

Memorandum of Understanding

**M/s BHEL
Trichy – 620014**

and

M/s: _____

Address:

(Vendor Code:)

For supplying

DUPLEX STRAINERS

MOU NO : MOU / TPBHEL /DUPLXSTR REV.00

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SCOPE

The specification is bifurcated in two broad sections, one is the “standard section” another is “project specific section”.

Project specific section is the variable part of the specification. It contains all the requirements of a specific project over and above the requirements of the standard section.

Memorandum of Understanding (MOU) for supplying DUPLEX STRAINERS.**1.0 GENERAL:**

- 1.1 Sections 1.0, 2.0, 3.0 and 4.0 are standard and Section 5.0 alone will be furnished along with enquiry to the vendors for their acceptance.
- 1.2 In case of any difference between the details given in Section 5.0 and other sections, Section 5.0 shall be considered as final and binding and the vendors shall meet this requirement for that particular project.
- 1.3 Point wise compliance to this specification is required. Deviations, if any, shall be brought out during offer stage itself.
- 1.4 Pre commissioning spares (if applicable) with price break up as per the list (vide Section 5.0) shall be supplied along with the equipment.
- 1.5 Two years recommended Spares list(vide Section 5.0) with price break up, if required, shall be enclosed.
- 1.6 If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the equipment.
- 1.7 Trouble-free operation of the equipment shall be guaranteed for a period of 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.
- 1.8 Materials shall be dispatched on "Door Delivery with or without Consignee Copy attached basis to avoid demurrage at transporter's go down".
- 1.9 Since the vendors works alone is approved by BHEL, it is agreed the vendor will manufacture this item in their own works only and will not off-load the jobs to any other suppliers without the written approval by BHEL. All components shall be packed in such a way that they should not get damaged during transport.
- 1.10 BHEL and the Vendor shall have an involvement which will commence at bid stage and follow through the completion and acceptance, thus ensuring total conformity to Purchaser's requirements.

2.0 SPECIFICATIONS**2.1 Scope**

This specification covers design, manufacture, inspection, testing, marking, identification, packing and supply of **FUEL OIL DUPLEX TYPE 6-PORT INTEGRAL CHANGE OVER COCK STRAINER** as per the specification that follows. Technical parameters for equipment design are furnished in Section-1 to 4. For quantity, scope of supply and special requirements refer Section-5.

This is a general specification dealing with technical requirements as specified under scope. Contract requirements and special requirements (if any) for a particular project are specified in Section-5.

The extent of supply stated herein is not necessarily exhaustive and shall not relieve the vendor from his responsibility to provide goods and services necessary to satisfy the performance criteria and guarantees specified.

2.2 Codes & Standards:

The equipment shall be designed to meet the governing standards as applicable and also meet with the local standards where the equipment is installed. In case of any information not specified in this technical delivery conditions these standards will be binding.

2.3 Technical specification:

- a) The fuel oil strainer procured for HFO application shall be suitable for HFO/LSHS/HPS/Drain oil and other heavy fuel oils. The fuel oil strainer procured for LFO application shall be suitable for LFO/LDO/HSD and other light fuel oils.
- b) Duplex, basket type of compact design with preferably 6-Port integral changeover cock.
- c) The net Free flow area of filter element shall not be less than six times the specified line size, per section. In case of pleated element design, the foldings shall be properly spaced and guided at the end plates, so that they do not cluster and they do not make the free flow area ineffective.
- d) There shall not be flow interruption while manipulating the changeover cock.
- e) The changeover cock shall offer good seat closure tightness and the idle section shall be serviceable when the other is working.
- f) The changeover cock shall be of single lever and of 90° operation.
- g) The pressure drop shall be less than 0.1 bar for suction strainer and 0.2 bar for the discharge strainer at specified maximum viscosity and flow rate, with clean element. The type of strainer suction or discharge will be specified in enquiry.
- h) The above figures shall be less than 0.35 bar and 0.7 bar respectively with 50% clogged element.
- i) Flow across the filter basket shall be from inside to outside and of sturdier construction to accept higher operating differentials.
- j) Body shall be of cast iron or fabricated steel for suction service cast steel or fabricated steel for discharge service.

- k) Filter mesh and support sheet shall be of SS 321/304.
- l) HFO strainer shall be with steam jacketing for maintaining the oil flow temperature. Steam operating pressure 24 kg/cm²(g). Steam operating temperature 290 °C. Steam jacket shall cover the body so that the heat is dissipated to oil at maximum possible extent.
- m) LFO strainer shall be without steam jacketing.
- n) Design Parameters:

Flow temperature maximum shall be 50deg.C for LFO, 60 deg.C for HFO suction, 145deg.C for HFO. Operating pressure maximum shall be 6bar for suction strainers and 30bar for delivery strainers. Pour point is 12 - 21deg.C for LFO and 25deg.C for HFO.

Degree of filtration shall be as follows:

 - i. HFO suction – 500 microns
 - ii. Drain oil suction – 500 microns
 - iii. HFO discharge – 250 microns
 - iv. LFO suction – 250 microns
 - v. LFO discharge – 250 microns
- o) Flange gaskets provided shall be suitable for oil service and shall not have any damages. After hydraulic test of strainer assembly, the gaskets shall be replaced by a defect free new gasket.
- p) Pressure equalizing valve shall be provided to equalize the pressure among the filter baskets during change over operation.
- q) Suitable support provision shall be given for the duplex strainer. Central basket with change over cock shall also be suitably supported.

2.3.1 Connections and Nozzle Stubs

- a) Inlet/Outlet flanges as per ANSI to specified rating (150 class for suction strainers and 300 class for delivery strainers) and of size equal to the specified line size and arranged on either side of body.
- b) Drains - 100mm long 1" SCH40 pipe for HFO and ½" SCH40 pipe for LFO with plug at the body sides, on the outlet nozzle end.
- c) Vents - 100mm long ½" SCH40 pipe with plug on the cover top.
- d) Pressure taps - 1" SCH40 pipe with plug for HFO strainers and ½" SCH40 pipe with plug for LFO strainers. Pressure taps one each at suction pipe and delivery pipe shall be provided.
- e) Suitable maintenance provision shall be provided for six port change over cock.

2.3.2 Duplex strainer sizes

Following sizes of strainers are standardized and will be enquired in future. Vendor shall prepare standard documents against each size and shall offer the same documents for any future enquires against this MOU specification. The drawings and data sheets will not be approved for each contract. However one time approval for each type and size of duplex strainer will be provided by BHEL. Vendor may use the documents for inspection for any PO based on this MOU specification.

Table 2.3.2.1

S.No.	Description	Flow max. (LPM) #
2.3.3.1	Drain oil suction – NB50 – Class 150	65
2.3.3.2	HFO suction – NB80 – Class 150	140
2.3.3.3	HFO suction – NB100 – Class 150	275
2.3.3.4	HFO suction – NB150 – Class 150	575
2.3.3.5	HFO suction – NB200 – Class 150	1000
2.3.3.6	HFO suction – NB250 – Class 150	1600
2.3.3.7	HFO suction – NB300 – Class 150	2300
2.3.3.8	HFO suction – NB350 – Class 150	2670
2.3.3.9	HFO suction – NB400 – Class 150	3420
2.3.4.1	HFO discharge – NB50 – Class 300	325
2.3.4.2	HFO discharge – NB80 – Class 300	715
2.3.4.3	HFO discharge – NB100 – Class 300	1400
2.3.4.4	HFO discharge – NB150 – Class 300	2875
2.3.4.5	HFO discharge – NB200 – Class 300	5000
2.3.4.6	HFO discharge – NB250 – Class 300	8000
2.3.5.1	LFO suction – NB50 – Class 150	65
2.3.5.2	LFO suction – NB80 – Class 150	140
2.3.5.3	LFO suction – NB100 – Class 150	275
2.3.5.4	LFO suction – NB150 – Class 150	575
2.3.5.5	LFO suction – NB200 – Class 150	1000
2.3.5.6	LFO suction – NB250 – Class 150	1600
2.3.5.7	LFO suction – NB300 – Class 150	2300
2.3.5.8	LFO suction – NB350 – Class 150	2670
2.3.5.9	LFO suction – NB400 – Class 150	3420
2.3.6.1	LFO discharge – NB50 – Class 300	325
2.3.6.2	LFO discharge – NB80 – Class 300	715
2.3.6.3	LFO discharge – NB100 – Class 300	1400
2.3.6.4	LFO discharge – NB150 – Class 300	2875
2.3.6.5	LFO discharge – NB200 – Class 300	5000
2.3.6.6	LFO discharge – NB250 – Class 300	8000

- Flow maximum value is furnished for calculation purpose.

3.0 DOCUMENTS TO BE SUBMITTED**3.1 Along with Offer.**

- 3.1.1 Compliance to the MOU (MOU number, as applicable, shall be confirmed)
- 3.1.2 Point wise compliance or deviations to the project specific requirements of section-5 of the MOU specification.
- 3.1.3 Overall dimensional assembly drawing for all the variants.
- 3.1.4 Cross sectional drawing with parts and materials identified with Basket assembly details.
- 3.1.5 Free flow area calculations for all the variants.
- 3.1.6 Pressure drop calculations for all the variants.
- 3.1.7 Filled in data sheet given in Section 5.

3.2 After Placement of Order/Along with the supply.

- 3.2.1 Following documents shall be submitted along with the supplies.
 - a. O&M instruction in soft version
 - b. Dimensional drawing
 - c. Cross section drawing with material identification and basket assembly details
 - d. Data sheets

4.0 TESTING, INSPECTION AND PACKING

- 4.1 Vendor shall follow the Quality Plan applicable for this project.
- 4.2 Check all the dimensions.
- 4.3 Pressure drop results for clean and dirty conditions of similar strainers from other sites (two sites) shall be submitted for purchaser's review.
- 4.4 Body hydraulic test with 1.5 times the cold working pressure.
- 4.5 Witnessing & verifying hydraulic testing.
- 4.6 Diverting cock seat leak test done at the operating pressure.
- 4.7 Check locations of nozzles, stubs and foot and squares of nozzles & flanges and orientation of flange drillings.
- 4.8 Verification of shop records for material and stage inspections.
- 4.9 Certificates on Chemical composition and Mechanical properties shall be furnished.
- 4.10 Visual Inspection of weld quality and workmanship, welding shall be checked by dye penetrant test
- 4.11 Welding shall be carried out by qualified welders with qualified procedures for which records will be shown for verification.
- 4.12 Verify main name plate & name tags on all nozzles & stubs.
- 4.13 Clearance for painting after ascertaining surface preparation.
- 4.14 Inward Inspection:
 - a) Verify works inspection reports, workmanship, finish, marking particulars and scope of supply.
 - b) Watch for damages.
 - c) Check all the mounting dimensions and terminal connections.
 - d) Random check on internals.

4.6 Painting, Protection, Packing, Supply and Identification:**4.6.1 Surface Preparation**

Weld slag & spatter shall be removed and the surfaces to be coated shall be free from contamination. Surface defects shall be removed by suitable methods. Sharp edges shall be smoothened by grinding. Prior to surface preparation oil, grease, drilling emulsions, cutting emulsions and preservative agents shall be carefully removed by suitable solvents. The surface shall be carefully dried with clean clothes to prevent the dissolved impurities from spreading over the entire surface. The surface shall be cleaned by wire brush and shot blasting if required. Proper adhesiveness of paint to the surface shall be ensured.

4.6.2 Marking

- a) Stainless steel name plate with the following boldly engraved shall be firmly fixed to the body :
Maker's name and Production Serial No., Service, BHEL Material Code, Tag No., Size and Rating of the Strainer Body, Degree of filtration and maximum allowable DP.
- b) Inlet/Outlet Nozzles and the diverting cock handle positions shall be legibly identified by metallic labels.

4.6.3 Painting

- a) Following hydraulic test and drying, all the interior surfaces shall be applied with rust preventive oil.
- b) All exterior surfaces shall be degreased, de-rusted and epoxy coated over red oxide primer. Also, refer section 5 for any special instruction on painting requirements.

4.6.3 Packing

4.6.3.1 After completing painting and marking, Inlet and Outlet nozzles shall be properly capped to prevent ingress of water and dust and all the openings shall be firmly capped.

4.6.3.2 Assemblies shall be packed in wooden crate with sufficient struts and packing materials and with water proof under-cover.

5 PROJECT RELATED INFORMATION

5.1 Project Name : PANKI(1x660 MW)
 5.2 Customer No : 1728
 5.3 Data sheet – STRAINER SIZE : 300 NB 150 # LDO Suction

UNITS: Flow: liquids in LPM; Pressure: Kg/cm²(g); Temperature:°C;

	Description	BHEL Requirement	Vendor
01	Service	LFO Suction	
02	Tag No.	LO01A, LO01B	
03	BHEL Matl. Code	A172814201005001	
04	Quantity	Two (2)	
05	Make	Vendor to fill	
06	Production Sl. No.	Vendor to fill	
07	Model No.	Vendor to fill	
08	Line Fluid	LDO	
09	Flow Maximum	2300	LPM
10	Pour point	12 - 21	Deg.C
11	Operating Pressure max.	06	Kg/cm ² (g)
12	Flow Temperature max.	50	Deg.C
13	Flow Sp. gravity	0.83	
14	Flow viscosity max.	20 cST(LDO)	
15	Line size	NB300	
16	Body size	* (minimum two times the line size)	
17	Body rating	ANSI150LBS	
18	Body material	Cast steel/ fabricated steel (specify grade *) SA210 GrA1/ SA106 Gr B/ SA516 Gr 70	
19	Cover material	A105/IS2062 Gr B	
20	Cock material	SA 106 Gr B/ SA516 Gr70	
21	Gasket material	Non Asbestos spiral wound gasket	
22	Body test pressure	9	Kg/cm ² (g)
23	Cock seat test pressure	6	Kg/cm ² (g)
24	Cock leak rate	0	
25	Perforated sheet detail	Vendor to fill	
26	No. of filter sections per basket	Vendor to fill	
27	Degree of filtration	250	Microns
28	Filtering direction	IN TO OUT	
29	Total filter area/section	Vendor to fill	Sq.cm
30	Net filter area/section	Vendor to fill	Sq.cm
31	DP when clean	Vendor to fill	Kg/cm ² (g)
32	DP at 50% clogged	Vendor to fill	Kg/cm ² (g)
33	Max. allowable DP	0.30	Kg/cm ² (g)
34	Mesh material	SS304	
35	Support gauze material	SS304	
36	Steam Jacketing	Not Applicable	
37	Equalising valve	Required	
38	IN / OUT nozzle	NB 300 FLG: ANSI 150 #	
39	Drain	½" SCH 40 x 100 LONG	
40	Vent	½" SCH 40 x 100 LONG	
41	Pressure gauge	½" SCH 40 x 100 LONG	
42	Testing code	ASME SEC VIII & XI	
43	Dimensional Drawing No.	2-42-000-02118	
5.4	Special requirements, if any		

5 PROJECT RELATED INFORMATION

5.1 Project Name : PANKI(1x660 MW)
 5.2 Customer No : 1728
 5.3 Data sheet – STRAINER SIZE : 50 NB 150 # Drain Oil Suction

UNITS: Flow: liquids in LPM; Pressure: Kg/cm²(g); Temperature:°C;

	Description	BHEL Requirement	Vendor
01	Service	Drain Oil Suction	
02	Tag No.	LO63A, LO63A1	
03	BHEL Matl. Code	L172814220002001	
04	Quantity	Two (2)	
05	Make	Vendor to fill	
06	Production Sl. No.	Vendor to fill	
07	Model No.	Vendor to fill	
08	Line Fluid	DO (LDO)	
09	Flow Maximum	65	LPM
10	Pour point	25	Deg.C
11	Operating Pressure max.	06	Kg/cm ² (g)
12	Flow Temperature max.	50	Deg.C
13	Flow Sp. gravity	0.83	
14	Flow viscosity max.	20 cSt	
15	Line size	NB50	
16	Body size	* (minimum two times the line size)	
17	Body rating	ANSI150LBS	
18	Body material	Cast steel/ fabricated steel (specify grade *) SA210 GrA1/ SA106 Gr B/ SA516 Gr 70	
19	Cover material	A105/IS2062 Gr B	
20	Cock material	SA 106 Gr B/ SA516 Gr70	
21	Gasket material	Non Asbestos spiral wound gasket	
22	Body test pressure	9	Kg/cm ² (g)
23	Cock seat test pressure	6	Kg/cm ² (g)
24	Cock leak rate	0	
25	Perforated sheet detail	Vendor to fill	
26	No. of filter sections per basket	Vendor to fill	
27	Degree of filtration	250	Microns
28	Filtering direction	IN TO OUT	
29	Total filter area/section	Vendor to fill	Sq.cm
30	Net filter area/section	Vendor to fill	Sq.cm
31	DP when clean	Vendor to fill	Kg/cm ² (g)
32	DP at 50% clogged	Vendor to fill	Kg/cm ² (g)
33	Max. allowable DP	0.30	Kg/cm ² (g)
34	Mesh material	SS304	
35	Support gauze material	SS304	
36	Steam Jacketing	Not Applicable	
37	Equalising valve	Required	
38	IN / OUT nozzle	NB 50 FLG: ANSI 150 #	
39	Drain	½" SCH 40 x 100 LONG	
40	Vent	½" SCH 40 x 100 LONG	
41	Pressure gauge	½" SCH 40 x 100 LONG	
42	Testing code	ASME SEC VIII & XI	
43	Dimensional Drawing No.	2-42-000-02118	
5.4	Special requirements, if any		

5 PROJECT RELATED INFORMATION

5.1 Project Name : PANKI(1x660 MW)
 5.2 Customer No : 1728
 5.3 Data sheet – STRAINER SIZE : 100 NB 300 # LDO discharge

UNITS: Flow: liquids in LPM; Pressure: Kg/cm²(g); Temperature:°C;

	Description	BHEL Requirement	Vendor
01	Service	LDO Discharge	
02	Tag No.	LO27A	
03	BHEL Matl. Code	L172814220008001	
04	Quantity	One (1)	
05	Make	Vendor to fill	
06	Production Sl. No.	Vendor to fill	
07	Model No.	Vendor to fill	
08	Line Fluid	LDO	
09	Flow Maximum	1400	LPM
10	Pour point	12 - 21	Deg.C
11	Operating Pressure max.	25	Bar
12	Flow Temperature max.	50	Deg.C
13	Flow Sp. gravity	0.83	
14	Flow viscosity max.	20 cST(LFO)	
15	Line size	NB100	
16	Body size	* (minimum two times the line size)	
17	Body rating	ANSI 300 LBS	
18	Body material	Cast steel/ fabricated steel (specify grade *) SA210 GrA1/ SA106 Gr B/ SA516 Gr 70	
19	Cover material	A105/IS2062 Gr B	
20	Cock material	SA 106 Gr B/ SA516 Gr70	
21	Gasket material	Non Asbestos spiral wound gasket	
22	Body test pressure	38	Kg/cm ² (g)
23	Cock seat test pressure	25	Kg/cm ² (g)
24	Cock leak rate	0	
25	Perforated sheet detail	Vendor to fill	
26	No. of filter sections per basket	Vendor to fill	
27	Degree of filtration	250	Microns
28	Filtering direction	IN TO OUT	
29	Total filter area/section	Vendor to fill	Sq.cm
30	Net filter area/section	Vendor to fill	Sq.cm
31	DP when clean	Vendor to fill	Kg/cm ² (g)
32	DP at 50% clogged	Vendor to fill	Kg/cm ² (g)
33	Max. allowable DP	0.30	Kg/cm ² (g)
34	Mesh material	SS304	
35	Support gauze material	SS304	
36	Steam Jacketing	Not Applicable	
37	Equalising valve	Required	
38	IN / OUT nozzle	NB 100 FLG: ANSI 300 #	
39	Drain	½" SCH 40 x 100 LONG	
40	Vent	½" SCH 40 x 100 LONG	
41	Pressure gauge	½" SCH 40 x 100 LONG	
42	Testing code	ASME SEC VIII & XI	
43	Dimensional Drawing No.	2-42-000-02117	
5.4	Special requirements, if any		