4) FeCL3 Dosing pump 5) Lime Solution Dosing Pump 6)CLO2 Dilution pump B) DM Plant 1)Degasser water transfer pump 2)Degasser Blower 3) UF Feed pump 4)Regeneration Water pump C) CPU Process Condensate : 1) ACF Feed pump Turbine Condensate : 1) Cartridge filter feed pump
79.	Part II : Technical Section - 7.0,	5	1.4	Sustained Load Test Guarantee	**M**	During the Sustained Load Test the contractor will demonstrate that the WPT,DM & CPU operate for a minimum of 7 days at an aggregate output of min. 95% of the rated capacity.

80.	General				**C**	For Stream #1 of WTP & DMW, Commissioning shall mean the operation of Stream or Plant at Turn down capacity and as per guarantee quality norms on manual mode (excluding PLC based control system)
81.	Part II : Technical Section - 2.0	5 of 6	2.2	Polished Water Quality From DM Plant / CPU (Guarantee)	**M**	Total Iron content as Fe shall be <0.01 mg/kg

LEGEND:

M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

INTER-OFFICE MEMORANDUM

From:	AGM (NETRA)	**To:**	GM (INST.)- PDIL
Our ref.:	NETRA/GCL/WATER/ 1193 /2018	**Your ref.:**	EMAIL / IOM;
Date:	27-04-2018	**Date:**	16-04-2018

Kind Attention: **Sh.** S K TRIPATHI

SUBJECT: REPORT ON WATER ANALYSIS : PDIL

We had received 01 Nos. of water sample on 17-04-2018 from your station. The samples have been evaluated for desired parameters. The said report is enclosed herewith.

NOTE:
- Nil.
- .

(**Dr. R. Das**)

Copy to:

1. *Office copy.*

NOTE: Kindly return the duly filled feedback form to us.

NTPC Energy Technology Research Alliance (NETRA)
GREEN CHEMISTRY LABORATORY

WATER ANALYSIS REPORT

(A) *Brief Description:*

Name of Client & Project	SH. S K TRIPATHI; GM(INST)-PDIL			
Number of samples	01 No.	Sample type :	WATER- Gorakhpur	
Your reference No. & Date	EMAIL; Date- 16-04-2018			
Test requirement	General Water Analysis			
Date of receipt at NETRA	17-04-2018	Completed on	27-04-2018	
NETRA Report No. & Date	NETRA/GCL/WATER/1193/2018, Dated- 27-04-2018			
Number of pages in report	02			

(B) Analysis result:

SOURCE: PDIL	Expressed as	GORAKHPUR SITE
Parameter		1193/1
Temperature	°C	28
pH at 27 deg.C	*	7.8
Turbidity	NTU	9
Conductivity at 27 deg.C	µs/cm	430
Dissolved Oxygen at 27 °C	ppm O2	6.5
Total Dissolved Solids (TDS)	mg/litre	314
Total Suspended Solids (TSS)	mg/litre	11
P- alkalinity	ppm $CaCO_3$	0
M- alkalinity	ppm $CaCO_3$	156
Total hardness	ppm $CaCO_3$	196
Calcium hardness	ppm $CaCO_3$	100
Magnesium hardness	ppm $CaCO_3$	96
Sodium	ppm Na	16
Potassium	ppm K	2
Iron - Total	ppm Fe	0.05
Chloride	ppm Cl	18
Sulphate	ppm SO_4	48
Nitrate	Ppm NO_3	0.5
Reactive silica	ppm SiO_2	7
Colloidal Silica	ppm SiO_2	5
Zinc	ppm Zn	0.02
Manganese	Ppm Mn	0.01

TEST METHOD : IS-3025; Ion Chromatography & AAS

Dr. R. Das / AGM (NETRA)
GREEN CHEMISTRY LABORATORY

NOTE:

1. Testing was done as per relevant methods mentioned. The results are related only to the item tested and as on received basis. The report shall not be reproduced except in full, without the written approval of NETRA (NTPC).
2. Any anomalies / discrepancies in the test report should be brought to our notice within 05 days from the date of issue of test report as samples (if remain) will be disposed off there -after.

UTILITIES REQUIRED AS PER TABLE SCHEDULE

SR. NO.	UTILITY	UNIT	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27
1	DM Water	m3/hr	25	30	30	30	30	162	162	200	220	330	330	330	330	330
2	Process Water	m3/hr	25	25	25	25	25	560	560	710	570	570	800	800	800	800
3	Fire Water	m3/hr	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1	NOTE-1
4	Potable Water	m3/hr	30	30	30	30	30	30	30	30	30	30	30	30	30	30

NOTE:

1) Fire water shall be made available by vendor from end of 14th month.

WTP ,DM & CPU PLANT; HURL GORAKHPUR
NIT NO.: PNMM/PC161/E/001
CORRIGENDUM -4.0 TECHNICAL(ELECTRICAL), DATE:04.05.2018

SL. NO	REFERENCE OF BIDDING DOCUMENT				AMENDMENT TYPE	AMENDMENT
	Part/Sec.	Page No.	Clause No.	Description as per NIT/Amendment	M/D/A/C	
	PC161-G001-P-II/Sec.-5.3 rev. 0	04 of 80	1.3	The minimum scope….	C	Air pressurization & ventilation system is not required in cable cellar/gallery of substation.
	PC161-G001-P-II/Sec.-5.3 rev. 0	11 of 80	5.1.e)	All outdoor lighting … from outdoor lighting bus	M	All outdoor lighting … from outdoor lighting bus. Aviation light shall be provided if required as per ICAO regulation.
	PC161-G001-P-II/Sec.-5.3 rev. 0	11 of 80	5.2	DC Power…..220 V DC Distribution Board to be located in the Sub-Station.	C	DC Power…..220 V DC Distribution Board to be located in the Sub-Station. For DC battery backup time refer Cl. No. 9.6 b) of doc. no. PC161-G001-P-II/Sec.-5.3 rev. 0 and for ACUPS power (provided by owner) battery backup time is also for 1hour.
	PC161-G001-P-II/Sec.-5.3 rev. 0	14 &15 of 80	7.3,7.4 & 7.5	Protective relays shall be of latest version….. part of protective device.	C	Protective relays shall be of latest version….. numerical relay having serial port for monitoring. Energy management is in owner's scope however numerical relay shall have communication on IEC-61850 protocol in redundant mode and meter shall have communication on MODBUS protocol.
	PC161-G001-P-II/Sec.-5.3 rev. 0	17 of 80	7.8	Bare minimum protection for power distribution…	C	DC supply supervision relay (80) shall be provided in the Switchgear with provision for annunciation locally at switchboard.
	PC161-G001-P-II/Sec.-5.3 rev. 0	21 of 80	9.3.1.d & 9.3.3(ii)	LV Switchboard above 1600 Ampere… complete 415V switch boards shall be IP-54. Low voltage switchboards… protection shall be IP 52.	C	For IP protection Cl. No. 9.3.1 (d) shall prevail.
	PC161-G001-P-II/Sec.-5.3 rev. 0	21 of 80	9.3.5.b	240V single front, non-draw out type Emergency LSDB for power supply to Emergency lighting fixtures.	C	240V single front, non-draw out type Emergency LSDB for power supply to Emergency lighting fixtures. LSDB (N) shall be fed from MLDB (bidder's scope) & LSDB (E) shall be fed from EMLDB (bidder's scope).
	PC161-G001-P-II/Sec.-5.3 rev. 0	24 of 80	9.3.3.x)	Motor rated below 75 KW rating… draw-out type in all the switchboards.	M	Motor rated below 75 KW rating… draw-out type in all the switchboards. Power feeders of rating 250 Amp. & below shall be fed from SFU (refer PDS 404) and power feeders rating

SL. NO	REFERENCE OF BIDDING DOCUMENT				AMENDMENT TYPE	AMENDMENT
	Part/Sec.	Page No.	Clause No.	Description as per NIT/Amendment	M/D/A/C	
						above 250 AMP to 630 AMP shall be provided with MCCB, ACB power feeder shall be provided above 630 AMP.

LEGEND:

M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

WTP ,DM & CPU PLANT; HURL GORAKHPUR
NIT NO.: PNMM/PC161/E/001
CORRIGENDUM -4.0 TECHNICAL(INSTRUMENTATION), DATE:04.05.2018

SL. NO	REFERENCE OF BIDDING DOCUMENT				AMENDMENT TYPE	AMENDMENT
	Part/Sec.	Page No.	Clause No.	Description as per NIT/Amendment	M/D/A/C	
	PC161-E001-P-II/5.4	46 of 75	8.1 Pt.d	PLC control system	C	All the closed loop shall be redundant
	PC161-E001-P-II/5.4	61 of 75	12	2 Nos. of Level measurement of two different principle shall be provided for storage tank level measurement	C	For each storage 2 Nos. of Level measurement of two different principles shall be provided.
	PC161-E001-P-II/5.4	3 of 75	1.0	Common PLC system for Water treatment package plant.	C	Common PLC has been considered for WTP package and bidder to ensure segregation of individual plant level signals at AI/AO/DI/DO card level so as to ensure the reliability of the system
	PC161-E001-P-II/5.4	63 of 75	Annexure-1	Instruments Accuracies	M	Accuracy for the instruments shall be % of reading and shall be supplied with wet calibration certification.
	PC161-E001-P-II/5.4	54 of 75		Instrumentation cable trays	C	For instrumentation FRP perforated cable trays/cable ducts shall be provided as per NIT.
	PC161-G-101-P-II/11.0			Instrument vendor list	M	Additional vendor list enclosed to be consider by the bidders

LEGEND:

M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

Sl. No.	IINSTRUMENTATION ITEM	PDIL	BIDDER'S REPLY
1	SILICA ANALYSERS	**FORBES MARSHALL**	
2	CHLORINE ANALYSER	**AWA**	
		B&C ELECTRONICS SRL	
3	MOISTURE ANALYSERS	**SERVOMAX**	
		MICHELL INSTRUMENTS LTD	
		TELEDYNE ANALYTICAL INSTRUMENTS	
4	GAS DETECTION SYSTEM	**MSA**	
		DETCON INC	
		DETECTOR ELECTRONICS CORP (KIDDE)	
		NET SAFETY MONITORING INC	
5	FIRE ALARM SYSTEM	**TYCO FIRE SECURITY INDIA PVT LTD**	
		EDWARD INTERNATIONAL	
6	PC / SERVERS	**HP**	
7	FLOW ELEMENT: ORIFICE/ VENTURI/ FLOW NOZZLE	**STAR MECH CONTROLS INIDA PVT LTD**	
		EUREKA INDUSTRIAL EQUIPMENTS P LTD	
8	PITOT TUBE/ ANNUBAR	**MINCO INDIA**	
		STAR MECH CONTROLS INIDA PVT LTD	
		THERMO FISHER SCIENTIFIC	
9	ROTAMETERS	**KROHNE MARSHALL PVT. LTD.**	
		YOKOGAWA	
		TOKYO KEISO CO. LTD.	
		ROTA YOKOGAWA GMBH & CO. KG	
		ASA SPA	
		HEIRICH	
10	MASS FLOW METER (CORIOLIS TYPE)	**DANIEL MEASURMENTS**	
11	VORTEX METER	**BOPP & REUTHER MESSTECHNIK GMBH**	
12	MAGNETIC FLOW METER	**KROHNE MARSHALL PVT. LTD.**	
		E&H	
13	PRESSURE & D/P TRANSMITTERS	**HONEYWELL AUTOMATION INDIA LIMITED**	
		YOKOGAWA LIMITED	
14	ULTRASONIC FLOWMETERS	**DANIEL MEASURMENT**	

15	GWR	**MAGNETROL**	
16	TANK LEVEL INSTRUMENTS	**ROSEMOUNT TANK RADAR**	
17	SPECIAL LEVEL SWITCHES (VIBRATION FORK/RF ADMITTANCE)	**MAGNETROL**	
18	TEMPERATURE ELEMENTS (THERMOCOUPLE, RTD)	**PYRO ELECTRIC INSTRUMENTS GOA PVT. LTD.**	
		TEMPSENS INSTRUMENTS (I) PVT. LTD.	
		GENERAL INSTRUMENTS CONSORTIUM	
		GOA INSTRUMENTS INDUSTRIES LTD	
19	RADIATION PYROMETER	**LUMA.SENSE**	
20	ELECTRIC ACTUATOR	**LIMITORQUE**	
21	SMART POSITIONER	**FLOWSERVE**	
		FISHER	
22	SS TUBES	**RATNAMANI**	
		HEAVY METAL AND TUBES	
23	TUBE FITTINGS (FOR CONTROL VALVES, ANALYSERS, SAMPLING SYSTEM)	**COMFIT**	
		HYDRO PNEUMATIC	
		ASTEC	
		FLUID CONTROLS	
24	INSTRUMENT VALVE MANIFOLD	**COMFIT**	
25	INSTRUMENT MINIATURE VALVES	**COMFIT**	
26	INSTRUMENTS COMPENSATION, POWER AND CONTROL CABLE	**CORDS CABLES**	

WTP ,DM & CPU PLANT; HURL GORAKHPUR
NIT NO.: PNMM/PC161/E/001
CORRIGENDUM -4.0 TECHNICAL(STATIC), DATE:04.05.2018

SL. NO	REFERENCE OF BIDDING DOCUMENT				AMENDMENT TYPE	AMENDMENT
	Part/Sec.	Page No.	Clause No.	Description as per NIT/Amendment	M/D/A/C	
1	PC161-G-101-P-II/5.2.1 Rev P,	5 of 44,	1.15	**Nitrogen filling :** All process equipments shall be supplied with Nitrogen filled. In case of equipment assembled and welded at site, it shall be filled with N2 after testing at site. Dry Nitrogen shall be filled at a pressure of 0.5 Kg/cm2g and equipment shall be fitted with a pressure gauge and valve.	M	All static equipments shall be supplied with Nitrogen filled. In case of static equipment assembled and welded at site, it shall be filled with N2 after testing at site. Dry Nitrogen shall be filled at a pressure of 0.5 Kg/cm2g and equipment shall be fitted with a pressure gauge and valve.
3	PC161-G-101-P-II/5.2.1 Rev P	12 of 44	2.2.16	**PWHT requirement**: Equipment under Caustic, amine, hydrogen, Lethal & sour (Wet H2s) service shall essentially be PWHT with 100 % radiography. The hardness of the parent weld, weld & HAZ shall be Limited to 200 BHN in such cases	M	**The clause shall be considered revised as follows:** Equipment under Caustic service shall essentially be PWHT with 100 % radiography. The hardness of the parent weld, weld & HAZ shall be Limited to 200 BHN.
4	PC161-G-101-P-II/5.2.1 Rev P	20 of 44	3.6.1	***Rubber lining thickness :*** The type of rubber (i.e. Natural, Butyl, Nitrile, Ebonite, and Hypalon etc.), its minimum Thickness shall be 5 mm & hardness shall be decided as per design code/specification	M	**The clause shall be considered revised as follows:** The type of rubber (i.e. Natural, Butyl, Nitrile, Ebonite, and Hypalon etc.), its minimum Thickness shall be 4.5 mm & hardness shall be decided as per design code/specification.

LEGEND:
M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

WTP ,DM & CPU PLANT; HURL GORAKHPUR
NIT NO.: PNMM/PC161/E/001
CORRIGENDUM -4.0 TECHNICAL(PIPING), DATE:04.05.2018

SL. NO	REFERENCE OF BIDDING DOCUMENT				AMENDMENT TYPE	AMENDMENT
	Part/Sec.	Page No.	Clause No.	Description as per NIT/Amendment	M/D/A/C	
1	P-II/ Sec.5.2.3 (Design philosophy-Piping)			PMS/VMS	A	Following Pipe classes are attached : a) **B24RL** for CS rubber lined, Equivalent BIS specification shall also be acceptable. b) **B24P** for CPVC
2	P-II/ Sec.5.2.3 (Design philosophy-Piping)			PMS/VMS	A	CS FRP lined piping material specification : Material specification shall be as per pipe class B24RL except rubber lining. Specification for FRP lining shall be as per manufacturer std, which shall be provided at bidding stage.

LEGEND:

M: MODIFICATION, A: ADDITION, D: DELETION, C: CLARIFICATION

PIPING MATERIAL SPECIFICATION

Class: B24P

CLIENT :M/S.HURL.
PROJECT :AMMONIA /UREA FERTILIZER PROJECT(OSBL.)
LOCATION :GORAKHPUR(INDIA) .
PROJECTS & DEVELOPMENT INDIA LIMITED

PROJECT NO. PC160/161/EM250
DOC. NO. : PC160/161/EM250 -PDS-600
REV.:P

SERVICE	TEMPERATURE LIMITS (Deg.C)			
ETP	Ref.SI	Ref.SI		

RATING ASME	CORROSION ALLOWANCE	MATERIAL	BC TABLE	STRESS RELIEF	
150# FF	NONE	CPVC	R2		

ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE							
PIPE		2 - 3	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
PIPE		4 - 6	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
PIPE		8 - 10	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
PIPE		12 - 12	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
PIPE		1/2 - 3/4	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
PIPE		1 - 11/2	SCH 80	PE	CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE	PP552QC00	
FLANGE							
FLANGE		1/2 - 12	150#	FF	CPVC,ASTM F441,MF.STD/ASTM F441,SCH80	FL551QC01	
BLIND FLANGE							
BLIND FLANGE		1/2 - 12	150#	FF	CPVC,ASTM F441,MF.STD/ASTM F441,	BF551QC01	
GASKET							
GASKET		1/2 - 12	150#	3.0 MM THK FF	EPDM,MF.STD./ASME B16.21,FULL FACE	GS788PA01	
STUD & NUTS							
STUD & 2NUTS HVY HEX		-			TYPE AB7,,	SNFS00000	
FITTING (BW)							
BRANCH WELD WITH RP		1/2 - 12		PE	CPVC,ASTM F441,MF.STD/ASTM F441,	WB55JQC00	
FITTING							
REDUCER CONC.		1/2 - 12		PE	CPVC,ASTM F441,MF.STD/ASTM F441,	RC55JQC00	
REDUCER ECC.		1/2 - 12		PE	CPVC,ASTM F441,MF.STD/ASTM F441,	RE55JQC00	
TEE		1/2 - 12		PE	CPVC,ASTM F441,MF.STD/ASTM F441,	TE55JQC00	
UNION (GJ)		1/2 - 12		PE	CPVC,ASTM F441,MF.STD/ASTM F441,	UN55JQC00	
VALVES							
GATE VALVE		8 - 12	150#	FF	CPVC BODY W/ PP PLUG & EPDM SEATS,GAV500C,	GAV500C	
CHECK VALVE		1/2 - 12	150#	SOCW	CPVC BODY,CHV500C,	CHV500C	
BALL VALVE		1/2 - 2	150#	SOCW	CPVC BODY WITH CPVC BALL,BAV500C,	BAV500C	
BALL VALVE		3 - 6	150#	FF	CPVC BODY WITH CPVC BALL,BAV501C,	BAV501C	

:

GAV500C :FLANGED GATE VALVE ; 150# ;CPVC BODY(ASTM F441);POLY PROPYLENE PLUG; EPDM SEALS ;TAPERED CYLINDRICAL PLUG DESIGN; BOLTED BONNET; FLAT FACE; FLANGE DIMENSION AS PER ASME B16.1 .

CHV500C :SOCKET WELD CHECK VALVE ; 150# ; H OR V ; UNION OR BOLTED COVER ; BALL TYPE CPVC BODY(ASTM F441);TRIM AS PER BODY MATERIAL ; SOCKET WELD ENDS AS PER ASME B16.11 MANUFACTURER'S STANDARD CONSTRUCTION .

BAV500C :SOCKET WELD BALL VALVE ; 150# ; FLOATING BALL;FULL PORT ;WRENCH OPERATED ; CPVC BODY(ASTM F441);CPVC BALL;VITON O RING SEALS; SOCKET WELD ENDS AS PER ASME B16.11 MANUFACTURER'S STANDARD CONSTRUCTION .

BAV501C : FLANGED BALL VALVE ; 150# ; FLOATING BALL;FULL PORT ;WRENCH OPERATED ; CPVC BODY(ASTM F441);CPVC BALL;VITON O RING SEALS; FLAT FACE; FLANGE DIMENSION AS PER ASME B16.1 ;MANUFACTURER'S STANDARD CONSTRUCTION .

PIPING MATERIAL SPECIFICATION CLIENT :M/S.HURL.
PROJECT :AMMONIA /UREA FERTILIZER PROJECT(OSBL.)

PROJECT NO. PC160/161/EM250
DOC. NO. : PC160/161/EM250 -PDS-600
REV.:0

Class: B24RL

PROJECTS & DEVELOPMENT INDIA LIMITED

SERVICE	TEMPERATURE LIMITS (Deg.C)			
EFFLUENT,WASTE H2O,CHLORINATED H2O	Ref.SI	Ref.SI		

RATING ASME	CORROSION ALLOWANCE	MATERIAL	BC TABLE	STRESS RELIEF	
150# FF	NONE	CSRL	R1		

ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE							
PIPE		1 - 11/4	SCH XS	PE	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX721300	
PIPE		11/2 - 11/2	SCH XS	PE	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX721300	
PIPE		2 - 21/2	SCHSTD	BE	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX711300	
PIPE		3 - 4	SCHSTD	BE	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX711300	
PIPE		5 - 6	SCHSTD	BE	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX711300	
PIPE		8 - 10	SCH 20	BE	CS,ERW,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PP2A11300	
PIPE		12 - 12	SCH 20	BE	CS,ERW,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PP2A11300	
FLANGE							
FLANGE		1 - 2	150#	SO-FF	CS,ASTM A105,NATURAL RBR LND,ASME B16.5,3MM THK LING	FLX650801	
W.N.FLANGE		1 - 12	150#	WN-FF	CS,ASTM A105,NATURAL RBR LND,ASME B16.5,3MM THK LING	WNX6M0801	
SPECL BLIND		1 - 12	150#	FF	CS PLT,ASTM A516 GR.60,NATURAL RBR LND,ASME B16.48,3MM THK LING	SPX81PO01	
BLIND FLANGE							
BLIND FLANGE		1 - 12	150#	FF	CS,ASTM A105,NATURAL RBR LND,ASME B16.5,3MM THK LING	BFX610801	
GASKET							
GASKET		1 - 12	150#	FLAT	GASKET,SOFT RUBBER,ASME B16.21,3MM THK.	GSW190401	
STUD & NUTS							
STUD & 2NUTS HVY HEX		-			ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
FITTING (BW)							
CAP		1 - 12		BW	CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING	CPX910900	
ELBOW		1 - 6		BW	CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING	ELX910900	
ELBOW		8 - 12		BW	CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING	EL3A10900	
REDUCER CONC.		1 - 6		BW	CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING	RCX910900	
REDUCER CONC.		8 - 12		BW	CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING	RC3A10900	
REDUCER ECC.		1 - 6		BW	CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING	REX910900	
REDUCER ECC.		8 - 12		BW	CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING	RE3A10900	
TEE		1 - 6		BW	CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING	TEX910900	
TEE		8 - 12		BW	CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING	TE3A10900	
VALVES							
GATE VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8,GAV510,	GAV510	
GLOBE VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8,GLV510,	GLV510	
CHECK VALVE		2 - 12	150#	FLG	CS BODY ASTM A216 GR.WCB RUBBER LINED,CHV210D,	CHV210D	
BALL VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8M,BAV510,	BAV510	
BUTTERFLY VALVE		2 - 12	150#	FF	CS BODY ASTM A216 GR.WCB RUBBER LINED,BUV203,LUG TYPE	BUV203	

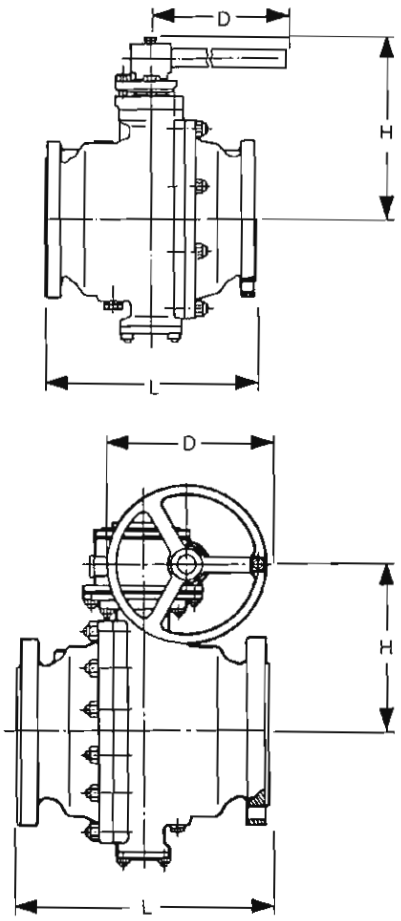
:

BRANCH TABLE : TABLE-R1
APPLICABLE PIPING MATERIAL SPECIFICATIONS: B24RL.
PRESSURE RATING <= 300#

```
   <-----------------B R A N C H    S I Z E------------>
       3   1 1   2         1 1
     M Q 1 Q M 2 M 3 4 6 8 0 2

    M
   3Q
    1      T
   1Q
   1M      E   T
    2      E   E T
   2M
    3      E   E E   T
    4      E   E E   E T
    6      E   E E   E E T
    8      E   E E   E E E T
   10      E   E P   P E E E T
   12      E   E P   P P E E E T

   A-


E  TE  REDUCING TEE
P  WB  BRANCH WELD WITH RP
T  TE  EQUAL TEE
```

PDIL

BALL VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	BAV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	SPLIT BODY, FULL BORE, FLOATING BALL = < 4" TRUN. MOUNT BALL > 4" LONG PATTERN
EXTENDED STEM	NO
WRENCH OPERATED	2" - 6"
GEAR OPERATED	8" - 12"
FIRE SAFE	YES
NOMINAL SIZE	2" - 12"
MATERIALS	
BODY	A 351 Gr. CF 8M
BALL	AISI 316
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

MANDATORY STANDARDS:

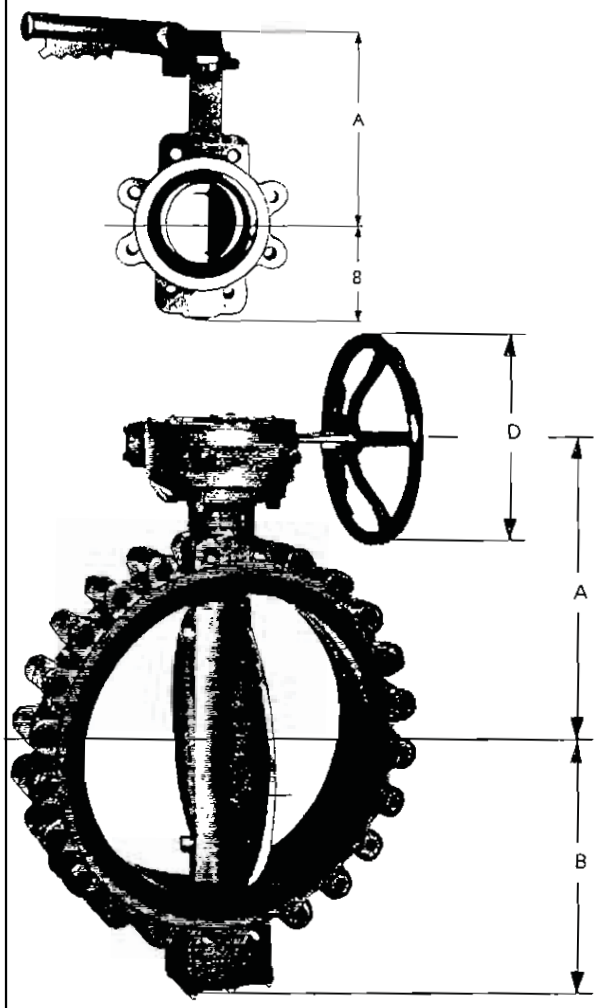
API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD

PDIL

BUTTERFLY VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**BUV 203**
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
	LUG TYPE WITH
	THREADED HOLES
	RUBBER LINED
GEAR OPERATED	YES > = 8"
NOMINAL SIZE	2" - 24"
MATERIALS	
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A 216 Gr. WCB
SHAFT	A 276 Gr. 316
SHAFT PACKING	PTFE
DESIGN CONDITIONS	
PRESSURE RATING	API 609

GENERAL

1. RUBBER LINING: THE WETTED SURFACES OF VALVE BODY SHALL BE FULLY LINED AND THE LINING SHALL EXTEND OVER THE FLANGE SEALING FACE
2. LEVER OPERATORS SUITABLE FOR THROTTLING PURPOSES SHALL BE PROVIDED FOR VALVES 6" AND SMALLER
3. FACE-TO-FACE DIMENSIONS SHALL BE PER API 609
4. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

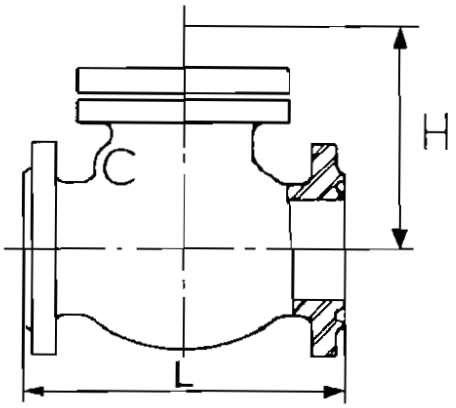
API 609, ANSI B16.5

NOTES:

a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING

PDIL

CHECK VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	CHV 210D
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MATERIALS	
BODY	A216 GR.WCB RUBBER LINED
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13Cr. FACED
HINGE PIN	13 Cr.
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

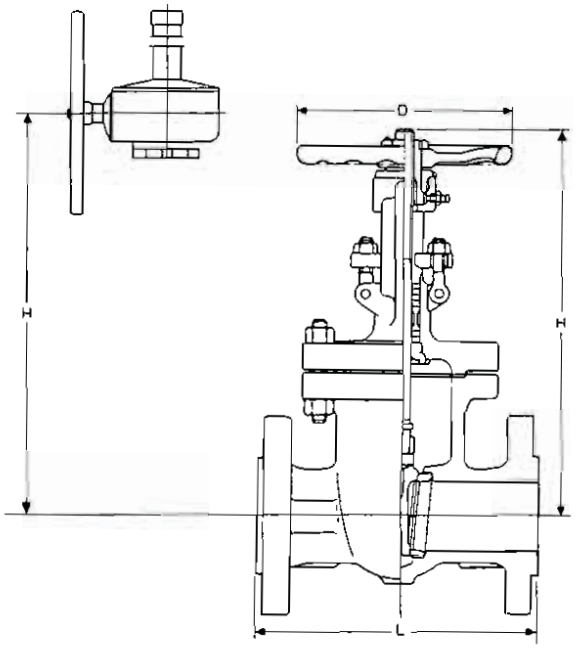
GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

GATE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	NON-RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
GATE TYPE	WSF OR WDF
GEAR OPERATED	YES > = 14"
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 24"
MATERIALS	
BODY	A 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304
GATE	AISI 304
STEM	A 276 Gr. 304
STEM PACKING	GRAFOIL /GRAPHITE
TRIM NUMBER	2
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

GATE YMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL		FLEXIBLE

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

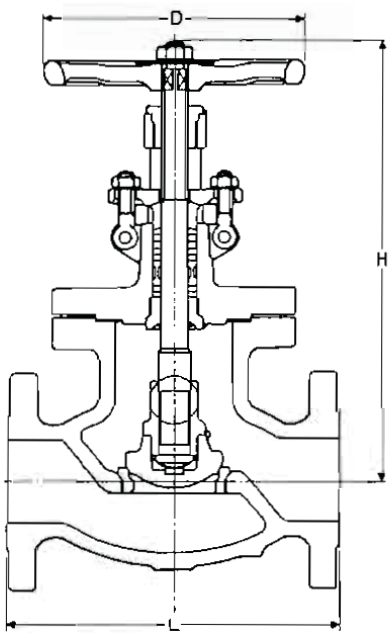
MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES:

PDIL

GLOBE VALVE



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	**GLV 510**
PRESSURE RATING CLASS	150
FACE	RF
CONSTRUCTION	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
DISC TYPE	PARABOLIC
GEAR OPERATED	NO
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 8"
MATERIALS	
BODY	A 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304
DISC	AISI 304
STEM	A 276 Gr. 304
STEM PACKING	GRAFOIL
TRIM NUMBER	
DESIGN CONDITIONS	
PRESSURE RATING	ANSI B16.34

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"		
Cv	50	120	220	490	900	1400	2100		

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO ANSI B16.34 AND MSS-SP 45, LOCATION E-F

MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOTES: