

Request for Proposal

For

REFURBISHMENT OF GANDHI MANDAP

Design, Build and Operate Basis

Volume II D: SCOPE OF WORK & SPECIFICATIONS FOR MECHANICAL WORK

Client:



**GSCL,
Guwahati, Assam**

DOCUMENT NO: TCE.10477A-AC-1007-1300

GANDHI MANDAP

BIDDING DOCUMENT FOR REFURBISHMENT OF GANDHI MANDAP

Design and Development of Landscaping works consisting of Softscaping, Hardscaping and related Civil works along with Maintenance of Entire Garden for period of One years at Gandhi Mandap, Sarania Hill.

VOLUME II D

TECHNICAL BID - EMPLOYERS REQUIREMENT AND SPECIFICATION

Employer

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Scope of work:

Mechanical and Irrigation works are as per the Specifications, Engineering Standards.

- The Contractor shall have to do all the relevant necessary survey
- Contractor shall do all the design development and working drawings and take the approvals of the same from client/PMC.
- Contractor shall have to take all the necessary approvals, if any, from respective authorities.
- Contractor shall do all necessary co-ordination activities with client & PMC for seamless implementation of the said works.
- The scope of work includes One year operation & maintenance and Contractor is responsible for liability period of 1 years

TECHNICAL SPECIFICATIONS / WORKS REQUIREMENT: MECHANICAL WORKS FOR IRRIGATION SYSTEM

- For gardening: Water requirement for garden is calculated @ 5litre/sqm , hence total water requirement for gardening = 500 sqm x 5 = 2,500 lrs.
- For public use: It is assumed that there will be 100 visitors per day and considering water demand @ 15lit/person, water requirement for public uses= 100 x 15=1500 lrs.
- For Plantation use: Considering @ 1lit/plant, water requirement for Plantation use = 3647 x1 = 3647 l lrs.

Hence total water requirement will be around 7647 lrs. per day. Approx. 8,000 liter per day.

So a sump of capacity 10000 lrs to be provided.

Thus, it is proposed to provide 1w+1S Horizontal monoblock type pumping set for Sprinkler irrigation purpose and 1w+1S Horizontal monoblock type pumping set for Drip irrigation purpose in garden.

Type of Pump (Sprinkler irrigation)	Horizontal monoblock type
Volume to be transferred	4m ³
Working Hours	3 hrs
Capacity of pump required	1.33 m ³ /hr
Capacity of pump provided	1.5 m ³ /hr (1W+1S)
Head of pump required	40 meter
Head of pump provided	25 meter

Type of Pump (Drip irrigation)	Horizontal monoblock type
Volume to be transferred	4 m ³
Working Hours	8 hrs
Capacity of pump required	0.5 m ³ /hr
Capacity of pump provided	1 m ³ /hr (1W+1S)
Head of pump required	10 meter
Head of pump provided	12 meter

Assumptions:

- We are considering working hours for pumping is 3 hours for Sprinkler Irrigation & 8 hours for Drip Irrigation.
- Velocity through Ring main for irrigation is min 0.52 m/sec.
- Distance between two consecutive sprinklers is 10 meter.

Irrigation Detail:

Total length of pipe (Sprinkler irrigation)	200 meter
MOC of pipe	G.I. Medium duty
Distance between two sprinklers	10 meter
Total number of sprinklers required	20
Total no of sprinklers provided	25 Nos
Type of sprinklers	full rotating sprinklers
Range of sprinkler	35-40 feet
Velocity through ring main	0.52 m/sec (Min.)
Head of pump required	40 meter
Head of pump provided	25 meter
Size of Pump main Header	32 mm
MOC of Pump main Header	G.I. Medium duty
Size pipe for irrigation	32 mm
MOC of sprinklers	Brass/Stainless steel
Type of irrigation	semi-automated sprinkler system

Total length of pipe (Drip irrigation)	750 meter
MOC of Pipe	PVC/ HDPE
Total no of Plants	3647
Total number of drippers required	3647
Total no of drippers provided	3700 Nos
Type of drippers	Drop Drippers
Head of pump required	10 meter

Head of pump provided	12 meter
Size of Pump main Header	32 mm
MOC of Pump main Header	G.I.
Size pipe for irrigation	32 mm main line & 15 mm branch lines
MOC of Drippers	PVC/ HDPE

Approach of working:

Water from underground tank will be transferred in the entire park for the irrigation purpose. Water from that tank will be lifted by 2 nos (1W+1S) Horizontal monoblock pumps capacity 1.5 m³/hr @ 45 m head with the help of foot valve for Sprinkler Irrigation and 2 nos (1W+1S) Horizontal monoblock pumps capacity 1 m³/hr @ 12 m head with the help of foot valve for Drip Irrigation. Discharge line of that will be laid in the park for irrigation and number of Sprinklers will be provided for irrigation. The distance between the two consecutive Sprinklers will be 10 meters.

ITEM NO: 01 HORIZONTAL CENTRIFUGAL PUMP SET

1 SCOPE:

This specification covers the design, manufacturer, testing performance guarantee and supply of horizontal centrifugal pumps. The pump shall be directly coupled with electric motors. A common base plate shall be provided for the pump motor with all accessories.

2 STANDARDS & CODES:

The horizontal centrifugal pumps as specified herein shall comply with requirement for all applicable codes, regulation and safety codes in the locality where the pump sets will be installed and the pump data sheet attached.

The latest editions of the following standard shall be followed.

- a) IS – 6595 (part-I): 1993 Horizontal Centrifugal Pump for clear, cold and freshwater.
- b) IS – 11346:1985 Tests for agricultural & water supply pumps code of acceptance.
- c) IS – 9137:1978 & IS – 5120:1977 code for acceptance test for centrifugal, mixed flow and axial pumps - Class C

d) IS 9079:2013 - Electric monoset pumps for clear, cold water for Agriculture and water supply.

3 SPECIFIC REQUIREMENT:

- 3.1 The contractor shall make his own assessment of the friction losses under all conditions of operation and suitable head shall be selected data given in the data sheets is indicative.
- 3.2 Details of pump and motors such as discharge, efficiency, head, B.H.P., R.P.M. etc. shall be worked out and filled up by the contractor in the enclosed data sheets.
- 3.3 Pumps shall have a continuous rising head characteristic from the operating point towards shut off without any zone of instability. Pump with dropping curves shall not be acceptable. The contractor shall submit system resistance curve superimposed on solo and parallel operation curves. The head capacity curve shall be continuously rising towards shut-off with the highest at shut-off head shall be minimum 120 % of the duty point head.
- 3.4 Pumps of each category shall be identical in all respect and shall be suitable for parallel operation and from the same manufacturer.
- 3.5 The power rating for motor thus selected should be higher than the power consumption on any point of the Characteristic curve.
- 3.6 Material of construction of pumps shall be as per data sheets enclosed.

4 GENERAL REQUIREMENT:

The calculation for system resistance is to be furnished along with offer. The Head vs Flow characteristic of pump to be super imposed on system resistance curve for solo and parallel operation & to be enclosed with bid. The pump model shall be the one from the existing regular production range of the manufacturer.

5 CONSTRUCTION FEATURES:

Construction features shall be generally as specified here under.

5.1 CASING

Casing shall be robust construction and shall be tested to withstand 1.5 times maximum discharge pressure for 2 minutes.

5.2 IMPELLER

The impellers shall be dynamically balanced to ensure freedom from vibrations. It shall be positively locked on shaft and shall not loosen under reverse rotation. In case of pumps up to 2000 rpm the impeller shall be statically and dynamically balanced. In case of pumps above 2000 rpm impeller shall be balanced as per grade G6.3 of IS 11723:1985 (Part 1)

5.3 WEARING RINGS

It shall be or renewable type and these shall be held in place by screwing against rotation, press fit and locked with pins, flanged and screwed. Material construction shall be as per data sheet

5.4 SHAFT & SHAFT SEALS

A single piece shaft shall be designed for 0.05 mm maximum deflection at stuffing box face under worst condition of shut off head. Renewable shaft sleeves shall be provided with suitable packing to prevent leakages. Shaft shall be properly balanced so as not to cause any vibration during operation. The shaft shall be of adequate size to transmit the required power over the entire range.

The design of the shaft shall also take into consideration the critical speed of the shaft which shall be all tested 20% above/below the operating speed. Mechanical seal to be provided for shaft sealing.

Material of construction shall be as per data sheet

ITEM NO 02: GI PIPE, MEDIUM DUTY

1.0 SCOPE:

Providing and Supplying ISI mark G I pipes with couplings of following class and diameter including all taxes, freight , transportation, insurance, loading, unloading, conveyance to department stores, stacking etc, complete.(IS 1239). Jointing GI pipes with GI specials of following diameters in proper positions grade and alignment as

directed by Engineer in charge, including conveyance from stores to site of work, labor, giving hydraulic testing etc

2.0 APPLICABLE CODES

The laying of pipes and fittings/specials shall comply with all currently applicable status, regulation, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred to. In all cases, the latest revision of the standards/codes shall be referred to. If requirements of this specification conflict with the requirements of the standards/codes, this specification shall govern.

3.0 CARTING & HANDLING

Pipes and fittings/specials shall be transported from the factory to the work sites at places along the alignment of pipeline as directed by Owner/Engineer and as specified by manufacturer. Contractor shall be responsible for the safety of pipes and fittings/specials in transit, loading/unloading. Every care shall be exercised in handling pipes and fittings/specials to avoid damage. While unloading, the pipes and fittings/specials shall not be thrown down from the truck on to hard surfaces. They should be unloaded on timber skids with steadying ropes for by any other approved means. Padding shall be provided between coated pipes, fittings/specials and timber skids to avoid damage to the coating. Suitable gaps between pipes should be left at intervals in order to permit access from one side to the other. As far as possible pipes shall be unloaded on one side of the trench only. All pipes shall be checked for any visible damage (such as broken edges, cracking or spalling of pipe) while unloading and shall be sorted out for recantation. Any pipe which shows sufficient damage to preclude it from being used shall be discarded. Dragging of pipes and fitting/specials along concrete and similar pavement with hard surfaces shall be prohibited.

4.0 STORAGE

Each stack of pipes shall contain only pipes of same class and size, with consignment or batch number marked on it with particulars of suppliers wherever possible. Storage shall be done on firm level and clean ground and wedges shall be provided at the bottom layer to keep the stack stable. The stack shall be in pyramid shape or the pipes laid

lengthwise and crosswise in alternate layers. The pyramid stack shall be made for smaller diameter pipes for conserving space in storing them. The height of the stock shall not exceed 1.5 m. Fittings/specials, shall be stacked under cover and separated from pipes.

ITEM NO: 03 BUTTERFLY VALVE

Resilient seated butterfly valve shall be as per IS 13095-1991/ BS 5155. Valve shall be suitable for mounting in any position.

The valve seat shall be of integrally cast or replaceable design. When the valve is fully closed, the seal shall seat firmly so as to prevent leakage. The seat surfaces shall be machined smooth to provide a long life for the seal.

All fasteners shall be set flush so as to offer the least resistance possible to the flow through the valve.

Valve shall be suitable for throttling purpose.

All valve, spindles and hand wheels shall be positioned to give good access for operational personnel.

All hand wheels shall be arranged to turn in a clockwise direction to close the valve, the direction of rotation for opening and closing being indicated on the hand wheels. Specification & M.O.C. of Butterfly valve :

1.1 General

a	Type	-	Threaded
b	Rating of valves	-	PN 1.0
c	Manu. Standard	-	IS-13095:1991 / BS 5155
d	Sizes and quantity	-	As per Price schedule

1.2 Material of construction

a	Body	-	CI IS 210 FG 260
b	Bush	-	PTFE
c	Disc	-	SS ASTM A 536

d	Liner	-	EPDM
e	Lock Plate	-	CS
f	Internal & External Hardware	-	SS-304
g	Lever & Lever lock screw	-	CS
h	Upper & Lower stem	-	SS
j	Dowel pin	-	CS

ITEM NO: 04 BALL VALVE

The ball valve shall confirm to API 6D. The flange end shall be ANSI B 16.5 150#.

The valves shall be three pieces, full bore bi directional type.

i) Material of construction shall be as follows:

a. Body & body connector	:	ASTM A 216 GR WCB
b. Ball	:	ASTM A 351 Gr. CF8M
c. Seat	:	PTFE.
d. Stem	:	AISI 316
e. Body Seal	:	PTFE.
f. Stem seal	:	35% Carbon-filled PTFE

ii) Design parameters

a. Size (mm)	:	As per priced BOQ
b. Rating (bar)	:	150#

iii) Testing

a. Shell	:	31.5 kg/cm ²
b. Seat	:	5.6 kg/cm ²

ITEM NO: 05 NON-RETURNS VALVE

The valve shall be suitable for mounting on a horizontal pipeline and flow direction shall be clearly embossed on the valve body.

Valves shall possess high speed closing characteristics and be designed for minimum slam condition when closing.

Non Return valves shall conform to IS 778. They shall have metal to metal sealing. The spring action shall optimize the equal closing rates of each plate especially when the friction coefficients are uneven due to one plate resting upon one another. The plates shall not drag on the seat while opening. The plates shall not vibrate under full or partial flow condition.

1.3 Specification for Reflux Valve (Non Return Valve)

Standard	:	IS 778 with latest edition
Ends	:	Threaded.
Type	:	Swing type
Body, Disc, bonnet	:	Leaded tin Bronze LTB 2 (IS 318)
'O' ring	:	Nitrile rubber (IS 5192 – 1

ITEM NO: 06 SPRINKLERS

The full- or part-circle sprinkler shall be a single stream, water lubricated, gear drive type. The sprinkler shall be capable of both full circle and part circle operation in the same unit. The mode of operation shall be selected by inserting a flat blade screwdriver in the top of the rubber cap and turning a selector approximately 45°. The Sprinkler shall not reverse in direction during continuous operation in the full circle mode.

The part-circle sprinkler shall have adjustable arc coverage of 50° to 330°. Arc adjustment should be possible to be performed with or without the rotor in operation and shall require only a flat blade screwdriver. The arc adjustment should be possible to be performed on both the right and left trip of the sprinkler. The sprinkler shall have a rotating nozzle turret independent of the riser stem. The portion of the riser stem that is in contact with the wiper seal shall be non-rotating. The sprinkler shall have a non-

strippable drive mechanism and permit manual rotation of the pop-up stem in any direction. This shall have no effect on either the drive or the set arc. Once the manual rotation is terminated, the sprinkler shall automatically return the water stream to its preset arc. The sprinkler shall have a pressure activated, multi-function, soft electrometric wiper seal. This wiper seal shall prevent the sprinkler from sticking in the up position, and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. The sprinkler body shall have a 1"(26/34) female (NPT or BSP) bottom inlet. The sprinkler shall have a standard rubber cover which designates each adjustment opening from the top. The sprinkler shall have a two piece, front-load nozzle assembly which will allow the nozzle to be installed without a stator bushing change. The primary and secondary nozzle ports shall be contained in one of the parts and shall be unique to each nozzle size. The tertiary nozzle port shall be common to all of the other primary/secondary nozzle assemblies. The sprinkler shall have a selection of eight color-coded nozzles. All nozzles shall have three ports for optimal close-in, mid-range and long-range water distribution. The sprinkler shall have a stainless steel nozzle retention screw. The angle of trajectory shall be 25° from horizontal. The sprinkler shall have a strong stainless steel retract spring for positive pop-down. The sprinkler shall have a standard check valve device capable of holding up to 10 feet (3,1 m) of head. Pop-up height as measured from the top of the covert to the centerline of the nozzle orifice shall be at least 5 inches (12, 7 cm). The sprinkler's overall height shall be 10 1/8 inches (25, 7 cm) and the exposed diameter shall be 1 7/8 inches (4,8 cm).

The pop-up sprinklers, shall be installed as per the manufacturers guidelines. Swing joints shall be used to connect the sprinklers to the lateral lines. The top of the sprinkler shall always be flush with the finished ground level such as to ensure that the sprinkler top is not damaged during lawn mowing.

The positioning of sprinklers and the arc setting shall be done as per site condition to ensure maximum coverage of the area to be wetted and to avoid water falling in dry areas.

As a standard rule, 100% overlap from sprinkler to sprinkler shall be maintained, i.e., the throw radius of the sprinkler shall be the spacing to be maintained between sprinkler to

sprinkler. However, in high windy areas where the wind velocity is very high and in undulating terrains, the sprinkler-to-sprinkler spacing shall be reduced to prevent any dry patches occurring, to ensure effective coverage.

Sprinkler details are as follows

Radius : 8 - 12 mtr Flow- 0.20 - 0.25 lps

ITEM NO: 07 DRIP IRRIGATION

Drop by drop, water is distributed to the active root zone of plants. This method, if managed properly, might be the most water-supply-efficient way of irrigation, because runoff and evaporation reduced significantly. Drip irrigation in today's agriculture, is frequently integrated with plastic sheet, further diminishing evaporation, and is also a method of fertilizers delivery to the plants. This process called fertigation (fertilizer + irrigation). Latest drip irrigation technology called hydro-pc, guarantee a wide, efficient labyrinth leading the water into a flow control cell, where a special diaphragm compensate the stream, and keeps a stable flow rate at changeable inlet pressures. IG hydro-pc drip line is highly resistant to clogging. The dripper inlet filter, located closer to the tube center, guarantees an excellent constant flushing treatment.

Water is delivered to the plants via a set of plastic lateral tubes laid along the ground or buried just beneath it for protection. The lateral lines are connected to a buried main line that receives water from a head source. The trickling rate, generally in the range of 4-8 litres/ hour per emitter, must not exceed the soil's infiltrability if run off is to be avoided. The operating water pressure is usually in the range of 1 to 3 atmospheres. This system is especially successful in the regions where water supply is scarce.

The relatively small diameter drip line makes a better drip irrigation efficiency. Decrease retained water in the system, causing a shorter refilling time with less redundant drained water, on sloppy terrains, no excessive water wetting in the lower parts of the field.

A general problem which arises with drip irrigation systems is that the pipes and drippers are likely to become blocked by mineral or organic particles. It is therefore indispensable to have a good filtering system, especially where drip irrigation is concerned. There is also the risk that pipes exposed on the soil surface may be damaged by rodents and dogs. Added advantage of this system is that plant nutrients can also be applied to the trees through irrigation water (fertigation). Special attention must be paid to the design of drip irrigation systems based on the soil type, emitters/dripper characteristics and tree

development patterns and each individual case must be examined by qualified technical staff. For uniform distribution of water to the entire root zone of plants hydrogoles can be attached with laterals which have flexibility of adjustment as the root zone is expanding.

DATA SHEET FOR Horizontal Centrifugal Pump Set			
Sr. No.	Description	Particulars	Particulars by Bidders
1.	Make of Pump Set	As per Vendor list	
2.	Model	To be furnished by bidders	
3.	No of Pumps	As per price bid	
4.	Design Capacity	As per price bid	
5.	Total Head	As per price bid	
6.	Shut off Head	To be furnished by bidders	
7.	Rated speed & Supply Frequency	To be furnished by bidders	
8.	Type of Casing	robust construction	
9.	Pump Efficiency @ duty point (min.)	To be furnished by the bidder	
10.	BkW at Duty Point	To be furnished by the bidder	
11.	Rated Motor Efficiency	Bidder to furnish	
12.	Overall Pump Ste Efficiency	Bidder to furnish	
13.	Motor Input @ Duty Point	Bidder to furnish	
14.	Motor Rating	To be furnished by the bidder	
15.	Class of Insulation of Motor	F	

DATA SHEET FOR Horizontal Centrifugal Pump Set				
Sr. No.	Description	Particulars		Particulars by Bidders
16.	Fill of Motor	Air		
17.	Type of Bearing and its rated L ₁₀ life	Heavy duty Ball or Roller bearings with a minimum L10 life of 75,000 hours as per BS 5512		
18.	Type of Lubrication	Greased		
19.	Cable size & MOC	Power cables	____mm ² x ____Core x____ Runs ____mm ² x ____Core x____ Runs	
		Control Cables	____mm ² x ____Core x____ Runs	
		MOC Of Conductor	Al/ Cu	
20.	Pumps suction and Delivery nozzle Size	Bidder to furnish		
21.	MOC of Motor Rotor's Squirrel Cage	Aluminium Die Cast or Dual Cage Copper Bar		
22.	MOC of Motor Pump Shaft	Stainless Steel (SS 410 or SS 430 or 1.4021 or 1.4460		

DATA SHEET FOR Horizontal Centrifugal Pump Set			
Sr. No.	Description	Particulars	Particulars by Bidders
23.	MOC of Impeller	Cast Austenitic Stainless Steel (SS 316 or CF 8M or 1.4406)	
24.	MOC of Impeller's Wearing Ring	Cast Austenitic Stainless Steel (SS 316 or CF 8M or 1.4406)	
25.	MOC of Casing's Wearing Ring	Cast Austenitic Stainless Steel (SS 316 or CF 8M or 1.4406)	
26.	Weight of Pump Sets (Kg)	To be furnished by the bidder	

DATASHEET FOR BUTTERFLY VALVES			
	Description	Particulars	Particulars by bidder
1	General		
1.1	Make	As per Vendor List	
1.2	Type	Threaded	
1.3	Applicable standard	IS 13095-1991/BS 5155	
2	Size ,Location & quantity	As per Price BOQ	
2.1	Pressure Rating	PN 1.0	
3	Material of Construction		
3.1	Body	CI IS 210 FG260	
3.2	Bush	PTFE	
3.3	Disc	SS ASTM A 536	
3.4	Liner	EPDM	
3.5	Lock plate	CS	
3.6	Internal & External hardware	SS 304	
3.7	Lever & Lever lock screw	CS	
3.8	Upper & lower stem	SS	
3.9	Dowel pin	CS	
	Hydrotest Pressure		

3.10	Body	2.4MPa	
3.11	Seat	1.6MPa	
SWING CHECK VALVES			
	Description	Particulars	Particulars by Bidders
1	General		
1.1	Make	As per Vendor list	
1.2	Type	Swing Check Valve	
1.3	Applicable standard	API 594 & 598	
2	Size ,Location & quantity	As per Price BOQ	
2.1	Pressure Rating	PN 1.0	
3	Material of Construction		
3.1	Body, disc, bonnet	Leaded tin Bronze LTB 2 (IS 318)	
3.2	'O' ring	Nitrile rubber (IS 5192 - 1)	
3.3	Nuts	CSL, IS-1363(P-3),CL 4.0	
3.4	Bolts	CSL, IS-1363(P-3),CL 4.6	
	Hydro Test Pressure		
	Body	1.5MPa	
	Seat	1.0 MPa	

DATASHEET FOR BALL VALVES			
	Description	Particulars	Particulars by bidder
1	General		
1.1	Make	As per Vendor List	
1.2	Type	Threaded	
2	Material of Construction		
2.1	Body & body connector	ASTM A 216 GR WCB	
2.2	Ball	ASTM A 351 Gr. CF8M	
2.3	Seat	PTFE	
2.4	Stem	AISI 316	
2.5	Body Seal	PTFE	
2.6	Stem seal	35% Carbon-filled PTFE	
3	Design parameters	CS	
3.1	Size (mm)	As per priced BOQ	
3.2	Rating (bar)	150#	
4	Testing		
4.1	Shell	31.5 kg/cm ²	
4.2	Seat	5.6 kg/cm ²	