

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : SPECIFICATION OF GOV HYDRO MECHANICAL CABINET (SERVO VALVE CONTROLLED MDV)	741590060	Page 1 of 15

PROJECT : DEVELOPMENT

(1) GENERAL

This specification covers detail of Gov HMC **as per schematic Drg. No. 22000049045 Rev.00** consisting of Servo valve, Manifold, Solenoid operated directional control valves, main distributing valve with spool position feedback device, Hydraulic Valve, test points, minimesse hose and electrical wiring along with junction box in the cabinet etc.

Front Panel shall be provided with various analog indicators, push buttons, Indicating lamps and control selector switch as per schematic drawing with suitable place approachable for operator. All wiring must be done suitably and terminated at terminal blocks mounted inside terminal box. The wiring must be properly clamped esthetically along with ferrule nos. Servo valve connector shall be wired up to terminal blocks by screen cable. Terminal box shall be of protection class IP 65.

All out going pipe connections should be suitably plugged / blanked for further connection by purchaser.

(2) SUPPLIER SCOPE OF SUPPLY:

Fabricated Hydro Mechanical Cabinet should be of not less than 1.6 mm thick sheet on structural frame as per overall dimension & connection and must be rigid and sturdy. (Supplier to submit drawing for approval before starting the manufacturing). All 4 side of the cabinet rigid doors (having swing of 180°) are required. On all doors, except front door, must be provided with sufficient louvers on top and bottom for proper ventilation.

- Pipes & fittings, Isolating valves, solenoid valves, hydraulic valves, manifold, Pressure switches, indicating meters, push buttons and selector switch etc. required to complete the cabinet assembly.
- Wiring inside the cabinet should be as per wiring diagram (Drg. No. 32083915028 Rev.00), this shall be given to successful vendor after placement of P.O.
- Illumination lamps (LED Type; 2 Nos.) with door switches (4 nos.) and Switch & socket (1 No.) to be provided.
- Testing of the cabinet at supplier works to be done as per BHEL Test Procedure.
- All name plates, Monogram, Inscription plates of all devices must be metallic.

REV.NO.		DISTRIBUTION.	QTY.	APPROVED:			
PREPARED				(PKB)			
CHECKED		HPE	01	PREPARED	CHECKED	ISSUED	DATE
APPROVED		MM(H)	04				
DATE				(YS)	(VKN)	(PKB)	13.11.18

- The following devices shall be mounted on front door of the cabinet:

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- a) Tachometer (TM) : 1 No.
- b) Gate Position Indicator (GPI) : 1 No.
- c) Gate Limit Indicator (GLI) : 1 No.
- d) Power (MW) Indicator (MWI) : 1 No.
- e) Pressure gauge (PG) : 1 No.
- f) Emergency Push Button with protective cover(PL-1) : 1 No.
- g) Indicating lamp for actuator “lock”(IL-1) : 1 No.
- h) Indicating lamp for actuator “unlock” (IL-2) : 1 No.
- i) Auto/Manual stay put selector switch, 2 position, : 1 No.
4 poles in each position (43A/M)
- j) Raise/Lower spring return switch, 2 position, : 1 No.
4 poles in each position (43L/R)
- vii) Two Nos. removable cable gland plates must be provided, one on top & one on bottom of the cabinet at suitable place.

(3) **TECHNICAL DETAILS:**

3.1 ELECTRICAL METERS:

Square dial, size 96X96 mm and suitable for panel cutout of 92X92 mm, dust proof, flush panel mounting type, back connection with ABS moulded case are required. All meters should conform in general to IS: 1248, 1983/84. The colour of the scale plate to be unfading white and the plate shall be stoved with black graduation and numbers, pointer movement to be 240 °.

Accuracy for all the meters to be $\pm 1.0\%$ of FS (Class 1).

Detailed specifications of the various meters are being given below:

A. Tachometer (TM):

Miliammeter, moving coil type taut band

- a). Input Range : 4-20 mA
- b). Calibration : 0 to 100 Hz.
- c). Dial scale marking shall be 240°.

B. Gate Position Indicator (GPI):

Miliammeter, moving coil type taut band

- a). Input Range : 4-20 mA
- b). Calibration : 0 to 100 %
- c). Dial scale marking shall be 240°.

C. Gate Limit Indicator (GLI):

Miliammeter, moving coil type taut band

- a). Input Range : 4-20 mA
- b). Calibration : 0 to 100 %
- c). Dial scale marking shall be 240°

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D. Power (MW) Indicator (MWI):

Miliammeter, moving coil type taut band

- a). Input Range : 4-20 mA
- b). Calibration : 0 to 100 %
- c). Dial scale marking shall be 240°.

3.2 PRESSURE GAUGE (0-160 kg/cm²) (PG):

Pressure Gauge shall be in the range of 0 – 160 kg/cm². Pressure Gauge shall be of circular dial, flush type mounting , size 150 / 160 mm having accuracy of $\pm 2\%$ FSD. Pressure gauge should be connected to isolating valve by mininess.

3.3 TEST PRESSURE GAUGE (0-160 kg/cm²)(TPG):

Pressure Gauge shall be in the range of 0 – 160 kg/cm². Pressure Gauge shall be of circular dial, flush type mounting inside the cabinet , size 150/160 mm having accuracy of $\pm 2\%$ FSD. Pressure gauge should be supplied along with 2 meter flexible hose & coupler to suit tests point TP1, TP2, TP3, TP4 & port connection C4

3.4 MANIFOLD ASSEMBLY FOR GATE CONTROL:

Manifold assembly consists of the following devices:

3.4.1 SERVO VALVE / SERVO PROPORTIONAL VALVE (65SV-G-1&2) :

2 Nos. Servo valve along with connector shall be given as free issue

(BHEL Scope of supply) after placement of P.O. to the successful bidder.

Make : Moog

Model Code : D634-XXXX -R24KX2MONSW2

3.4.2 Solenoid operated valve (Device no. 137-1) for actuator lock & Unlock

This is a 4 ways, 2 positions, Solenoid operated, detented spool, valve with manual over-ride facility

1. Valve size - $\phi 10$
2. Normal working Pressure - 100 kg/cm²
3. Operating medium - Turbine oil to ISO VG-68/46
4. Capacity of the valve - approx. 60 LPM or more
5. Manual over-ride facility - Required.
7. Solenoid type - Wet type (Oil immersed)
8. Insulation to DIN 40050 - IP 65 or better
9. Duty - Continuous
10. Supply Voltage - 220V DC continuously rated
11. Electrical connector - Large angled plug to DIN 43050 with indicator light
12. Seal material - VITON/NBR

The solenoids are to be marked / inscribed with (20G-46Ø-1) & (20G-46C-1)

(For hydraulic symbol refer DCG Drg. No. 22000049045 Rev.00)

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3.4.3 Solenoid operated valve (Device no. 137-2) for servo valve selection.

This is a 4 ways, 2 positions, Solenoid operated, detented spool, valve with manual over-ride facility with inductive position switch.

- | | |
|------------------------------------|---|
| 1. Valve size | - NG10 |
| 2. Normal working Pressure | - 100 kg/cm ² |
| 3. Operating medium | - Turbine oil to ISO VG-68/46 |
| 4. Capacity of the valve | - approx. 60 LPM or more |
| 5. Manual over-ride facility | - Required. |
| 7. Solenoid type | - Wet type (Oil immersed) |
| 8. Insulation to DIN 40050 | - IP 65 or better |
| 9. Duty | - Continuous |
| 10. Supply Voltage | - 220V DC continuously rated |
| 11. Electrical connector indicator | - Large angled plug to DIN 43050 with
Light. |
| 12. Seal material | - VITON/NBR |
| 13. Spool position feedback | - Inductive type position switch |

The solenoids are to be marked / inscribed with (20G-46Ø-2) & (20G-46C-2) as shown in the drawing no. 22000049045 Rev.00

(For hydraulic symbol refer DCG Drg. No. 22000049045 Rev.00)

3.4.4 Solenoid operated valve (Device no. 236) for emergency closing.

This is a 4 ways, 2 positions, Solenoid operated, spring offset valve with manual over-ride facility with inductive position switch.

- | | |
|------------------------------------|---|
| 1. Valve size | - NG10 |
| 2. Normal working Pressure | - 100 kg/cm ² |
| 3. Operating medium | - Turbine oil to ISO VG-68/46 |
| 4. Capacity of the valve | - approx. 60 LPM or more |
| 5. Manual over-ride facility | - Required. |
| 7. Solenoid type | - Wet type (Oil immersed) |
| 8. Insulation to DIN 40050 | - IP 65 or better |
| 9. Duty | - Continuous |
| 10. Supply Voltage | - 220V DC continuously rated |
| 11. Electrical connector indicator | - Large angled plug to DIN 43050 with
light. |
| 12. Seal material | - VITON/NBR |
| 13. Spool position feedback | - Inductive type position switch |

The solenoids are to be marked / inscribed with (20ES-3Ø) as shown in the Drg. no. 22000049045 Rev.00

(For hydraulic symbol refer DCG Drg. No. 22000049045 Rev.00)

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3.4.5 Hydraulic pilot operated directional control valve (Device no. 238) for emergency closing.

This is a 4 ways, 2 positions, hydraulically pilot operated, spring offset spool type directional control valve.

1. Valve size - NG10
2. Normal working Pressure - 100 kg/cm²
3. Operating medium - Turbine oil to ISO VG-68/46
4. Capacity of the valve - approx. 60 LPM or more

(For hydraulic symbol refer DCG Drg. No. 22000049045 Rev.00)

3.4.6 Hand lever operated directional control valve (Device no. 144-1) for emergency closing.

This is a 4 ways, 2 positions, hand lever operated, detented spool type directional control valve.

1. Valve size - NG10
2. Normal working Pressure - 100 kg/cm²
3. Operating medium - Turbine oil to ISO VG-68/46
4. Capacity of the valve - approx. 60 LPM or more
5. Manual over-ride facility - Required with hand lever.

(For hydraulic symbol refer DCG Drg. No. 22000049045 Rev.00)

3.4.7 Test points

TP-1,2,3 & TP-4 to be provide in the manifold as shown in DCG Drg. No. 22000049045 Rev.00.

Size : To be decided by bidder.

3.5 High Pressure Duplex Oil Filter (Device No.118) :-

Inline high pressure Duplex Oil Filter for Hydro Mechanical Cabinet is required. This filter will be used in the pressure line to supply the clean oil for the operation of servo valve and other hydraulic valve as per schematic drawing.

TECHNICAL SPECIFICATION:

Flow rate of oil	: 100 LPM or more
Normal working pressure	: 100 Kg/cm ²
Medium / Liquid	: Turbine oil ISO-VG- 46
Specific gravity	: 0.87
Filtration	: 10 micron
Operating temperature	: (0) °C to (+) 60 °C
Clean ΔP	: ≤2.0 Kg/cm ² at 100 LPM
Bypass system	: Required
Inlet/outlet Connection	: Bidder to decide
Mounting	: line mounted vertically

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Clogging indicator indicator : Combine visual/electrical clogging

is required with SPDT contact for alarm and annunciation. Operating voltage to be mentioned by supplier (0-24V DC preferably)

Diff. Pressure for clogging Indicator actuation : 3-5 kg/cm²

Filter element pressure : It should withstand the differential of 30 kg / cm².

3.6 MECHANICAL PRESSURE SWITCHES (Device No. 63G-6a, 63G-6b & 63G-6c):

- a) Enclosure : Weatherproof to IP 65 or better
- b) Pressure range : Up to 110 Bar
- c) Adjustable working range : The setting of the pressure switch should be adjustable for the wide range
- d) Test pressure : 160 Bar or more
- e) Differential : Fixed (Between 1.5 to 6 Bar) / Adjustable (Between 1.5 to 6 Bar)
- f) Sensing element : Diaphragm sealed piston type of non-corrosive metal
- g) Wetted parts : Stainless steel / Non corrosive
- h) Switching point contact : 1 No. switching point with changeover (SPDT type)
- i) Contact rating : 5A / 240 VAC , 0.2 A / 250 VDC
- j) Accuracy : ± 5.0 % of FSR or better
- k) Repeatability : ± 2.0 % of FSR or better
- l) Ambient temperature range : 0 to 50 Deg C
- m) Process temperature range : 0 to 50 Deg C
- n) Process connection : 1/4" BSP (F) (If pressure switch has some other process connection, vendor shall also offer suitable adaptor with the pressure switch)
- o) Cable entry : Suitable for connecting 3 core cable of 2.5 sqmm with suitable gland
- p) Mounting : Surface / direct mounting
- q) Working Media : Oil

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3.7 PRESSURE TRANSMITTER (Device No. 63G-14-1)

1.	RANGE	0-160 KG/CM2
2.	OUTPUT SIGNAL	4 – 20 mA DC Suitable for Electrical Load of minimum 500 ohm
3.	ACCURACY	± 0.5% of the calibrated span including linearity, hysteresis & repeatability
4.	VOLTAGE	24 V DC
5.	CONNECTION	2 wire system

3.8 ISOLATING VALVE (Device No. 323-1 to 5)

Needle type isolating valve (S.S.) class 900 of size 3/8”BSP (F).

3.9 ISOLATING VALVE (Device No. 598G-1)

Ball valve type Isolating valve (S.S.) class 900 of size 3/4”BSP (F).

3.10 MAIN DISTRIBUTING VALVE (Device NO. 37, 38, 377-1, 40 & 41) WITH POSITION FEED BACK (Device no. R706-1): Shall be given as free issue (BHEL scope of supply) to successful bidder.

- For mounting details of MDV (Main distributing valve) refer drawing no. 02083949067 Rev.00
- MDV spool position feedback device (R706-1) shall be given as free issue. This feedback device is of magneto restrictive profile housing type with 50mm (stroke) and 4-20mA output.

3.11 SELECTOR SWITCH [Device No. 43A/M]:

The selector switch shall be of multi – stage, rotary type, stay put type, 2 position, 4 pole in each position, rated for 660 volt AC and DC and having current rating of 5 amps. The switches shall be switch-board type.

A square or rectangular escutcheon plate for front of mounting shall be provided with main position labels.

The mechanism housing shall be mounted in fire resistant material. The switches having stayed put switches shall have spade type handle.

3.12 SELECTOR SWITCH [Device No. 43L/R]:

The selector switch shall be of multi – stage, rotary type, spring return type, 2 position, 4 pole in each position, rated for 660 volt AC and DC and having current rating of 5 amps. The switches shall be switch-board type.

A square or rectangular escutcheon plate for front of mounting shall be provided with main position labels.

The mechanism housing shall be mounted in fire resistant material. The switches having stayed put switches shall have spade type handle.

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3.13 EMERGENCY PUSH BUTTON [Device No. PL-1]:

The push button [PL-1 (Red)] shall be push to actuate type, have adequate current carrying capacity, rated for 220 VDC and shall have 2NO contacts. The push button shall be covered with protective cover to avoid unintentional operating of push button.

3.14 INDICATING LAMP [Device No. IL-1]:

The indicating lamp [IL-1(Red)] shall be of LED type .Rating of lamp shall be 220 V DC.

3.15 INDICATING LAMP [Device No. IL-2]:

The indicating lamp [IL-2(Green)] shall be of LED type .Rating of lamp shall be 220 V DC.

3.16 TERMINAL BLOCKS:

Terminal blocks for power supply and controls shall be as per BOM and wiring diagram.

3.17 TERMINAL BOX:

All the terminal blocks shall be mounted inside the terminal box.

(4) PIPES AND FITTINGS:

All Oil pressure pipes should be of seamless carbon steel of schedule 80 and Oil drain pipes should be of Schedule 40, carbon steel. Pipe fittings & couplings should be of weldable type with seal of steel. Flanges material shall be M.S.
Pipe sizes shall be as per the hydraulic scheme of governing system drawing no. 22000049045 Rev.00

(5) WIRING:

Cabinet wiring shall be carried out with colour coded PVC wire of 650V grade conforming to latest issue of IS: 694. The wiring shall be done with PVC insulated stranded conductor tinned annealed copper wire of size 1.5 sq. mm and wiring subject to swing shall be done with flexible cables.

The wiring shall be with identification ferrules (sleeved type) having black letters on white back ground at both ends as per IS: 375 (1963).

Colour	Circuit function
Black	Neutral
Gray	Single phase- AC / Control Supply
Green/Yellow	Earth
Red	+Ve DC Control supply
Black	-Ve DC Control supply

Note: For technical details of other items refer Annexure -A of this specification

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(6) IDENTIFICATION:

All the devices of the Hydro Mechanical cabinet should be provided with metallic inscription plate at appropriate place to identify the each device. The functional description shall be provided in the metallic plate below each device mounted on the front door of the panel.

Cabinet shall be identified with following inside the cabinet door.

NORMAL OPERATING PRESSURE	: 100 Kg/cm²
PROJECT NAME	: DEVELOPMENT
W.O. NO.	: OBHP18001BP
YEAR	: As applicable

(7) RATING PLATE:

Rating plate Drg. No. 12083749020 ITEM No. 1 shall be fixed below the name plate of supplier inside HMC. This rating plate shall be under supplier's scope.

(8) TESTING:

The testing at manufacturer works shall include electrical, mechanical and Hydraulic functional tests in accordance with the BHEL test procedure (To be given to successful bidder after placement of PO) to ensure that cabinet being supplied fulfill the requirement of specifications. The supplier shall carry out all the shop tests with test servo motor and power pack.

Following testing equipment required (To be arranged by the supplier) –

1. 4-20 mA DC current source
2. 240 VAC and 220 VC DC source
3. Multimeter
4. Test servomotor
5. Power pack (Suitable for pressure of 100 Kg /cm²)
6. Test Pressure gauge (0-160 Kg/cm²)

(9) PAINTING & PROTECTION:

The cabinet internal portion should be painted with brilliant white shade no RAL-9003 Glossy finished paint after two coats of primer. All external surface should be painted with RAL-7032 after two coats of primer. Thickness of paint should not be less than 90 micron.

Pipes should be identified with color code as follows.

Oil Pressure pipe (P)-Red: RAL-3020

Drain pipe (T)-mint green –RAL 6029

Control pipe (A, B,O & C) -orange-yellow: RAL-2000

(10) PACKING INSTRUCTION:

Hydro Mechanical cabinet shall be entirely covered with polyethylene sheet of at least 100 microns thickness after placing adequate quantity of silica gel packet in a cotton bag. Front side of cabinet shall be properly, covered by polyethylene air

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bubble film / thermocol sheet of adequate thickness to avoid damages to instruments. Wooden box must be reusable type.

The base of the wooden case shall be of wooden batten and planks with adequate reinforcement. Polyethylene coated bitumen Hessian craft paper shall be fixed in position above the wooden planks over which cabinet is to rest. Polyethylene sheet of at least 100 microns thickness shall be used over the base of polyethylene coated bitumen Hessian craft paper.

Four sides shall be lined from inside by polyethylene coated bitumen Hessian craft paper. It is preferable to have a single piece of above craft paper fixed on the four sides. In case jointing is unavoidable, then it should be overlapped by approximately 200mm length. Empty space in the box shall filled with adequate cushioning material wherever necessary i.e. thermocol piece, wood wool etc. to avoid movement and shocks.

The inner side of the top surface shall be lined with polyethylene coated bitumen Hessian craft paper. A polyethylene sheet of at least 100 microns thick shall project appropriately 150mm on all side of the top surface. This projection, after the top cover, shall be folded over on the sides of the wooded box & latched to prevent ingress of water from the top.

The following details are to be marked on the packing cases:

- i) Address of consignee.
- ii) P.O. No.
- iii) Description of item
- iv) Case No.
- v) Net weight
- vi) Gross weight
- vii) Dimension of box
- viii) Mark shown. Upright position
- ix) Mark showing sling position wherever necessary
- x) Mark showing umbrella (for showing cover storage)

(11) GAURANTEE / WARRANTEE:

The equipment supplied shall be guaranteed / warrantee for 18 months from the date of dispatch. During the guarantee period the supplier shall remain liable for repair / replacement for any defect that may fad due to bad workmanship / material defects.

(12) CERTIFICATION:

The inspecting agency shall certify that the testing has been witnessed as per applicable standard/Test procedure supplied by BHEL. Acceptance or waive of inspection does not absolve the supplier of his responsibility to rectify the equipment in case it does not perform satisfactorily at site where it is actually used.

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(13) DOCUMENTATION

✧ **ALONG WITH THE OFFER:**

13.1 The supplier shall submit the documents/drawings at the time of offer which shall include the following :-

- i) Catalogues for the items mentioned in this specification
- ii) Bill of material along with model code, make, quantity and catalogue. Incomplete offer will not be considered for technical scrutiny.
- iii) QAP

✧ **AFTER AWARD OF CONTRACT:**

13.2 Manufacturing drawing of manifold with its mounting accessories must be submitted for our reference.

13.3 - Vendor has to submit Arrangement drawing (GA Drawing) along with BOM within 5 weeks after placement of PO for BHEL approval.

- Submission of above drawing will be considered as first submission.
- After incorporating our comments subsequent revised drawing shall also to be Submitted within 2 weeks of receipt of comments.
- Vendor shall start manufacturing after getting clearance from BHEL.

13.4 Following documents must be submitted at the time of inspection call.

- Dimensional record certificate
- Calibration certificate of all measuring instruments
- TC & GC of all bought out items
- Compliance certificate of raw material & all bought out items.
- Operation test certificate
- Pressure test certificate

13.5 After approval of GA drawing , drawing of manifold to be submitted for our reference.

2 copies of O&M manual as well as soft copy of the same to be submitted to indenter in a separate packing box.

(14) STORAGE AND HANDLING:

Supplier should indicate the method of storage & handling instruction to avoid any damage and safe operation of the system. If any special precaution is required for handling the system it should be clearly indicated in the instruction plate as CAUTION.

(15) LIST OF INSTRUMENTS AND DEVICE LIST:

AS PER THE ANNEXURE A

(16) LIST OF FREE ISSUE MATERIAL:

AS PER THE ANNEXURE B

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**ANNEXURE -A TO P.I. NO. 741590060
LIST OF INSTRUMENTS AND DEVICE FOR HMC**

Sl. No.	Device No.	Description	Specification	Qty	Make
1	PG & TPG	Pressure gauge	As per clause no. 3.2 & 3.3 of specification no. 741590060.	1 No. each	Ashcroft / Wika / Budenberg / Kobold/Mass/F orbes marshall
2	238	Pilot operated hydraulic valve	As per clause no. 3.4.5 of specification no. 741590060.	1 No.	Hydac / Yuken / Rexroth / Moog / Eaton /Parker/ Atos
3	137-1	Solenoid valve	As per clause no. 3.4.2 of specification no. 741590060.	1 No.	Hydac/ Yuken / Rexroth /Moog / Eaton/Parker/ Atos
4	137-2	Solenoid valve	As per clause no. 3.4.3 of specification no. 741590060.	1 No.	
5	236	Solenoid valve	As per clause no. 3.4.4 of specification no. 741590060.	1 No.	
6	144-1	Hand lever operated directional control valve	As per clause no. 3.4.6 of specification no. 741590060.	1 No.	Yuken/Hydac/ Rexroth/Moog/ Eaton/Parker/ Polyhydron/ Atos
7	323-1to 5	Isolating Valve	As per clause no. 3.8 of specification no. 741590060.	5 Nos.	Hydac / Yuken / Rexroth / L&T (Audco) / MHA Zantgraf/leader
8	598G-1	Isolating valve	As per clause no. 3.9 of specification no. 741590060.	1 No.	
9	118,33-88a	Duplex Filter with clogging indicator	As per clause no. 3.5 of specification no. 741590060.	1 No.	Hydac/ Rexroth / Internorman / EPE / Pall / Eaton
10	63G-6a, 6b & 6c	Mechanical Pressure Switch	As per clause no. 3.6 of specification no. 741590060.	3 Nos.	Ashcraft/ Indfoss/Switzer / Hydac/Bosch Rexroth/Wika/ Mass/Trafag
11	63G-14-1	Pressure transmitter	As per clause no. 3.7 of specification no. 741590060.	1 No.	Yokogawa/Honeywell/E&H/Hydac/Yuken/Rexroth/ABB
12	TP-1,2,3&4	Test points	As per clause no. 3.4.7 of specification no. 741590060.	3 Nos.	Yuken/Hydac/ Rexroth/Polyhydron/Moog/Eaton /Parker/Stauff
13	TM, GPI, GLI, MWI	Electrical Indicating meters	As per clause no. 3.1 of specification no. 741590060.	4 Nos.	Meco/IMP/ Rishabh

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14	43A/M	Selector switch	As per clause no. 3.11 of specification no. 741590060.	1 No.	L&T / Kaycee / Saizer / C &S / EE / Siemens/ABB
15	43L/R	Selector switch	As per clause no. 3.12 of specification no. 741590060.	1 No.	L&T / Kaycee / Saizer / C &S / EE / Siemens/ABB
16	PL-1	Push button	As per clause no. 3.13 of specification no. 741590060.	1 No.	ABB/L&T /Schneider/ Siemens/Esbee
17	IL-1	Indicating Lamp	As per clause no. 3.14 of specification no. 741590060.	1 No.	ABB/L&T /Schneider/ Siemens/Esbee
18	IL-2	Indicating Lamp	As per clause no. 3.15 of specification no. 741590060.	1 No.	ABB/L&T /Schneider/ Siemens/Esbee
19	Q1	MCB	220 VDC , 2 Poles, 10 Amp	1 No.	ABB/L&T /Schneider/ Siemens
20	Q2	MCB	240 VAC , 2 Poles, 10 Amp	1 No.	
21	IL	Illumination Lamp	240 V AC LED TYPE	2	Philips /CGL/ Bajaj/Havells/ Anchor
22	DS-1~4	Door Switches	240 V AC, 1 A	4	Reputed
23	SSU	Switch & Socket	240 V AC , 5 Pin	1	Philips /CGL/ Bajaj/Havells /Anchor
24	220 V SM , ACTLX	Contactors-	220 V DC , 2 NO + 2NC	2	Siemens/L&T/ ABB / Schneider
25	TB1CT-1 to 50, TBP-1 to 10,	Terminal blocks	As per BOM and wiring diagram	1 set	Phoenix / Wago / Weid muller / /Elmex/Connec twel

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
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ANNEXURE-B

LIST OF FREE ISSUE MATERIALS

S. NO.	DESCRIPTION & MATERIAL CODE	QTY FOR 1 GOV	TOTAL VALUE IN RS.
1.	Servo valve (Device No. 65SV-G-1 & 2) Model: D634-XXXX -R24KX2M0NSW2 Material code: HT4383027350	2 Nos.	4,00,000/-
2.	MDV with position feedback Material Code:HT4385449015	1 Set	5,00,000/-
3.	MDV feedback device Material code: HT4385447020	1 NO.	83,500/-