

	<u>BHARAT HEAVY ELECTRICAL LIMITED</u>			Enquiry No. :		
	<u>UNIT'S ADDRESS:</u>			Due Date :		
	<u>UNIT'S PHONE NO.:</u>			Supplier Qtn. No.:		
	<u>CONTACT PERSON'S NAME/DESGN./PHONE NO./E-MAIL</u> <u>(FROM PURCHASE DEPT.)</u>			Date :		
<u>SPECIFICATION CUM COMPLIANCE CERTIFICATION FOR</u>						
<u>FLOW DIVERTER</u>						
	NOTE:-					
	1. Vendor must submit complete information against all Clauses. The offer meeting clause 7.0 would only be processed.					
	2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.					
	3. The offer and all documents enclosed with offer should be in English language only.					
ADDRESS OF THE SUPPLIER :			ADDRESS OF LOCAL (BHOPAL/MP) AGENTS :			
TELEPHONE NOS.:			TELEPHONE NOS.:			
FAX NOS.:			FAX NOS.:			
E-MAIL ADDRESS :			E-MAIL ADDRESS :			

SCOPE: SUPPLY OF FLOW DIVERTER AS SPECIFIED BELOW						
SNO	DESCRIPTION FOR BHEL REQUIREMENT		SPECIFIED / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE :					
1.1	Purpose : The flow diverter is required for calibrating flowmeters either by a volumetric or a gravimetric method		Vendor to Note			
2.0	SCOPE OF SUPPLY					
2.1	Flow Diverter along with electronic device and associated items as per specification in clause no. 3.0 .	1 No.	Vendor to confirm			
2.2	The supply shall be complete in all respects and any device not particularly mentioned in the specifications, but essential for proper operation of the system is deemed to be included in the supply.		Vendor to confirm			
2.3	Recommended spares for Two years of operation like various seals/special seals, o-rings.	1 Set	Vendor to Specify & confirm			

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3.0	SPECIFICATION					
3.1	Broad specification are given below: The flow diverter (typical arrangement is shown in Sub clause no. 3.4) is a device necessary for calibrating flowmeters either by a volumetric or a gravimetric method. The diverter is the outlet of an open loop piping circuit comprising variable speed pumps, flowmeters,energy dissipater and diverter. During normal operation, the water goes back to main reservoir, during calibration phase, the water is diverted into a calibration tank and diversion time is to be accurately measured.		Vendor to confirm			
3.2	Hydro-mechanical main data					
3.2.1	Maximum discharge; vendor to specify maximum discharge value if more than 0.35 m ³ /s	0.35 m ³ /s or more	Vendor to confirm			
3.2.2	Minimum discharge; vendor to specify minimum discharge value if less than 0.02 m ³ /s	0.02 m ³ /s or less	Vendor to confirm			

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3.2.3	<p>Nozzle area: It is required that the diverter nozzle be fitted with a throttling device. Typical area for the case of fully open position of nozzle is given. The nozzle area (Area=0.0433 m²) should be lesser than incoming 300 mm diameter, so as to maintain positive pressure in the diverter as well as in incoming pipeline (purging). In absence of known discharge coefficient the following can be stated: the nozzle area shall be such that a net head of 0.5 m (measured in chamber to which the nozzle is attached) will allow 0.35 m³/s to be discharged. Ø300, Q = 0.35 m³/s Vo = 4.95 m/s $\Delta V = \sqrt{2g \times 0.5} = 3.13 \text{ m/s}$ V jet = Vo + ΔV = 8.08 m/s S nozzle = 0.35 / 8.08 = 0.0433 m² Pressure in incoming pipe will depend on losses in the diverter and will be reflected in discharge coefficient. Design value for offered Nozzle area to be specified</p>	Vendor to Note & Specify			
3.2.4	<p>Pressure rating: As the diverter will be preceded by an energy dissipater, the maximum water pressure rating in the flow diverter will be 20 mWC. At that pressure, the circular seals should be perfectly leak free and specified change-over time should not be exceeded</p>	Vendor to confirm			
3.2.5	<p>Change-over time: To be less than or equal to 0.2 seconds up to maximum discharge</p>	Vendor to confirm			
3.3	Mechanical main data / Arrangement				

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3.3.1	Diverter type: The knife-shaped swivel flap, actuated by amply dimensioned pneumatic cylinder via a system of levers, is pressed up against the particular limit stop required. On the front of the cutting body the metal plates, shaped like sectors of a circle, are sealed against water entering at the sides by means of rubber seals alternatively the diverter may be of swivel cylinder type with associated system.	Vendor to Note & Specify			
3.3.2	Adjustable nozzle throttling device: Two flaps operated via a system of levers and threaded rod are used to set the correct outlet cross section, in order to prevent air from entering even at minimum specified discharge and thus, maintain smooth operation. The nozzle itself consists of rubber tube, shaped by flaps. A device allowing continuous throttling adjustment, by manual control, is to be given. This device should ensure that pressure inside the diverter is above atmospheric pressure through out the flow range even when no energy dissipating device is in the calibration loop.	Vendor to Specify			
3.3.3	Supporting structure: It is intended to utilize one diverter either existing bigger one or the one asked in this specification. This will be installed at some distance from the gravimetric tank. The supporting structure, integral with diverter shall be designed and supplied by the vendor as per the sketch of arrangement at clause no. 3.4 of this specification. The height of Flow diverter center line from supporting structure base has to be 1650mm (This might be increased to accomodate BHEL weigh tank pipe, vendor to specify height if different from 1650mm). Material of supporting structure can be carbon steel.	Vendor to confirm & specify			
3.3.4	Housing: The housing and major coponents shall be made of stainless steel.	Vendor to confirm			

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3.3.5	Connection to incoming pipe: By means of standard, (350mm nominal) VICTAULIC joints. Connecting flange for the VICTAULIC joint should be made of stainless steel. The VICTAULIC joint is to be supplied by vendor. Size of the incoming connecting pipe to be specified by the vendor.	Vendor to confirm & specify			
3.3.6	Actuation: By means of double acting air pressure (pneumatic) cylinders. At maximum discharge actuation system should be designed to operate with pressurised air at maximum pressure of 5 bar. Air supply at 5 bar is already available in the laboratory. It may be noted the pressure of available air supply may be upto 8 bar. However the system should be designed to operate considering the air pressure as 5 bar only.	Vendor to confirm			
3.3.7	Start / Stop for time measurement:(typical method is shown below) Electronic Panel An electronic unit is to be installed at a distance 12 m from diverter detector head to electronic unit in panel and requiring cable of 20m length. Change over time in both direction ≤ 0.2 Second. This electronic unit should have a manual switch for actuation of diversion start/stop by pneumatic cylinders through solenoid valve & suitable controls.. It should also generate a signal (typical signal from movement of piston in pneumatic cylinders shown in clause 3.3.8) at the start and at the end of actuation during diversion. This signal will be fed to timer which is already available in the laboratory.	Vendor to note & specify			
3.3.8	Typical signal diagram : As shown below	Vendor to note & specify			

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	<p>The diagram illustrates the timing and voltage levels for three output pulses: CAL, RET, and CENT. The vertical axis represents the position of the control system, with three distinct positions: RET (top), CENT (middle), and CAL (bottom). Dashed lines indicate the 'END POSITION' for each. The horizontal axis represents time. Three output pulses are shown: 'OUTPUT PULS: CAL' (a single pulse at the CAL position), 'OUTPUT PULS: RET' (a single pulse at the RET position), and 'OUTPUT PULS: CENT' (a single pulse at the CENT position). Each pulse is labeled with '+24V' and '0V' levels.</p>				
3.3.9	Power Supply: For Electronic Panel, single phase electric power supply of $220 \pm 10\%$ volts, $50 \pm 1.5\%$ Hz; will be available at BHEL.	Vendor to Note			

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3.3.10	Outlet duct: This initial Outlet ducts is to be supplied by vendor. It will be integral with the supporting structure of the upper part. a. Drawing of Outlet rectangular duct on reservoir side is to be provided by the vendor. BHEL would manufacture the duct and weld it to the initial portion of the Outlet duct. b. Drawing of Outlet duct towards calibration tank i.e. rectangular section to circular section is to be provided by vendor. BHEL to manufacture it and weld it to the initial portion of the Outlet duct. Final drawings of the ducts to be submitted within two weeks from the date of issue of purchase order.	Vendor to Confirm			
3.3.11	Arrangement for mounting of pressure gauge: Flow diverter should be provided arrangement for mounting of pressure gauge at the top.	Vendor to confirm			

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3.4	<p>Typical Arrangement of Flow Diverter</p>				

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4.0	INSPECTION AND TESTING				
4.1	The diverter and its operating mechanism shall be completely assembled and tested before dispatch, in presence of BHEL representative. BHEL will depute one test engineer to suppliers works , in order to follow assembly and shop testing of the considered equipment. Test certificate to be included along with supply. Following tests are to be carried out in presence of BHEL engineer. a. Demonstration of working of Flow Diverter at the maximum discharge with water. There should be no leakage. b. Demonstration of changeover time and it should be less than 0.2 seconds at maximum discharge. c. Demonstration that time taken for movements both ways should be equal at different discharge.	Vendor to Confirm			
5.0	ERECTION AND COMMISSIONING				
5.1	Erection of the items would be done by BHEL at BHEL Bhopal.	Vendor to Note			
5.2	Vendor should depute their representative during commissioning of flow diverter. at BHEL Bhopal (Typically four to five days) till all commissioning activities related to flow diverter are completed.	Vendor to Note & Confirm			
6.0	DOCUMENTATION				
6.1	General arrangement/Overall dimention drawing is to be submitted along with offer	Vendor to Confirm & submit			

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6.2	Drawings indicating Overall dimensions and Mounting details to be finalized in consultation with BHEL. Documents containing detail mechanical electrical drawing ,mounting details, dimensions, technical details are to be supplied along with items.	Vendor to Confirm & Note			
6.3	Four set of Operation and maintenance manual, final detail drawings are to be supplied along with items.	Vendor to Confirm			
7.0	QUALIFYING CRITERIA				
7.1	Offered items should be similar to proven existing design of the vendor and existing proven item should be running in hydro turbine/pump model test laboratory/flow calibration laboratory for flow calibration for at least one year. A list of laboratories where these items are being used is to be given by supplier with offer giving following details .	Vendor to Confirm & submit			
7.2	Name of Customer/Laboratory with name of contact person where the system is installed.	Vendor to Submit			
7.3	Complete postal address ,email address, and phone nos.	Vendor to Submit			
7.4	Year of Commissioning	Vendor to Submit			
7.5	Application for which the item is used.	Vendor to Submit			
7.6	Performance certificate / proof from the Customer/Laboratory regarding satisfactory performance of the Flow Diverter.	Vendor to Submit			
8.0	STANDARDS				
8.1	Material, design, method and quality should broadly confirm to International Standards like ISO 4185:1980/cor 1:1993 or equivalent.	Vendor to Confirm			

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9.0	METRIC UNITS				
9.1	Dimensions on drawings and documents shall be in metric units. Concurrence of BHEL to be taken if sizes vary from standard nominal size.	Vendor to Confirm			
10.0	GUARANTEE :				
10.1	The equipment shall be guaranteed for trouble free operation for a minimum period of 12 months from the date of commissioning. Supplier should undertake to replace free of cost any material/ component found defective due to faulty material or workmanship in operation during the guarantee period.	Vendor to confirm			